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Between 2004-2010, the journal is headed by Professor Ph.D. Constantin Mecu, as editor-in-chief, and associate professor Ph.D. Aurelian A. Bondrea, as deputy editor, both vice-rectors of the university.

In 2011, associate professor Ph.D. Aurelian A. Bondrea, rector of the university, takes over the presidency as editor-in-chief and leads the journal until present.

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In 2007, *Annals of Spiru Haret University. Economic Series* obtained the B+ quotation from The National Council of Research in Higher Education in Romania, becoming a publication of real scientific interest.

Starting 2009, the review is indexed in REPEC, SSRN and Google Scholar and beginning with 2016 our Journal is under a process of rebranding, the new team trying to rethink the journal indexing strategy in international databases, suggesting a greater external visibility.

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In the published materials, there are analysed theoretical and practical issues of edification and consolidation of the Romanian market economy, as well as the fundamental directions of the technical and scientific progress, the actual state, and ways of its promotion in the Romanian economy, the issue of developing the new world economy, the directions of globalization and contemporaneous economic integration and Romania's participation to these processes. Also, there are hosted articles that refer to different aspects of economic phenomena from all over the world.

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## FOREWORD

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According to the data of the Bursa.ro publication, dated August 11, 2023, appearing in the article called "IMF estimates a GDP of 105 trillion dollars for the world economy by the end of 2023", it is expected that by the end of 2023 the world economy will have a gross domestic product (GDP) of 105 trillion dollars, or 5 trillion dollars higher than the previous year, information that is taken from the publication ZeroHedge.ro. , according to the forecasts of the International Monetary Fund (IMF).

According to the cited source, in nominal terms, this is a 5.3% increase in global GDP. In inflation-adjusted terms, this would be an increase of 2.8%.

As Visual Capitalist's Pallavi Rao details below, the year got off to a turbulent start for the global economy, with financial markets rocked by the collapse of several mid-sized US banks, along with persistent inflation and tightening monetary conditions in most countries. However, some economies have proven resilient and are expected to grow from 2022.

The US is expected to continue to be the largest economy in 2023, with an estimated GDP of \$26.9 trillion. This is more than the sum of the GDPs of 174 countries ranked from Indonesia (17th) to Tuvalu (191st).

China remains constant in second place, with an estimated GDP of 19.4 trillion dollars in 2023. Most of the top five economies remain in the same positions from 2022, with one notable exception, states ZeroHedge.ro.

India is expected to overtake the UK to become the fifth largest economy, with an estimated 2023 GDP of \$3.7 trillion.

29 economies are projected to shrink from their 2022 size, resulting in output losses of nearly \$500 billion.

Russia will see the largest decline, with an estimated contraction of \$150 billion this year. This is equal to about a third of the total decline of all 29 countries with shrinking economies.

Egypt (-88 billion dollars) and Canada (-50 billion dollars) together represent another third of the lost production, according to the quoted source.



In the case of Egypt, the decrease can be partially explained by the country's currency (the Egyptian pound), which has fallen in value against the US dollar by approximately 50% since mid-2022.

Russia and Canada are some of the world's largest oil producers, and the price of oil has fallen since 2022. Another complication for Russia is that the country has been forced to sell oil at a deep discount due to Western sanctions.

The presence of Saudi Arabia, Norway, Kuwait and Oman in the top 10 largest GDP contractions further highlights the potential impact on GDP for oil-producing countries, according to IMF forecasts.

More recently, producers have cut supply in an effort to boost prices, but concerns about slowing global oil demand following a shrinking Chinese economy (the world's second-largest oil consumer) have kept oil prices lower than in 2022.

Although organizations such as the IMF have proven quite good at forecasting GDP, it is still worth remembering that these are projections and assumptions made at the beginning of the year, which may not hold true until the end of 2023.

For example, JP Morgan has already changed its forecast for China's 2023 real GDP growth six times in as many months after expectations for overall pandemic recovery spending failed to materialize in the country.

The main conclusion from the IMF forecasts for GDP growth in 2023 is based on how well countries limit inflation without stifling growth, all in tense liquidity conditions, ZeroHedge.ro also points out.

In the current context, the authors found forums for discussions and debates and have written articles for the current issue trying, as far as possible, to look at some solutions for the problems facing the new world state of the economy. Whether or not they succeeded in responding to the challenges, we leave it to you to determine.

In the first paper published in the present issue, entitled “*Building a Strong Economic Governance Framework for the Challenges Ahead*”, the author **UNGUREANU, D. M.** says that the policy responses to the COVID-19 crisis and the Russian invasion of Ukraine seems not to be enough to fight against macroeconomic imbalances, and further action should be taken to avoid an upcoming recession. The sharp rise in inflation under the pressure of energy, food and other commodity prices is hitting a global economy. Reforms have generally been made in reaction to weaknesses in the framework that nations have been exposed mostly in moments of economic crisis.

Authors **BABALOLA, A., YELWA, M. and OLANIYI, O.**, in their paper entitled “*Monetary Policy and Unemployment Rate in Developing Economies: Evidence from Nigeria*” analysed the impact of monetary policy on the

unemployment rate in Nigeria using quarterly time-series data from 1990(1) to 2019(3). The monetary instruments used were the monetary policy rate (MPR), cash reserve ratio (CR) and liquidity ratio (LR). Inflation (P) was added to represent a macroeconomic variable. The autoregressive distributed lag cointegration/bound test technique was employed in the analysis as directed by the order of integration. The study found that, in the short run, monetary policy, proxied by its instruments, monetary policy rate (MPR) and cash ratio (CR), did not have a significant effect on the unemployment rate in Nigeria. However, the liquidity ratio (LR) was significant. The finding also revealed that, in the long run, periods, monetary policy (MPR and LR) has a significant impact on the unemployment rate, though, CR did not. Furthermore, it was discovered that monetary policy has a low speed of adjusting the economy back to full employment equilibrium. Lastly, the liquidity ratio happened to be the most efficient individual instrument in both the short and long-run periods. In the long run, apart from the liquidity ratio, the monetary policy rate has the greatest impact and is the most efficient.

In the article entitled *“Challenges and Perspectives in Romania's Financial-Accounting Management System in the Context of Global Risks”*, the authors **GURGU, E. , ZORZOLIU R.I., UNGUREANU, G. , PISTOL , L. and GURGU, I.A.** are talking about the fact that financial-accounting management is an essential function for any organization, and it faces several challenges and perspectives that must be addressed to ensure its effectiveness. Financial-accounting management system faces several challenges in Romania, such as regulations and compliance, technology, data management, and talent management. However, there are also several perspectives that can help overcome these challenges, such as automation, sustainability, data analytics, and collaboration. By addressing these challenges and embracing these perspectives, financial-accounting management in Romania can become more effective and efficient.

The authors **GURGU E., SABYASACHI R., PETROVA E., and ILIC M.,** in their article entitled *“Innovations in Funding and Crowdsourcing for Social Logistics”* are talking about the fact that in recent years, the field of logistics has witnessed a significant transformation, largely driven by the advent of new technologies and innovative funding methods. This has paved the way for novel approaches to address societal and environmental challenges, giving rise to the concept of social logistics. Social logistics as we see it and we want to demonstrate refers to the management and coordination of the flow of goods and services to meet societal needs while considering environmental and social impacts.

**KIMOLO D.W. , ODHIAMBO N. and NYASHA S.**, in their paper named “*Inflation Dynamics in Uganda During The Post-Independence Era*” provides a comprehensive chronological analysis of Uganda's inflation performance and policy reforms aimed at reducing inflation and establishing the economy from 1970 to 2021. The impetus for this article lies in the growing interest in Uganda as a prototype for other developing countries grappling with high inflation rates. To achieve the objective, the study adopts a rigorous methodology involving a detailed analysis of selected statistical and academic literature. Uganda faced persistent hyperinflation for much of the 1970s and 1980s and early 1990s. In response, the Ugandan government implemented a series of inflation policy reforms aimed at reducing inflation and stabilizing the economy. The policy reforms in Uganda can be analyzed episodically through five distinct periods, starting with the first 10 years after independence (1962-1971), followed by 15 years of political instability (1971-1985), 10 years of recovery (1986-1995), 10 years of economic growth and poverty reduction (1996-2006), and the most recent episode of reforms consolidation (2007-2021). The impact of these reforms has been significant, with inflation rates falling to single digits and the economy experiencing sustained growth. The decline in inflation has helped to stabilize the economy, reduce the cost of living for Ugandans, and attract foreign investment. The study underscores the importance of implementing sound macroeconomic policies, strong political will and leadership, investing in infrastructure, diversifying the economies, communicating effectively with the public, and cooperating regionally to build a robust and sustainable economy that benefits all its citizens.

The young author **MALIKOV, A.**, in the article entitled “*Construction Industry Projects And Quality: Theoretical And Practical Approaches*”, is talking about the largest share in the growth of the country's economy who belongs to sectors such as agriculture, industry, and construction. Among these sectors, the construction sector has the largest share. It is possible to complete the projects produced in the construction sector, which has a significant share of the country's economy, within the required time, quality and within a certain budget, with coordinated work. This coordinated work is created within the concept of project management. Successful implementation of project management in a construction project is achieved through the coordination of project management techniques and project management methodologies. In this study, the construction industry and quality concepts, construction project management methodologies, project knowledge areas in this sector, project management processes in the construction industry and quality-oriented project techniques are explained and theoretical and practical

experiences are aimed at understanding the effects of project management in construction on the success of the project.

Another interesting paper is the one called *“Determinants of Delay in the Delivery of Materials to Oilfields in Rivers State, Nigeria”*, written by the authors **OPARAURE, C.B., OTTO, G. & UKPERE W.I.** who are talking about the role of the petroleum industry in Nigeria that cannot be overemphasized. This work identified the determinants of delay in the delivery of materials to oilfields in Rivers State. A cross sectional survey with a sample size of 190 respondents was adopted for this study. Questionnaires were hand distributed to respondents. For the research instrument, a reliability coefficient of 0.82 was obtained using Cronbach alpha reliability test. The data obtained from the respondents were analyzed with product moment correlation coefficient. The outcome of the test show that poor planning with 0.72, government policies 0.86, weather conditions 0.74 and logistics 0.782 were key determinants of delay in the delivery of materials to Oilfields in Rivers State, Nigeria. If these sources of delay are addressed, profitability in the industry could increase through reduction in unit cost of production. Poor planning and logistics can be addressed through efficient staff recruitment and training.

The study called *“The Impact of Port Operations on Freight Forwarders in Nigeria”* written by the authors **AKINDIPE L.E., OLONADE O. and LAWAL A.** examines the impact of port operations on freight forwarders in Nigeria. The study's objective is to examine the effect of automation of port operations on freight forwarders' efficiency in Nigerian ports and the impact of port infrastructure on the efficiency of freight forwarders in Nigeria. The study was conducted in the Lagos Port Complex located in the Apapa Area of Lagos and consisted of Apapa Port and a container terminal now called APM Terminal. A survey research design was used for the study, and a stratified sampling technique was used. The study population is 5400 people, and the sample size is 372. A structured questionnaire was used to gather responses from the respondents, and the information was analysed through simple descriptive statistics. The hypotheses were analysed using correlation analysis in SPSS, and the result showed that automation of port operations enhances freight forwarders' functions. It was concluded that port infrastructure is paramount for the further development of port operations and will immensely benefit the freight forwarders. It was recommended that the Safety and security of lives and properties at the Nigerian seaports must be seen as everybody's business needs to grow and be compared with other countries of the world. Stakeholders in the maritime industry must be willing to adopt security

preventive measures to avert what could lead to disaster or loss of lives and properties at the seaport in Nigeria.

A very interesting paper is the one of professor **PĂUN R.D.**, called “*Science Versus Conscience in Crisis Management. Technology versus Future without People. Interdisciplinary Approach*”. The author believes that in the current context, but especially the future one, in which a series of crises is taking shape more and more clearly, which specialists from different fields, theorists or practitioners, researchers and the academic environment have warned that they will be established with certainty in the coming years, it becomes a priority for Romania to reposition itself in the single European market, but also in the global economy.

In the conditions where the environment changes dramatically from day to day, in which economies become vulnerable, after years in a row the solution to success was considered to be the interconnection of economies (especially in Europe), and the stimulation of competition at any cost, under the pressure of the digital age that imposes new technologies and the transformation of the life and work of each of us, we are obliged to reposition ourselves this time not to perform but ONLY to resist the various forms of crisis that are foreshadowing: the energy crisis, the food crisis, the climate crisis, environmental crises, resource crises, etc.

This study, presented in an interdisciplinary, sociological, philosophical, psychological, legal and economic approach represents, in current realities, a point of view corroborated with the current stage of technological development of the Romanian economy, a scenario that can be considered regarding recovery options economy of Romania, drawing attention to the human component, without which nothing can be built.

A mathematical approach of the economy is shown in the paper of the authors **MOHAJAN D. and MOHAJAN H.K.** . called “*Mathematical Analysis of an Industry when Cost of Principal Raw Materials Increase: A Nonlinear Budget Constraint Attempt*”. During profit maximization procedure an industry faces various difficulties; and increase of cost of principal raw material is one of them that happen frequently. In this study an attempt is taken to discuss economic effects on various inputs when the cost of principal raw material is increased. The economic sensitivity analysis of various inputs on the basis of principal raw material is an essential step for an industry when the industry is on the profit maximization track. This article deals with four variable inputs, such as capital, labor, principal raw materials, and irregular inputs of an industry, where nonlinear budget constraint is considered. This study stresses on mathematical formalities to show the economic predictions scientifically.

The authors **OLOKEDE, B.A & UKPERE W.I.** wrote their paper talking about “*Performance Enhancement of Occupational Safety and Health in Nigeria's Manufacturing Sector Through Effective Government Safety Leadership*”. The manufacturing sectors in Nigeria may have benefited from a symbiotic relationship with governmental regulatory bodies due to their profit-driven intentions as well as their crucial contributions towards job creation, poverty eradication, and social and fiscal obligations. Such a connection puts the workers at risk and may jeopardize the government's ability to fulfil its statutory supervisory obligations. To close this knowledge gap, the performance enhancement of OSH through effective government safety leadership is investigated. The present investigation utilized a mixed-methods research design, integrating both qualitative and quantitative research methodologies through a fixed explanatory sequential QUAN-dominant mixed-method strategy to examine perceptions of the three key major stakeholders regarding existing safety measures in the manufacturing industry, their efficacy, and possible interventions to enhance their applicability to revitalize OHS practices. A cross-sectional research design was adopted in collecting data from both registered (196, with three participants drawn from each, representing about 56% of the total population of 353) and non-registered (15) workplaces located in the cities of three Nigerian states, totaling 633 required participants. This work employed a combination of simple random and convenience sampling methods to determine the desired sample size. A total of 800 semi-structured questionnaires were distributed to mitigate the possibility of non-response bias among the respondents. The blue-collar workers constituted the unit of analysis for this phase. Findings indicate that the influence of government safety leadership (SL) is not supported in the safety performance behaviors of both employees and employers in the Nigerian manufacturing industry. Thus, the appropriate utilization of transformation safety leadership could be a viable means of enhancing OSH performance in the manufacturing sector.

**NĂFTĂNĂILĂ C.A. and AVRAM L.G.**, in their article entitled “*Analysis of the Real Estate Market and Investments in Romania in 2022 and the Main Challenges in 2023*”, are talking about the fact that real estate market in Romania is on an upward trend in recent years. Romania remains an attractive market in terms of real estate asset prices, rents, but also the need for modern, energy-efficient office, industrial and retail spaces. That is why, even in the conditions of an economic environment that is facing difficulties due to high inflation, the increase in financing costs; difficulties that are present all over the world, Romania can continue to attract both significant investments in the real estate sector and

important tenants for the projects that will be built. In this scientific article, we aimed to analyse the residential and investment real estate market and the commercial real estate market in the year 2022, as well as presenting the main challenges for the year 2023.

The authors **AGAGIU M. and GURGU E** in their article called “*Organic Hotel Cosmetics – The Premise of Ecological Sustainability*”, analysed the fact that from the perspective of the hotel industry, sustainable development refers to the concept of "triple bottom line", promoting social responsibility, ecological and economic responsibility. Sustainability intervenes to correct the negative effects caused by entrepreneurial activities that have led to accelerated degradation of the ecosystems. Looking from this perspective, hotel entrepreneurs align with the sustainable development goals, integrating innovative technologies that capitalize on renewable energy, as well as environmentally friendly consumables, friendly to the surrounding menu and guest’s skin.

The authors **MANDALAC A. and GURGU E** thought of a paper called “*Sustainable Tourism In Romania*”. The sustainable trends attached to world tourism highlight hotel structures with innovative design and facilities, leaning towards the directives drawn through sustainable development. The main purpose of this study is to identify the respondent’s perception of sustainable tourism. The objectives set for this research are seen from a double perspective: the objective attached to the conceptual approach of sustainable tourism from the perspective of the consequences denoted by the pandemic context and the objective of identifying the perception of the sample regarding sustainable tourism in Romania.

The author **DRĂGĂNESCU, I.D.** wrote an interesting paper about “*Types of Internal Public Audit Missions Carried out by The Internal Audit Directorate in Entities of the Ministry of National Defence*”. In the article the author wants to present the salient features of the basic missions carried out by the Internal Audit Directorate of the Ministry of National Defense, under normal conditions, in the context of the COVID-19 pandemic and in recent years. As a result, he structured the article on 5 issues: 1) general methodological elements related to the conduct of assurance missions in the field of internal public audit; 2) specific characteristics of the general methodologies that refer to the performance of advisory and evaluation missions in the internal public audit; 3) particularities of the general methodology for organizing and carrying out missions focused on the performance audit; 4) key aspects resulting from the missions carried out in recent years by the teams of professionals from the Internal Audit Directorate of the Ministry of National Defense; 5) characteristics of the internal public audit activity in conditions of the

COVID-19 pandemic in the profile structures in Romania and in the Ministry of National Defense.

The author **NICOLAE, M.** in the paper entitled *“The Conclusions of The Court of Accounts from The Evaluations, Control, and Audit Missions Relating to The Activity of The Internal Auditors and The Profile Structures Regarding The Financial-Accounting Activity of Public Institutions in Romania and in Particular from The Ministry of National Defense”*, draws attention to a current and very important issue for public institutions, in general, but especially for decision-makers from entities of the Ministry of National Defense, namely the quality of the financial accounting activity carried out by the departments that perform this activity, evaluated by two superior control structures (Court of Accounts and UCAAPI), in order to correct the various dysfunctions that occur in this field. As a result of this proposed approach, I structured the material on 4 aspects, namely: 1)the activity of the professionals of the Court of Accounts when they audit the financial statements for the fulfillment of this mission and the evaluation of the activity of internal auditors in the area of this type of missions at public institutions in our country; 2)the conclusions of the Court of Accounts derived from the control and audit missions regarding the financial-accounting activity of public institutions in Romania; 3)the conclusions of the Court of Accounts' control over the financial statements and various accounting aspects found at the audited entities of the Ministry of National Defense in the years 2019, 2020 and 2021; 4) conclusions.

In the same manner, author **PILICĂ, M.C.** wrote the paper named *“Opinions Regarding European-Funded and Scientific Research Projects Implemented by Entities in The Ministry of National Defense and their Auditing by Qualified Professionals”*. The article is intended to bring to attention a series of current issues related to the projects with European funding and scientific research implemented or to be implemented by entities in the army and was structured on 4 issues: 1) types of projects with European funding implemented by operational and administrative entities from the Ministry of National Defense in the last 5 years; 2)types of projects with European funding and scientific research implemented by higher education and research institutions from the Ministry of National Defense and the mechanism of their auditing; 3) new requirements resulting from the writing, implementation and auditing of projects with European funding for the new programming period 2021 – 2027 for entities from the Ministry of National Defense; 4) conclusions.

An exciting paper is written by the authors **MINEA V, DIMA C., STAN C., BUCĂȚARU S.A., FLORESCU G.D., LIANU C.C. and LIANU C.**, and it is



called “*Opportunity Assessment for ERP Enhancements Based on Artificial Intelligence, IoT and Big Data*”. In the context of Romania's development after joining the European Union, the authors noted significant improvements in important areas, such as the business domain and public health. The economic progress is evident in the increasing number of local and foreign companies operating in the market. Complex business processes often rely on specialized software known as Enterprise Resource Planning (ERP) systems for efficient management. In general, ERP software addresses various technical challenges faced by companies, including accounting, inventory management, production, sales, and human resources, through a comprehensive approach. The study aims to explore the potential benefits that small to medium-sized Romanian companies could derive from utilizing an ERP solution enhanced with innovative technologies such as Artificial Intelligence (AI)-powered extensions, Internet of Things (IoT) integrations, and data-driven decision-making modules. To this end, the authors performed a quantitative study on 102 Romanian companies and presented the key findings in the paper. They found that the three innovative modules are potentially attractive for the Romanian companies interviewed. Among the three modules, the Big Data module has the greatest probability of adoption and the highest perceived utility.

We hope that ASHUES journal issue caught your attention and made you read it. Also, we strongly believe that all the articles are interesting and deserve to be appropriated by those who are interested in understanding the specific issues of the global economy.

If you've liked our articles, please visit our website at <http://anale-economie.spiruharet.ro/>. If you want to write an article in our journal, we invite you to expose your ideas in new studies published by us.

Finally, hoping that you found interesting Issue no. 3/2023, I strongly invite you to address your comments and suggestions at [ashues@spiruharet.ro](mailto:ashues@spiruharet.ro) and, of course, to submit your own paper via online submission system, using the following link: <http://anale.spiruharet.ro/index.php/economics/login>.

*Research is the breath of the future. Let's shape the world together!*

**Associate Professor Elena GURGU, Ph.D. in Economics**  
**ASHUES Deputy Chief Editor**





**Issue 3/2023**

# **ACADEMIA PAPERS**



## BUILDING A STRONG ECONOMIC GOVERNANCE FRAMEWORK FOR THE CHALLENGES AHEAD

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### **Abstract:**

*The policy responses to the COVID-19 crisis and the Russian invasion of Ukraine seems not to be enough to fight against macroeconomic imbalances, and further action should be taken to avoid an upcoming recession. The sharp rise in inflation under the pressure of energy, food and other commodity prices is hitting a global economy. Reforms have generally been made in reaction to weaknesses in the framework that nations have been exposed mostly in moments of economic crisis.*

**Keywords:** *macroeconomic imbalances, rising inflation, economic slowdown, economic governance reforms*

**JEL Classification:** *E30, E31, E60, E61, E66, H20, H60*

### **Introduction**

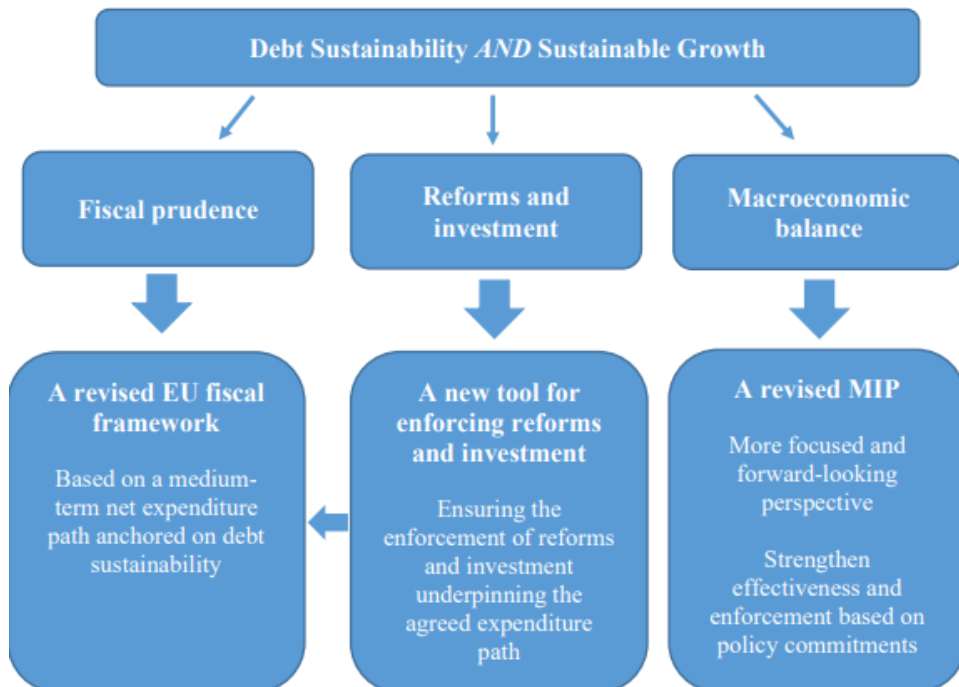
In October 2021, the Commission relaunched the public debate on the review of the EU's economic governance framework, inviting other EU institutions and all key stakeholders to engage. Through various fora, including dedicated meetings, workshops and an online survey, citizens and a wide range of participants, including national governments, parliaments, social partners, academia and other EU institutions, have debated how today's and tomorrow's economic challenges

require reforms of the EU economic governance framework. Romania has been actively involved in this debate through its participation to the Council (ECOFIN), the Eurogroup, the Economic and Financial Committee and the Economic Policy Committee which have provided Member States with an opportunity to reflect and express their views on the key objectives of the governance framework, its functioning, and new challenges to be addressed.

**1.The need for an effective economic governance framework**

The EU’s economic governance framework has guided Member States in achieving their economic and fiscal policy objectives. Since the Treaty of Maastricht of 1992, the framework has helped achieve macroeconomic convergence, safeguard sound public finances and address macroeconomic imbalances. Together with a common monetary policy and a common currency in the euro area, the framework has created conditions for economic stability, sustainable economic growth and higher employment for EU citizens.

**Figure 1: a new governance architecture**



*Source: European Commission*

The EU economic governance framework has evolved over time. Reforms have generally been made in reaction to weaknesses in the framework that have been exposed mostly in moments of economic crisis. In particular, the legislative packages known as the six-pack and two-pack responded to the lessons of the global financial crisis and the euro area sovereign debt crisis by revamping fiscal surveillance, strengthening national budgetary frameworks, reinforcing budgetary coordination in the euro area and broadening the scope of economic surveillance to include macroeconomic imbalances.<sup>2</sup>

While the framework filled surveillance gaps and became more adaptable to economic conditions, it has also become more complex and not all instruments and procedures have stood the test of time. The February 2020 Communication on the economic governance review and the ensuing public debate noted the mixed success of the fiscal surveillance framework and the growing heterogeneity of fiscal positions across Member States. The framework had not differentiated sufficiently between Member States despite different fiscal positions, sustainability risks and other vulnerabilities. National fiscal policies had often remained procyclical and Member States had not used good economic times to build fiscal buffers. The composition of public finances had not become more growth-friendly and national governments had not prioritised spending that enhances growth and economic and social resilience. The EU fiscal rules had become complex, with multiple indicators and reliance on unobservable variables, undermining transparency and hampering ownership and predictability. Despite improvements in national fiscal frameworks, their effectiveness varied markedly across Member States. With respect to the surveillance of macroeconomic imbalances, the framework had been successful in raising awareness of broader risks to macroeconomic stability but did not generate sufficient policy responses.

Lessons from the policy response to recent economic shocks, in particular the COVID19 crisis, have implications for the economic governance review. In March 2020, the general escape clause of the Stability and Growth Pact (SGP) was activated. This allowed Member States to react to the COVID-19 crisis by

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<sup>2</sup> A full description of the six-pack and two-pack reforms can be found in Box 1 of European Commission (2020), 'Economic governance review', COM(2020) 55 final of 5 February 2020

providing sizeable fiscal support to their economies, temporarily departing from the SGP budgetary requirements.<sup>3</sup>

This strong countercyclical response, together with new EU-level measures and instruments, and social safety nets and health systems at the national level, proved highly effective in mitigating the economic and social damage of the crisis. Lessons from the successful EU policy response to the crisis, including the positive interaction between reforms and investment under the Recovery and Resilience Facility (RRF), have also been useful for the review of the economic governance framework. At the same time, the crisis resulted in a significant increase in public- and private-sector debt ratios, underscoring the importance of reducing debt ratios to prudent levels in a gradual, sustained and growth-friendly manner. Fiscal prudence in times of sustained growth helps build fiscal buffers that governments can use to provide counter-cyclical fiscal support in times of crisis, when discretionary fiscal policy can be particularly effective. Investment in preparedness and resilience can also reduce the adverse economic impact of crises.

The COVID-19 crisis and the Russian invasion of Ukraine have also made these common priorities more visible and urgent. High levels of investment will be needed to achieve a fair twin transition (green and digital), increase social and economic resilience (including through upskilling and reskilling), increase territorial cohesion, reduce energy dependencies, and increase defence capabilities, both at the national level and in support of Europe's common priorities. Within its limited capacity, the EU budget has supported these efforts given that the twin transition, resilience, energy security and defence are common objectives for all Member States and made even more pressing by the current crisis. These objectives call for investment by corporations and households, but also for higher public investment, backed by a good composition and quality of public finances. These policies boost potential growth, strengthen resilience and help counter the negative shocks of the war. Finally, they reflect strategic EU priorities and are supported by common EU-financed programmes, such as the RRF financing provided until 2026 and cohesion policy funding.

The policy responses to the COVID-19 crisis, the Russian invasion of Ukraine and the ensuing energy crisis have underscored the value of strong policy coordination, including between different policy and funding tools, and between

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<sup>3</sup> A more in-depth discussion of the response to the COVID-19 crisis and the implications of that crisis on the economic governance review can be found in European Commission (2021), 'The EU economy after COVID19: implications for economic governance'

the EU and national levels. The activation of the general escape clause facilitated national fiscal responses. The interplay between fiscal policy and monetary policy was and continues to be critical for the effective macroeconomic response to the crisis. Monetary policy, created space for undertaking the necessary national fiscal policies which, in turn, helped to cushion the effects on economic growth and social cohesion. Some framework conditions, such as financial market prudential regulations and the EU State Aid framework, were temporarily adjusted. Flexibilities, including those within the EU budget, were fully applied. New EU-level tools also helped, in particular the temporary Support to mitigate Unemployment Risks in an Emergency (SURE), the Coronavirus Response Investment Initiatives (CRII) under Cohesion Policy and NextGenerationEU, including the Recovery Assistance for Cohesion and the Territories of Europe (REACT-EU) and the RRF. The effective implementation of reforms and investment in the Recovery and Resilience Plans (RRPs) provides a unique opportunity for Member States to reach a higher growth path, address economic and social vulnerabilities, improve public and private debt sustainability, strengthen resilience and accelerate the green and digital transitions, while delivering on Union objectives. More recently, in response to the energy market disruption triggered by the Russian invasion of Ukraine and Russia's weaponisation of energy, the Commission put forward a number of measures addressing high energy prices and ensuring security of supply. The Commission has also launched a series of initiatives, including the REPowerEU plan, to end dependence on Russian fossil fuels, by diversifying energy supplies, saving energy and accelerating the green transition.<sup>4</sup>

The reformed framework must also help Member States to address the long-term challenges facing the EU. Long term structural trends pose a significant challenge for the sustainability of public finances and sustainable growth in EU Member States. These trends include demographic challenges and the climate crisis, with the latter becoming increasingly apparent in the form of increasing severity and frequency of extreme weather events. Coping with these challenges will require Member States to take further action, including public investment to facilitate a green and digital transition and policies focused on ensuring sound public finances, including through reform of pension systems.

<sup>4</sup> European Commission (2022), 'REPowerEU: Joint European Action for more affordable, secure and sustainable energy,' COM (2022) 108 final of 8 March 2022.



## 2. Towards a simpler and more effective framework with greater ownership

The European Commission’s orientations seek to define a simpler and integrated architecture for macro-fiscal surveillance to ensure debt sustainability and promote sustainable and inclusive growth. In order for the framework to be consistent across its components and deliver effective economic surveillance, there is a need to clarify the objectives of each surveillance strand, to better integrate macroeconomic and fiscal policies, and to add instruments to monitor progress and meet new objectives.

**Figure 2: A suggested revised fiscal framework**

National ownership embedded in EU framework	Simplification and focus on fiscal risks	Enforcement
0. Commission puts forward reference adjustment paths 1. Member States propose medium-term fiscal-structural plans 2. Annual budgets will commit to follow the fiscal trajectory and ensure that debt will start converging to prudent levels within the adjustment period 3. Member States can request a longer adjustment period underpinned by reforms and investments 4. Council endorsement of the plan 5. Stronger role of national IFIs	1. Net expenditure path anchored on debt sustainability and agreed by Council will be the single fiscal indicator 2. Surveillance and enforcement will be risk-based 3. Debt reduction benchmark, benchmark for reduction in structural balance, significant deviation procedure and matrix of requirements no longer exist	1. Deficit-based EDP (3% of GDP threshold) maintained 2. Debt-based EDP will be operationalised and strengthened, as a tool to ensure compliance with the agreed net expenditure path 3. Financial sanctions toolbox will be enriched with smarter sanctions 4. Macroeconomic conditionality will be maintained

*Source: European Commission*

National medium-term fiscal-structural plans that bring together the fiscal, reform and investment commitments of each Member State, within a common EU framework, would be the cornerstone of the proposed revised framework.<sup>5</sup> This would ensure consistency and streamline processes and deliverables, while recognising that reforms and investments can have a positive impact on fiscal sustainability. The revised EU fiscal framework would set the requirements to ensure that the debt ratio is put on a downward path or stays at prudent levels and the budget deficit is maintained below the 3% of GDP reference value over the medium term. Member States would present medium-term plans that set out country-specific fiscal trajectories as well as priority public investment and reform commitments that together ensure sustained and gradual debt reduction and sustainable and inclusive growth. All Member States would be required to address

<sup>5</sup> The fiscal-structural plans would merge the current Stability and Convergence Programmes with the National Reform Programmes.

the priorities identified in country-specific recommendations (CSRs) issued in the context of the European Semester. The medium-term plans should also put forward initiatives that are in line with strategic EU priorities derived directly from agreed EU guidance and targets that require policy action by Member States.

This medium-term approach would allow for differentiation between Member States, within a revised common EU framework that has sustainable growth and risks to debt sustainability as a common basis.

A risk-based surveillance framework would allow to adapt the existing debt reduction benchmark to the country-specific debt ratio, while the requirement to maintain budget deficits credibly below 3% of GDP would be preserved.

National medium-term plans should ensure a sustainable debt reduction path through a gradual consolidation and reforms and investments.

Moreover, Member States would be able to commit to a set of reforms and investment that help bring debt on a sustainable path and therefore could underpin a longer adjustment period and a more gradual adjustment path

A single operational indicator anchored on debt sustainability would serve as a basis for setting the fiscal adjustment path and carrying out annual fiscal surveillance, thus significantly simplifying the fiscal framework and increasing transparency.

### **3. How would the revised economic governance framework work in practice?**

As part of the common framework, the Commission would put forward for Member States with a substantial or moderate public debt challenge, a reference multiannual adjustment path in terms of net primary expenditure covering at least 4 years. The reference adjustment path would be anchored on debt sustainability meaning that for Member States with substantial and moderate fiscal challenges, it should ensure that, even in the absence of further fiscal measures, debt would remain on a plausibly downward path after the fiscal adjustment period and that the deficit would be maintained below the 3% of GDP threshold. For each Member State, the multiannual expenditure path that would put debt on a downward trajectory could thus be translated into the corresponding level of the structural primary balance to be achieved at the end of the 4-year period.

To assess plausibility, the Commission should use stress tests and stochastic analysis, simulating common shocks related to short and long-term interest rates, nominal GDP growth, the primary budget balance and nominal exchange rates.

As a following step, each Member State would submit a medium-term fiscal-structural plan for assessment by the Commission and endorsement by the Council. The plans would outline the medium-term fiscal path, and reform and investment commitments. The fiscal adjustment path would be set in terms of net primary expenditure, i.e. expenditure net of discretionary revenue measures and excluding interest expenditure as well as cyclical unemployment expenditure. The medium-term fiscal path would be translated into corresponding annual spending ceilings. For Member States identified with imbalances under the MIP, the plans would also include reforms and investments to correct those imbalances. The submission of the plan would be preceded by an in-depth technical dialogue with the Commission. The Commission would assess the medium-term plan in an integrated manner, taking account of the interactions between the fiscal trajectory, and reforms and investments. The assessment would take place on the basis of a common EU assessment framework and transparent methodologies, retaining the possibility of seeking additional information or requesting a revised plan.

The Member State could request and be granted an extension of the adjustment period by a maximum of 3 years, provided it underpins its plan with a set of reforms and investments that supports sustainable growth and debt sustainability. Member States could propose a more gradual adjustment path, provided that this more gradual path is underpinned by a set of priority reform and investment commitments. These commitments would be assessed using a common EU assessment framework. They would need to support debt sustainability and respond to common EU priorities and targets, as well as ensuring that the national fiscal-structural plan addresses all or a significant subset of relevant CSRs.

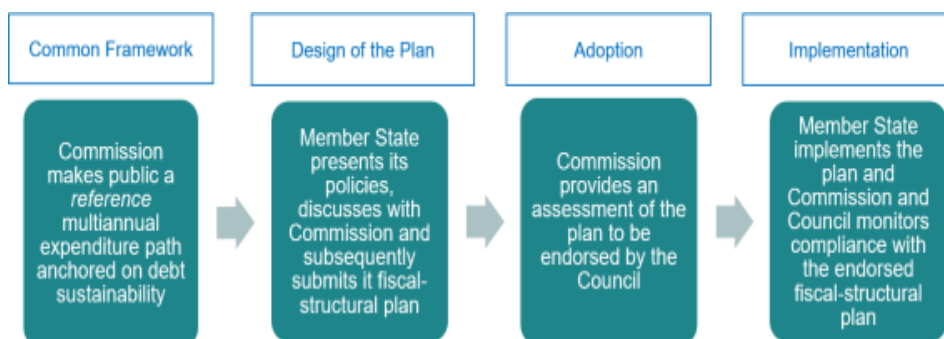
As a following step, the plan would be adopted by the Council on the basis of a Commission assessment. After the Commission has assessed the medium-term plan, on the basis of a common assessment framework, the Council would either adopt the plan or recommend that the Member State resubmit a modified plan. In case there would be no agreement between the Member State and the Commission, the reference multiannual net expenditure path would be used by the Commission and the Council for the purpose of fiscal surveillance and enforcement.

As a last step, the Member State would implement the plan, with annual monitoring by the Commission and the Council under the European Semester. The national plan as endorsed by the Council should commit the annual national budgets for a period not inferior to four years. The agreed fiscal trajectory could be revised before this period only in the case of objective circumstances making the implementation of the plan infeasible. Any revision proposed by the Member State

would need to be assessed by the Commission and adopted by the Council, as is the case for the plan itself.

For Member States found to be in a situation of macroeconomic imbalances when the medium-term plan is already in place, the plan would not, as a rule, be re-opened to incorporate the policy approach to address those imbalances. A policy dialogue with the Member State would be initiated to identify the measures needed to address the imbalances. These would be communicated by the Member State in a letter and would eventually be incorporated in the medium-term plan when updated, on the basis of the assessment and approval process.

**Figure 3: steps of the process**



*Source: European Commission*

In the design phase, the Commission would assess whether the multiannual fiscal adjustment path put forward by Member States is consistent with ensuring that debt is put or kept on a downward path by the end of the adjustment period at the latest or remains at prudent levels and that the deficit is maintained below 3% of GDP over the medium term. The reference adjustment path would serve as a common basis for the discussion and for the assessment of the plans by the Commission. The reference adjustment path should also ensure that the deficit is maintained below the 3% of GDP reference value over the medium term. For Member States that are already in EDP when the plan is submitted, the Commission would assess whether the plan is consistent with relevant Council recommendations and decisions.

On the basis of a positive Commission assessment, the Council would adopt the extended adjustment path and the reform and investment commitments underpinning this path.

## Conclusion

This proposal from the European Commission sets out the main features of a reformed EU economic governance framework. The main elements outlined in this Communication respond to the need for a reformed framework that is fit for the challenges of this decade. The necessary financing for the just transition to a digital and green, climate-neutral economy and higher debt-to-GDP ratios call for fiscal rules that allow for strategic investment, while safeguarding fiscal sustainability.

Swift agreement on revising the EU fiscal rules and other elements of the economic governance framework is a pressing priority at the current critical juncture for the European economy. Member States and the Commission should reach a consensus on reform of the economic governance framework ahead of Member States' budgetary processes for 2024. In light of the mounting challenges that the EU is facing, there is a need for strong budgetary and structural policy coordination and effective economic and fiscal surveillance. Sound public finances that can respond in a coordinated manner to the prevailing challenges and to the achievement of common EU priorities have become increasingly important in the face of recent and current crises. This would also reassure financial markets on the institutional robustness of the euro area, which rests on sustainable public finances and on preventing and addressing macroeconomic imbalances in all Member States. The operation of credible fiscal rules and surveillance of risks to macro-financial stability will also help the ECB attain its goals, particularly as it faces the challenge of delivering on its mandate to maintain price stability while avoiding financial fragmentation in the euro area.

A thorough reform of the EU economic governance framework would require legislative change. Amending the underlying legislation would allow for clarification and simplification of the framework. It would provide a high degree of legal certainty for the operation of a reformed framework, with the necessary involvement of the Council and the European Parliament. Agreeing on necessary legislative change would follow the ordinary legislative procedure, involving on most aspects the Council and the European Parliament on an equal footing.

Most of the objectives of the proposed reform to the MIP could be pursued within the existing legal provisions. In particular, pursuing a more forward-looking approach to better assess risks and the adjustment of the criteria followed to decide on the existence and classification of imbalances and their correction could be accommodated within the current legal framework.

On the basis of these orientations and the ensuing discussion, the Commission should consider tabling legislative proposals to provide guidance for fiscal policy for the period ahead in the first quarter of 2023. This guidance will facilitate the coordination of fiscal policies and the preparation of Member States' stability and convergence programmes for 2024 and beyond. The guidance will reflect the economic situation, the specific situation of each Member State and the orientations laid down in this Communication provided a sufficient degree of convergence across Member States is achieved by that time.

As regards Romania, it is very important how much and serious will be involved in this negotiation process with the European Commission and among member states. A wise positioning would help a lot the Romanian economy to recover faster from the last three years world major events – COVID-19 crisis and the Russian invasion of Ukraine which led to significant economic turmoil and high increase of inflation. Currently, Romania is experiencing imbalances. Vulnerabilities relate to external accounts, linked to large fiscal deficits, and to competitiveness issues that are re-emerging. The high current account deficit further worsened in 2022 and is not forecast to improve this year or next. Large fiscal deficits pre-date the COVID-19 crisis have driven up the current account deficit which poses risks to external debt sustainability. Sovereign borrowing costs have increased since early 2021. The negative net international investment position is expected to remain below its pre-pandemic levels. The external position is expected to benefit from significant RRF funds but external financing can otherwise become more challenging amid tighter global financial conditions.

Recent policy initiatives, including the ongoing successful implementation of Romania's Recovery and Resilience Plan, can address some vulnerabilities, still further action is needed to improve competitiveness and potential growth.

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## MONETARY POLICY AND UNEMPLOYMENT RATE IN DEVELOPING ECONOMIES: EVIDENCE FROM NIGERIA

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### Abstract:

*This study analyzed the impact of monetary policy on the unemployment rate in Nigeria using quarterly time-series data from 1990(1) to 2019(3). The monetary instruments used were the monetary policy rate (MPR), cash reserve ratio (CR) and liquidity ratio (LR). Inflation (P) was added to represent a macroeconomic variable. The autoregressive distributed lag cointegration/bound test technique was employed in the analysis as directed by the order of integration. The study found that, in the short run, monetary policy, proxied by its instruments, monetary policy rate (MPR) and cash ratio (CR), did not have a significant effect on the unemployment rate in Nigeria. However, the liquidity ratio (LR) was significant. The finding also revealed that, in the long run, periods, monetary policy (MPR and LR) has a significant impact on the unemployment rate, though, CR did not. Furthermore, it was discovered that monetary policy has a low speed of adjusting the economy back to full employment equilibrium. Lastly, the liquidity ratio happened to be the most efficient individual instrument in both the short and long-run periods. In the long run, apart from the liquidity ratio, the monetary policy rate has the greatest impact and is the most efficient.*



**Key words:** *Monetary Policy, Monetary Policy Rate, Unemployment*

**JEL Classification:** *E52, E58, J68*

## Introduction

It is pertinent to note that every economy in the world today employs monetary and fiscal policies to achieve set objectives for the economy within a specific time frame. There are scholarly papers on how these policies are used to improve economic activities and create employment worldwide. These policies have been very effective in some advanced countries while in some other countries, they have not been as effective. The degree of government participation in an economy has always been a contemporary issue for deliberation and several economists like classical economists such as David Ricardo, Alfred Marshall, Eugen Bohn von Bawerk, and John Stuart Mill, have argued in opposition to huge government intervention even as others like Alvin Hansen, Thomas Palley, William Vickrey, Geoffrey Maynard, Paul Davidson, Nicholas Kaldor, have countered that if there was no sizable participation of government in the running of the economy, many countries would hardly be stable. Government participation in the economy could be through its policies to stabilize the system, basically through fiscal and monetary policy tools. Consequently, there is an increasing curiosity and debate regarding the influence of monetary policy on the unemployment rate as regards the period of impact and span of the effect. In contrast, the practical experience in developing nations like Nigeria, and owing to the nature of its financial operations and development so far, it will not be a surprise, if monetary policy has a significant interface to consolidate and have an impact on unemployment, just as Polanyi (1945) concluded that, monetary expansion through lowering of interest rates would be adequate to increase output and employment. whether in the short run or long run period. Researchers have produced inconsistent conclusions about the period of impact: short run/long run, in which monetary policy affects unemployment.

Since 1964, the Nigerian government has used both monetary and fiscal policies as tools to power the level of economic performance in an attempt to achieve full employment among other economic goals. However, it is obvious in Nigeria that people within the labour force age bracket of 15-64 years are yet to be fully employed as obtained in the late 1960s and early 1970s (Akeju & Olanipekun, 2015; Onimole & Olaiya, 2018).

Monetary policy is a tool used to regulate outcomes in both the money and real sectors and move the economy towards the preferred direction. The ultimate goals of monetary policy are usually to maintain price stability, increase economic growth and reduce the unemployment rate to an insignificant minimum. Monetary economists anticipate that monetary policy would influence the real sector all the way, through regulations in money supply, rates of interest and other monetary policy instruments that could modify the cost and availability of capital as well as induce investment within a system. The major debate about the effect of monetary policy on the unemployment rate is the period of impact (Blanchard, 2003; Rongrong, 2012; Essien et al., 2016).

The debate has been on since the era of the pre-classical economists and gained prominence after the great depression. Friedman submitted that stagflation in the 1970s was evidence of the inability of monetary adjustments to kindle economic growth or improve employment because the output is conceptualized as a real sector issue and not a monetary component (Friedman, 2006). Therefore, monetary policy is virginal and untainted and could not influence economic growth and unemployment unswervingly but only in a roundabout way through its impact on expectations. Another prominent conviction is that monetary policy only has a short-term impact/effect on a real sector like unemployment and growth before the impact fades off (Ravn & Simonelli, 2006; Annika & Bertil (2007)). Other scholars have scrutinized this argument and submitted that monetary policy, rather, has a long-lived effect on unemployment (see Ball, 1999). Similarly, Blanchard (2003) contented that monetary policy has a large and long-lasting impact on real interest rates and hence on economic activity. On the Nigerian economy, related studies are those of Nicholas (2011) who was silent about the period of impact; Nick, Igwe and Wilfred (2015) who did not disaggregate the period of effect; Essien et al. (2016) explained the effect of structural change and identified three structural breakpoints in monetary policy and unemployment relationship; and Ibekwe (2018) did similar work but could not conclude on the period issue. Therefore, it would be fair to say that this debate is still ongoing in the Nigerian context.

The developing nature of Nigeria's monetary sector is informed by illiteracy/ignorance of many people about capital market activities, inadequate orientation about money market activities like open market operations, and poor attitude of people, to deposit their money in the bank, among others, call for research on whether policies from this sector, would have significant impact to managing unemployment rate in Nigeria.

Since monetary policy affects different businesses, directly and indirectly, investors and policymakers need to understand and make follow up on changes in government monetary policy. The Central Bank could use this study to know the significant effect of its monetary actions on economic activities and most especially on the unemployment rate. Since the result of this study will show which of the monetary policy instruments have a significant impact on the employment rate in Nigeria, policymakers will be able to distinguish which instruments are significant from those that are not significant.

Other parts of this work were prepared as follows: part two showcased the relevant literature review; part three presented the methodology; part four explained the data analysis and interpretation of results; part five presented the conclusion and policy recommendations.

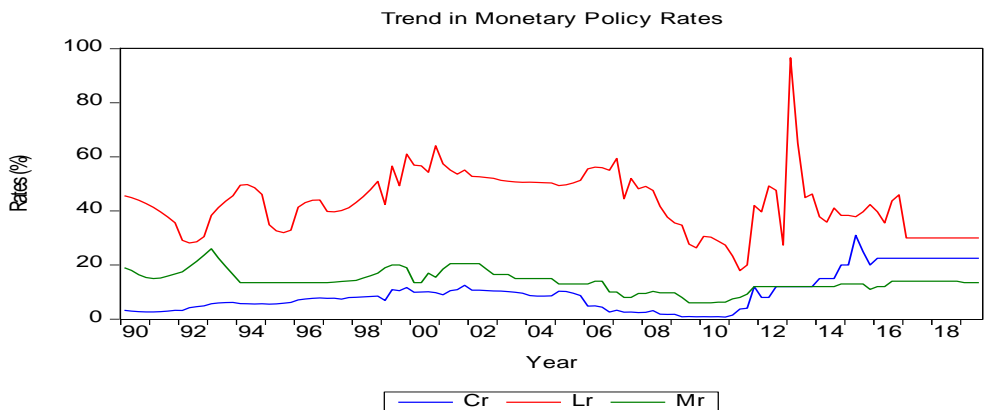
### **1. Trends on Monetary Policy and Rate of Unemployment in Nigeria (1990-2019)**

The policy instruments used to achieve economic stability are Monetary Policy Rate (MPR) (formerly known as Minimum Rediscount Rate), Open Market Operation (OMO) and Discount Window Operation. Others are Cash Reserve Ratio (CR), Liquidity Ratio (LR) and Net Open Position (NOP) of Exchange limit (CBN 2014).

The key tool employed in a market-based structure is the open market operations (OMO) which is usually supported with cash reserve requirements (CRR), liquidity ratio as well as discount window as basic instruments. To enhance macroeconomic permanence, determined attempts were placed on the administration of surplus liquidity, which gave the monetary authority the impetus to introduce different measures to trim down liquidity in the economy. More so, with effect from August 1990, employing stabilization securities for decreasing the huge size of surplus liquidity in commercial banks was revived. Commercial banks' CRR was raised in 1989, 1990, 1992, 1996 and 1999. Still, in 1990, the CBN launched several cautious guidelines for accredited commercial banks which were complementary to both the capital adequacy requirement as well as a declaration of standard accounting practices. These measures had a favourable effect on the unemployment rate as it reduced from 3.5 per cent in that year to 3.1 in 1991 and then to 2.0 and 1.8 per cent in 1994 and 1995 (NBS 2013).

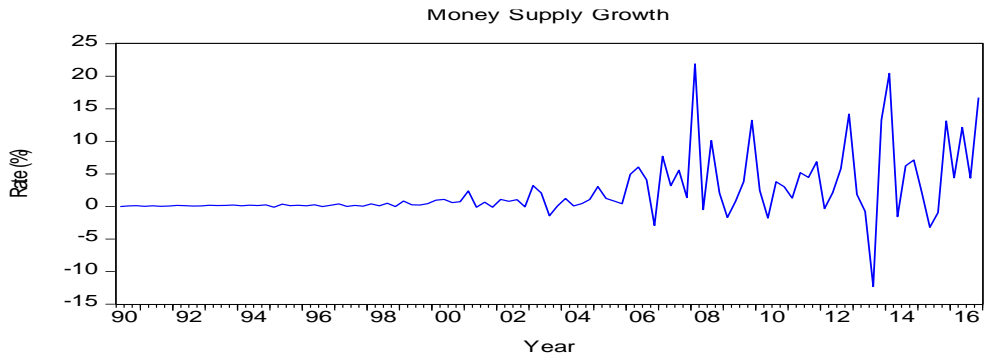
Before the Structural Adjustment Programme (SAP) of 1986, as well as the succeeding financial sector reorganization in 1987, monetary policy operations on the determination of interest rates were not market-based, but directly

regulated/fixed by the CBN. According to Soludo (2008), nominal interest rates were at the minimum level during this period, though there was an upsurge in the rate of inflation, real interest rates were less than zero which caused savings, investment and growth to reduce tremendously with high unemployment as a result of the regulations. In the same vein, Aliero, Ibrahim and Shuaibu (2013) posited that the SAP as well as the subsequent financial sector reorganizations resulted in the removal of regulation in the banking sector and the liberalization of interest rates. Subsequently, interest rates have increased compared with the SAP period with momentous restraint in the price level, principally during 1998-2006, apart from the irregularity between 1993 and 1998, which marked the period of "guided deregulation". The major objectives of monetary policy, according to CBN (2011), from 1986 and beyond, were similar to the previous periods which included supporting output growth and employment through a reduction in the cost of investment. Monetary policy, under SAP, was meant to spur the appearance of a market-oriented structure for efficient encouragement of financial savings in addition to the proficient allocation of resources.



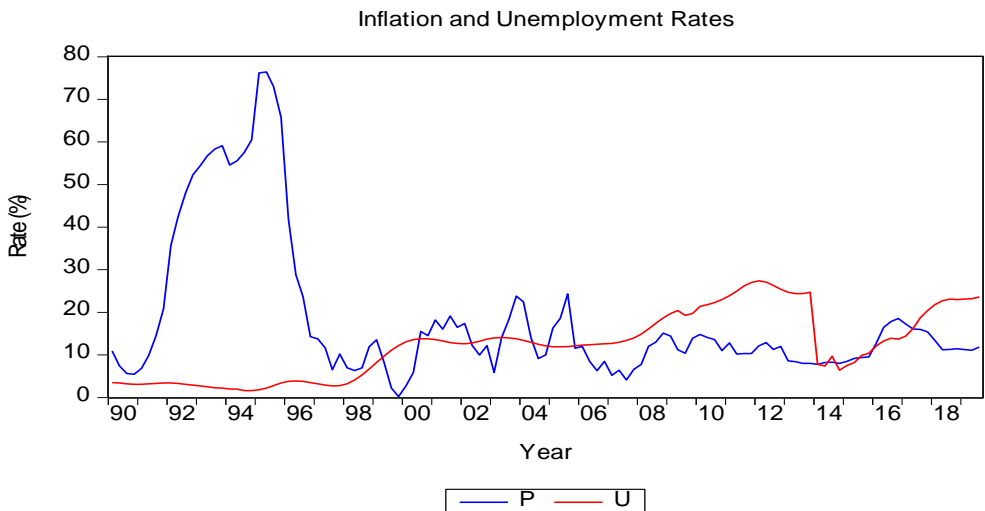
**Figure 1: Trend in Monetary Policy in Nigeria**

Just as any other country does, monetary policy is meant to regulate the stock of money. In Figure 1, the trends of the three most used instruments are shown. From 1990 through 2011, MPR was in between LR and CR, with LR being the highest and CR, the lowest. The situation later changed around 2015 when MPR became the lowest rate while LR still maintained being the highest.



**Figure 2: Broad Money Supply Growth in Nigeria**

Growth in the broad money supply was stable from 1990 through 2001, after which it became highly unpredictable as could be seen in figure 2. Figure 3 presents the historical movement of inflation and unemployment rates, in Nigeria, inflation was highest in 1995, and the unemployment rate was lowest in this same year. Unemployment continued to increase steadily until 2013 when it dropped drastically before another round of increasing trend from 2015.



**Figure 3: Trend in Inflation and Unemployment Rates**

In 2001, commercial banks in the country were further liberalized with the introduction of the universal banking system, which did not improve the employment situation of the economy. In 2002, the execution of monetary policy encountered several issues as the crisis of excess money stock continued, capital flight and the demand for foreign exchange increased (CBN, 2005). To moderate commercial banks to reduce their charges on loans to stimulate investment and increase employment opportunities, the Minimum Rediscount Rate (MRR) was reduced by 5.5 per cent in 2000 which was also complemented with a remote monetary instrument, moral suasion. As of 2003, the performance of the economy, in general, was mixed; excess liquidity due to fiscal supremacy posed serious challenges to the operation of monetary policy (CBN, 2006). Credit growth to the private sector was 18.4 per cent against the target of 32.3 per cent and the inflation rate stood at 23.8 per cent way above the 9.0 per cent target. Despite the inability to meet most targets, the target of 5 per cent growth in GDP was exceeded by about 5.2 per cent growth in 2003, but the unemployment rate rose to 14 per cent, which implied that the growth was inflation-induced.

In 2006, a new policy agenda was established. The crucial aim of the new agenda was to accomplish a steady value of Nigeria's Naira via stability in short-term interest rates just around an Operating Target, which was the newly introduced Monetary Policy Rate (MPR). The rate, which replaced the MRR in December 2006, operates as an anchor rate for dealings in the inter-bank money market, and it also pivots other rates in the money market activities (CBN, 2007). Complete cessation of aggressive mop-up of money stock with effect from September 18, 2008 through gradual decrease in MPR from 10.3 to approximately 6.0 per cent, continuous cutback of CRR from 4.0 to approximately 1.0 per cent, LR was progressively cut down to 25.0 per cent, development of Expanded Discount Window (EDW) to raise Deposit Money Banks (DMB's) right to use facilities from the CBN, and was changed to CBN Guarantee of interbank transactions by July 2009, though the effect this policy had on unemployment was insignificant (CBN, 2011).

The monetary policy stance from 2010 through 2016 was to moderate the inflation rate due to the massive growth in the money stock in the previous years (CBN, 2016). The main policy (tightening) instruments were MPR, CRR and LR, among others. The policy had a favourable impact on economic activities as indicated by the unemployment rate of 24.7 per cent in 2012, a 2.7 per cent reduction from the previous year.

Monetary policy in 2018 was geared toward the recovery of slow output, and liquidity surfeit in the banking system, among others (CBN, 2018). Following the mandate of the monetary policy committee (MPC) to maintain a tight policy stance during this period, the anchor interest rate (MPR), CRR and LR remained at 14.0, 22.5 and 30.0 per cents respectively, however, the MPR was reduced to 13.5 in August 2019 (CBN, 2019). Mainly, open market operation, supported by foreign exchange intervention, was the liquidity management tool employed to achieve a contractionary policy, which significantly reduced, among others, the capital market operations within the period. This went a long way in affecting the unemployment rate, which increase from 20.4 per cent between October and December 2017 to 21.8, 22.7 and 23.1 in the first three quarters of 2019.

Out of all the monetary policy instruments used so far over the years reviewed, MPR, CRR, LR, and NOP were most frequently used. Hence, to be as parsimonious as possible, the study used three of these instruments.

## **2. Literature Review**

Monetary policy as defined by CBN (2011) is the precise actions of the Central Bank to control the value, quantity and cost of money in the economy to achieve predetermined macroeconomic goals, while the National Bureau of Statistics (2015) stated that unemployment arises when people between the age bracket of 15 to 64, and as such fall in the economically active section of the population, are available for work and actively seeking for a job but are unable to secure work. The unemployment rate is the percentage of the labour force that is accessible to work, but could not for at least 20 hours in the week preceding the survey period. Therefore, a member of the labour force in Nigeria is said to be unemployed if they did completely nothing at all or did something, but for less than 20 hours during the reference week (National Bureau of Statistics, 2018).

In conducting monetary policy, the authorities set goals for variables whose values are intended to be modified. These goals are three: It could be ultimate (final goals, like economic growth, full employment, and price stability) or its variance from a preferred level, and employment; It could be intermediate (instruments that the CBN manipulates like money supply and rate of interest); Or operating goal (variables the CBN manipulates directly using the instruments in its possession).

The theories of unemployment are broadly classified into two: Classical theory and Keynesian theory. To the former, unemployment is caused by the real wage rate; unemployment arises when the real wage rate is above the requirement to

clear the labour market even in boom periods. Following this theory, jobs could be available, but workers opt not to work because they are not ready to accept the wages being offered or are unable to take up the job due to trade union legislation. To this theory, full employment was a normal situation and any deviation from this was regarded as something abnormal. Full employment, according to the Classical economist, does not mean that there is no unemployment but a very small rate of about 5 per cent. They believe that change in the money stock does not stimulate the real variable such as output, employment and income. Therefore, money is believed to be neutral in its impact on the whole economy. Their analysis is based on positive, proportional and mechanical correlations between money supply and the level of price. It says if the stock of money rises, the general price level increases in the same percentage. This relationship is based on the quantity theory of money equation which shows equality between the supply and demand for real cash balances.

According to Keynes, the main factor that sparks depression is aggregate demand deficiency, that is, demand deficiency. The economy could reach the revival stage if aggregate demand is raised, and this will in turn spur increased consumption and/or investment. The theory noted that since consumption is steady during the short run, revival is not impossible by raising investment. As such, fluctuations in investment are important causes of cyclical fluctuations and as the recovery of the economy begins to take place, the money stock will grow to house the recovery, therefore, there is a need to mop up excess money from the economy before it creates inflationary effect (Keynes, 1936). On the impact of monetary policy, Keynesian economics contend that monetary policy influences price level through its effect on investment, production, real income and employment. This school of thought views money as non-neutral and so the impact of monetary policy comes up from market shocks, imperfect information and nominal prices, and wages inflexibilities. Some of its proponents argue that monetary policy through its influence on demand can have a long-run effect on economic activities such as output and unemployment (Rongrong, 2012). Other theories that are offshoots of these broad views are the models of the New-Classical model and the Neo-Keynesian model (Jhingan, 2010).

Fernald and Spiegel (2013) researched monetary and fiscal policy efficiency in China employing monthly data from the beginning of 2000 to September 2013 and using Factor-Augmented Vector Auto-Regression. The variables used, among others, were money supply (M2), cash reserved ratio and interest rate. Their results divulged that interest rate has a significant influence on economic activity and price



level though adjustment in credit conditions like shocks to M2 or lending levels, did not. This study did not divulge the debate on the period.

In developed economies, like France and the U.K., there is considerable proof of the efficacy of monetary policy on real variables as suggested by Christiano, Eichenbaum and Evans (1999), Bernanke, Jean and Elias (2005) and Rafiq and Mallick (2008). Nevertheless, for developing countries like Nigeria, there is a paucity of research in this area and the findings from the few available literature are mixed. Some like Amassoma and Esther (2015), Ezeji and Micheal (2013), Ogar, Nkamare and Emori (2013), and James and Patrick (2014) discovered the existence of a weak relationship, while some researchers like Aliero *et al.* (2013), Essien *et al.* (2016), and Ibekwe (2018) found that the relationships are strong.

Ball (1999) studied Group of Seven developed (G7) countries to determine the actions of monetary policy in deciding whether a cyclical increase in unemployment causes a rise in the nonaccelerating-inflation rate of unemployment (NAIRU). His finding showed that monetary policy, among other factors affecting aggregate demand, has long-run effects as well as short-run movements in unemployment.

Similarly, in a baseline model of the effect of monetary policy on unemployment in Sweden, Annika and Bertil (2007) employed quarterly data from 1970 to 2005 and employing the structural VAR model submitted that monetary policy change achieves its optimum effect on the unemployment rate beyond nine quarters which is a more extended reaction than the study of Ravn and Simonelli (2006). Also, the study discovered that monetary policy was accountable for an average of about 29 per cent variations in unemployment. Similar to this were those of Cambazoğlu and Karaalp (2012), Onyeiwu (2012) Ezeji and Micheal (2013), Göçer (2013) Aliero *et al.* (2013) and Ajibola (2016).

Essien *et al.* (2016) examined the relationship between unemployment and monetary policy in Nigeria employing a vector autoregressive (VAR) with a structural breakpoint technique on quarterly time series data from 1983:Q1 to 2014Q1. The study revealed that a positive shock to the policy rate, which is the official interest rate, raises unemployment for over 10 quarters. More so, the policy instruments used collectively granger caused unemployment, indicating the presence of a non-static association between monetary policy and unemployment in the economy. This study could only answer a quantum of the debate on this topic and it is relationship-based.

The most recent study on this topic in the extant literature is the work of Ibekwe (2018) who examined the effect of monetary policies on Nigeria's unemployment,

adopting the VAR cointegration and error correction model (ECM) as tools for analysis. The study found that treasury bill rate (TBR) and money supply (MS) have direct relationships with unemployment while the policy rate (MPR) and exchange rate have negative relationships with unemployment. These findings were relatively similar to the finding of Nick et al. (2015). Akeju and Olanipekun (2015) and Onimole and Olaiya (2018) examined unemployment but not the impact monetary policy has on unemployment, and thus, could not give answers to the debate period.

The studies by Amassoma and Esther (2015), Essien et al. (2016) and Ibekwe (2018) are among the most recent of all studies on monetary policy and unemployment in Nigeria. However, the studies researched the effectiveness and dynamic relationship (with few monetary policy instruments) and not impact analysis as this study addressed. More so, there are differences in variables representing monetary policy instruments as this study used only the frequently employed instruments as reviewed under the stylized fact. Some other major departures from the work of previous researchers were the data set and methodology used.

Of all the studies reviewed, most scholars did not address the question of which monetary policy instruments impacted the most on unemployment. In addition, they did not empirically ascertain whether monetary policy has a short-run and/or long-run significant impact on the unemployment rate in Nigeria using sufficient methods and most of them did not report their finding in line with the period of impact. This was the gap that the study intended to fill.

### **3. Theoretical Background**

#### **Data and Methodology**

Various methods have been employed by different researchers in investigating this topic ranging from cointegration and VAR (Imoughele & Ismail, 2014) to the polynomial-distributed lag model (PDL) and VAR (Nicholas, 2011) among other methods. The pre-estimation causality test was already carried out by Essien et al. (2016) and most recently by Yelwa et al. (2018), which justified the use of these monetary policy instruments employed in this work.

#### **Sources of Data**

Secondary data was sourced from the Central Bank of Nigeria website and the National Bureau of Statistics E-library. The reason for the use of secondary data is

that such data cannot be obtained through primary sources since they have to be collected over a long period. The dataset was quarterly time series from 1990:Q1-2019:Q3 (i.e., 119 observations). This period was chosen as it was the period within which indirect monetary policy was institutionalized following the adoption of SAP in 1986. The annual data of the unemployment rate were transformed into quarterly using quadratic average match tools from E-Views 9.0, to allow uniformity in the data set. Quarterly data was also chosen to capture the volatility of the economic variables as used by many researchers like CBN (2014), Essien *et al* (2016) and most recently Yelwa *et al.* (2018).

### Model Specification

To keep the analysis as parsimonious as possible, we include only four explanatory variables. Three variables, MPR, CR, and LR, represented monetary policy instruments. The justification for choosing these monetary policy instruments was that they were most frequently used in contracting or expanding the stock of money in circulation as the stylized fact revealed. P represented a macroeconomic variable that affects unemployment according to Philip's curve hypothesis. The model employed adapted theoretical models of Monetarists and Keynesians. Precisely, it adapted the model of Amassoma and Esther (2015) and Essien *et al.* (2016). The basic model for the single equation was

$$ue = f(MPR, CR, LR, P) \quad (1)$$

ue is the unemployment rate, MPR is the monetary policy rate, CR is the cash reserve requirement, LR is the liquidity ratio, and P is the inflation rate.

It is expected that when there is a cut in MPR, which also determines the lending interest rate, the cost of investment goes down and more investors will invest thereby employing more workers; unemployment reduces as a consequence. As such, MPR is expected to have a direct impact on the unemployment rate. When the Central Bank intends to carry out a tightening monetary policy, it will increase cash reserved requirement (CR) and liquidity ratio (LR). The effect is that commercial banks will not have much cash to give investors as loans. Investors will reduce investment and thereby reduce employment. Thus, they have a positive impact on the unemployment rate. On inflation (P), it has already been proven that inflation has a negative correlation with unemployment following the Phillip curve theory.

Equation 1 was transformed into an econometric model as

$$ue = \alpha_0 + \alpha_1 MPR + \alpha_2 CR + \alpha_3 LR + \beta_1 P + \eta \quad (2)$$

Summarily, our *a priori* expectations are:  $\alpha_1 - \alpha_3, > 0, \beta_1 < 0$

The  $\alpha_0, \alpha_1, \alpha_2, \alpha_3$  and  $\beta_1$  were the parameters for estimation.  $u_t$  being the white noise representing all other factors that affect unemployment but are not captured in the model. The  $u_t$  is a disturbance term.

The main specification for this study was to ascertain the short and long-run impact that monetary policy has on the unemployment rate, employing ARDL, bound testing cointegration technique. Thus, it is specified as

$$w = \delta_0 + \sum_{i=1}^n \delta_1 MPR_{t-1} + \sum_{i=1}^n \delta_2 CR_{t-1} + \sum_{i=1}^n \delta_3 LR_{t-1} + \sum_{i=1}^n \delta_4 P_{t-1} + \gamma_1 MPR_{t-1} + \gamma_2 CR_{t-1} + \gamma_3 LR_{t-1} + \gamma_4 P_{t-1} + v_t \quad (3)$$

Since the period impact analysis is embedded in the ECM, the model of ECM is specified as

$$\Delta w_t = \alpha_0 + \beta_1 \Delta MPR_t + \beta_2 \Delta CR_t + \beta_3 \Delta LR_t + \beta_4 \Delta P_t + \xi \bar{\psi}_{t-1} + v_t \quad (4)$$

which has the advantage of including both the long-run and short-run information and also the adjustment path. The  $\xi$  is the ECM coefficient,  $\alpha_0$  is the constant and  $\beta_1 - \beta_4$  are the impact multipliers, short-run impacts, that quantify the instantaneous effects of variations in the monetary policy instruments (MPR, CR LR) and P on change in the unemployment rate. The *Psi* ( $\bar{\psi}_{t-1}$ ) is specified as

$$\bar{\psi}_{t-1} = w_{t-1} - \hat{\rho}_0 - \hat{\rho}_1 MPR_{t-1} - \hat{\rho}_2 CR_{t-1} - \hat{\rho}_3 LR_{t-1} - \hat{\rho}_4 P_{t-1} \quad (5)$$

where  $\hat{\rho}_1$  to  $\hat{\rho}_4$  are the long-run responses/impact of the explanatory variables.

## Results and Discussion

### Descriptive Statistics

The statistics result in Table 1 show that LR has the highest mean value followed by MPR, P,  $w$  and CR. The distribution indicates diverse forms of normality as shown by the Kurtosis result. Only CR showed a mesokurtic distribution as its value is approximately 3 which means a normal distribution. MPR, LR and P show that the distribution is peaked (leptokurtic distribution) while  $w$  shows a kurtosis less than 3 (platykurtic distribution) denoting a flat distribution relative to normality. A small probability (less than 0.05) value means rejection of  $H_0$  of a normal distribution. The probability shows that the variables are not normal except for MPR. In Table 1, the highest standard deviation figures are that of P (17.034), LR (11.1093),  $w$  (7.7097), CR (6.9040) and lastly, MPR (3.8326)

Others are less than 1 meaning that they are less volatile. The skewness figures show that all the variables are negatively skewed long left tail distribution.

**Table 1: Descriptive Statistics**

	CR	LR	MPR	P	u
Mean	9.5336	42.9649	13.9710	18.3073	12.2829
Median	8.2200	43.1375	13.5000	12.1000	12.6000
Maximum	31.0000	96.6100	26.0000	76.4261	27.4000
Minimum	0.7600	17.9400	6.0000	0.2200	1.6000
Std. Dev.	6.9040	11.1093	3.8327	17.0343	7.7097
Skewness	0.9645	0.7608	0.2738	1.9995	0.2734
Kurtosis	3.1131	6.1744	3.5108	5.9594	1.9682
Jarque-Bera	18.5120	61.4415	2.780098	122.7186	6.7605
Probability	0.0001	0.0000	0.249063	0.000000	0.0340
Sum	1134.505	5112.830	1662.550	2178.571	1461.660
Sum Sq. Dev.	5624.529	14563.13	1733.327	34239.80	7013.920
Observations	119	119	119	119	119

Source: Authors' Computation, 2021.

### Unit Root Test

The two-unit root test statistics used are Augmented Dickey-Fuller (ADF) and Phillip Peron (PP). ADF and PP have their H<sub>0</sub> to have the presence of unit roots.

**Table 2: Results of the ADF Test**

Variables	At Level	Prob.	At 1 <sup>st</sup> Diff.	Prob.	Decision
u	-1.0620	0.7291	-9.7029***	0.0000	<b>I(1)</b>
MPR	-2.6424	0.0875	-7.9457***	0.0000	<b>I(1)</b>
CR	-0.5474	0.8766	-13.574***	0.0000	<b>I(1)</b>
LR	-3.1674**	0.0245	-	-	<b>I(0)</b>
P	-2.3898	0.1469	-6.0124***	0.0000	<b>I(1)</b>
** absence of unit root at 5 per cent level of significance.					
*** absence of unit root at 1 per cent level of significance.					

Source: Authors' Computation, 2021.

Unit root test results are presented in Tables 2 and 3. All the two statistics showed that  $\varpi$ , MPR, CR and P were not stationary at 1 and 5 per cent levels of significance as their probabilities were greater than 0.05, at level, except for LR which was significant at a level of 5 per cent. At first difference, all the variables  $\varpi$ , MPR, CR and P became stationary at a 1% significant level.

**Table 3: Results of the PP Test**

Variables	At Level	Prob.	At 1 <sup>st</sup> Diff.	Prob.	Decision
$\varpi$	-1.3912	0.5845	-9.8402***	0.0000	<b>I(1)</b>
<b>MPR</b>	-2.5087	0.1161	-7.5879***	0.0000	<b>I(1)</b>
<b>CR</b>	-0.6749	0.8482	-13.5985***	0.0000	<b>I(1)</b>
<b>LR</b>	-4.5402**	0.0003	-	-	<b>I(0)</b>
<b>P</b>	-2.0865	0.2505	-7.0364***	0.0000	<b>I(1)</b>
** absence of unit root at 5 per cent level of significance.					
*** absence of unit root at 1 per cent level of significance.					

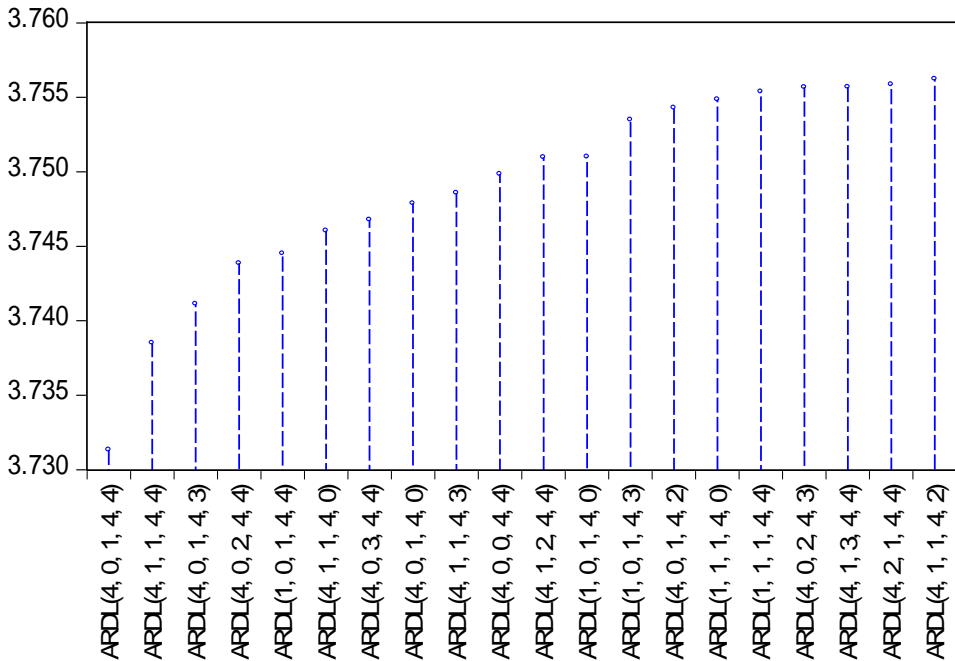
*Source: Authors' Computation, 2021.*

The difference in the order of integration precipitated the use of the ARDL cointegration technique.

### **Result of ARDL Lag Order Selection**

Figure 4 depicted the result of ARDL lag order selection using the Akaike Information Criterion (AIC) only. From the figure, out of the twenty top models, AIC has automatically selected the model of ARDL (4,0,1,4,4), with the smallest AIC figure of 3.732. This model was used throughout the analysis of the study.

Akaike Information Criteria (top 20 models)



*Source: Authors' Computation, 2021.*

**Figure 4: AIC Model Selection Criterion**

**Result of ARDL**

Table 4 presented the regression analysis of the selected model, ARDL (4,0,1,4,4). The unemployment rate ( $u$ ) for the four lagged periods showed that  $u$  has a positive and significant impact on itself in one and three lag periods at 1 per cent and 5 per cent levels of significance, as their probabilities (0.0000 and 0.0534) showed, but it has a negative and significant impact in fourth-lag period at 1 per cent level but could not be significant in second lag even at 10 per cent. The coefficient showcased that MPR has a negative impact on  $u$ , meaning that, a 1 unit increase in the MPR, on average, would lead to a 0.09 unit reduction in  $u$ , however, the impact was not significant at a 5 per cent level. CR coefficients at present and one lag period showed that a 1 unit increase in CR, on average, led to a 0.14 reduction and 0.15 unit increase in  $u$ . Nevertheless, both spontaneous and lag periods could not show any significant effect on  $u$  at a 5 per cent level of significance. On the coefficients of LR,

of all four lag periods selected according to the AIC, only the lag-four period was significant at a 1 per cent level, with a negative impact on  $\varpi$ . As such, a 1 unit increase in LR, on average, would lead to a more than 0.11 unit decrease in  $\varpi$ . The coefficients of P demonstrated that P did not have a significant impact on  $\varpi$ . This implied that in the short run, monetary policy instruments (MPR and CR) are not significant to have an effect but liquidity ratio (LR) has a significant impact on unemployment ( $\varpi$ ). This result is in tandem with the result of Fernald and Spiegel (2013) on the Chinese economy but against the finding of Nicholas (2011) on five (5) advanced countries. The  $R^2$  showed that 96.9 per cent of the variation in  $\varpi$  was explained by the explanatory variables.  $R^2$  adjusted (96.4) was very close to the  $R^2$ , meaning that, there was no redundant variable in the model. Fisher's statistics (F-statistics) which explains the goodness of fit of the  $R^2$ , was quite high (179.78) and its probability value indicated a significant performance of the  $R^2$ . Lastly, the Durbin-Watson statistics (1.37) showed the possibility of autocorrelation in the model.

**Table 4: ARDL Result**

Variable	Coeff.	S.E.	t-stat.	Prob.
$\varpi(-1)$	0.9352	0.0819	11.4173	0
$\varpi(-2)$	-0.0689	0.1173	-0.5868	0.5587
$\varpi(-3)$	0.2262	0.1156	1.9558	0.0534
$\varpi(-4)$	-0.2008	0.0796	-2.5210	0.0133
MPR	-0.09	0.0485	-1.8553	0.0666
CR	-0.1352	0.0792	-1.7067	0.0911
CR(-1)	0.1476	0.0784	1.8829	0.0627
LR	0.0095	0.0184	0.5171	0.6063
LR(-1)	0.0078	0.0202	0.3873	0.6994
LR(-2)	0.0336	0.0198	1.6952	0.0932
LR(-3)	0.0015	0.0200	0.0736	0.9415
LR(-4)	-0.1147	0.0187	-6.1253	0
P	-0.0311	0.0345	-0.9005	0.3701
P(-1)	0.0264	0.0554	0.476006	0.6351
P(-2)	0.0177	0.0548	0.3223	0.7479
P(-3)	0.0090	0.0555	0.1615	0.8721
P(-4)	-0.0571	0.0349	-1.6349	0.1053
C	6.0133	1.1354	5.2964	0
$R^2$	0.9692			
Adj- $R^2$	0.9638		F-statistic	179.7834
DW	1.3770		Prob(F-statistic)	0.0000

Source: Authors' Computation, 2021.



### Result of Comparative Analysis

To compare the monetary policy instruments in order of efficiency, analyses using scaled coefficients were taken using the much-known *Beta coefficient* as specified by Gujarati (2009). The result was presented in Table 5. From the result, bearing in mind that the second column has been explained earlier in Table 4, the area of concern for relative comparison was the third column which standardized the coefficients of the variables in question. The result, in absolute terms, divulged that LR at four lag periods appeared to have the highest coefficient with a 0.165 value, and then CR and P with 0.132 and 0.129 at one and four lag periods respectively. The MPR (0.045) remained the weakest of the three instruments, in the short-run period. In addition, the result showed that a 10 unit increase in LR, Cr, P and MPR, average, would have a 16.5, 13.2, 12.9 and 0.5 unit impact on  $\omega$ , in the short run.

**Table 5: Result of Scaled Coefficient of the ARDL**

Variable	Coeff.	Stand. Coeff.	Elasticity at Mean
$\omega(-1)$	0.9352	0.9328	0.9220
$\omega(-2)$	-0.0689	-0.0685	-0.0670
$\omega(-3)$	0.2262	0.2243	0.2168
$\omega(-4)$	-0.2008	-0.1983	-0.1897
MPR	-0.0910	-0.0452	-0.0990
CR	-0.1353	-0.1221	-0.1049
CR(-1)	0.1476	0.1318	0.1124
LR	0.0095	0.0140	0.0325
LR(-1)	0.0078	0.0115	0.0267
LR(-2)	0.0336	0.0490	0.1150
LR(-3)	0.0015	0.0021	0.0051
LR(-4)	-0.1147	-0.1653	-0.3955
P	-0.0311	-0.0699	-0.0462
P(-1)	0.0264	0.0593	0.0390
P(-2)	0.0177	0.0398	0.0261
P(-3)	0.0090	0.0202	0.0132
P(-4)	-0.0571	-0.1288	-0.0840
C	6.0133	NA	0.4774

Source: Authors' Computation, 2021.

### ARDL Bound Test

Table 6 showcased the result of the bound test which was meant to test for any long-run effect of monetary policy on the unemployment rate. From the result, the F-statistics (6.307) indicated the presence of long-run cointegration in the model since its figure was more than the upper bound of the critical value of I1 (5.06) at a 1 per cent level of significance. The finding is in support of the result of Ball (1999) on a group of Seven (G7) countries and 17 OECD countries, Loganathan, Ishak and Mori (2012) in Malaysia, Nick et al. (2015) and Ibekwe (2018) in Nigeria, who concluded that monetary policy has a long-run impact on unemployment but in contrast with the work of Ravn and Simonelli (2006) and Annika and Bertil (2007).

**Table 6: ARDL Bound Test**

Statistic	Value	K
F-statistic	6.3066	4
Critical Value Bounds	Bound	
Significance (%)	I0	I1
10	2.450	3.520
5	2.860	4.010
2.5	3.250	4.490
1	3.740	5.060

*Source: Authors' Computation, 2021.*

Following the presence of long-run cointegration of the bound test in Table 6, Table 7 presented the result of cointegration and ECM results which disaggregated the impact into the short and long run. The short-run result was the same as that of Table 4 except for the ECM (-0.108), which showed the correct negative sign but a low speed of adjustment, that 10.8 per cent of the variations in  $u_t$  is corrected by monetary policy in a quarter. The probability (0.0000) indicates that it is significant at a 1 per cent level. Between 0.8 and 1.0 indicates moderate speed while above 1.0 is an indication of a high speed of adjustment back to equilibrium (Gujarati, 2009). The findings are not different from the study of Villy and Robert (2005), Annika and Bertil (2007), Ajibola (2016) Nampewo et al. (2013).

**Table 7: Cointegration and ECM Form of ARDL Model**

Variable	Coefficient	S.E.	t-stat.	Prob.
D( $\omega(-1)$ )	0.0434	0.0799	0.5438	0.5879
D( $\omega(-2)$ )	-0.0255	0.0798	-0.3190	0.7504
D( $\omega(-3)$ )	0.2008***	0.0796	2.5211	0.0133
D(MPR)	-0.09*	0.0485	-1.8552	0.0666
D(CR)	-0.1353*	0.0792	-1.7067	0.0911
D(LR)	0.0095	0.0184	0.5171	0.6063
D(LR(-1))	-0.0336*	0.0198	-1.6952	0.0932
D(LR(-2))	-0.0015	0.0200	-0.0736	0.9415
D(LR(-3))	0.1147***	0.0187	6.1252	0.0000
D(P)	-0.0311	0.0345	-0.9005	0.3701
D(P(-1))	-0.0177	0.0548	-0.3224	0.7479
D(P(-2))	-0.0090	0.0555	-0.1615	0.8721
D(P(-3))	0.0571	0.0349	1.6349	0.1053
ECM(-1)	-0.1082***	0.0263	-4.1336	0.0001

\*\*\*, \*\*and \* indicate significance at 1% , 5% and 10% levels.

Source: Authors' Computation, 2021.

The second part of the result showcased the long-run coefficients of the ARDL model in Table 8. From the result, in the long run, MPR has an inverse impact on  $\omega$ , that a 1 unit increase in MPR, on average, would lead to a 0.83 unit fall in  $\omega$ . This impact was significant at the 5 per cent level as its probability (0.0375) indicated.

**Table 8: Long Run Coefficients of ARDL**

Variable	Coeff.	S.E.	t-stat.	Prob.
MPR	-0.8319	0.3945	-2.1087	0.0375
CR	0.1143	0.2028	0.5635	0.5744
LR	-0.5762	0.2032	-2.8362	0.0056
P	-0.3251	0.0946	-3.4361	0.0009

Source: Authors' Computation, 2021.

The CR coefficient indicates a positive impact on  $\varpi$ , meaning that, on average, a 1 unit increase in CR would lead to a 0.11 unit rise in  $\varpi$ . However, the impact could not be significant even at a 10 per cent level of significance. Both the LR and P were negatively signed indicating that a, 1 unit increase in LR and P, on average, would lead to 0.58 and 0.33 unit increase in U. They were both significant at 1 per cent level as their probability values (0.0056 and 0.0009) indicated. This result divulged that, in the long run, there remains a significant trade-off between the inflation rate (P) and the unemployment rate ( $\varpi$ ). This long-run result also revealed that, aside from liquidity ratio (LR), monetary policy rate (MPR) was the most efficient instrument within the period under review, as it anchors three interest rates: treasury bill rate, maximum lending rate and the bank rate/interbank rate. The findings are not far from the statement of Blanchard (2003) and the result of Nicholas (2011) and Ibekwe (2018) who found a negative relationship between MPR with the unemployment rate in Nigeria using another method.

### Conclusion

The study researched analysis of the effect of monetary policy on the unemployment rate in Nigeria: between 1990Q1 and 2019Q3. It made use of the monetary policy rate (MPR), cash reserve ratio (CR) and liquidity ratio (LR) to represent the monetary policy instruments as they were often used during the period under study. It also added a macroeconomic variable of inflation rate (P). Both the monetary policy instruments and the macroeconomic variable were used as regressors and the unemployment rate ( $\varpi$ ) as regressand. It is evident from the result that, in the short run, monetary policy proxied with its instruments did not have any significant impact on the unemployment rate in Nigeria except liquidity ratio (LR) which was significant at the 4 lag period. The finding revealed that, in the long run, periods, monetary policy has a significant impact on the unemployment rate which implies that changes in monetary policy have the ability and capability to change the unemployment rate through the transmission mechanism as explained by Keynes (1936). However, the investigation revealed that monetary policy has a low speed of adjusting the economy back to full employment equilibrium. This implies that there is no strong pressure of monetary policy on unemployment to reinstate long-run equilibrium during times of disequilibrium. Lastly, it is clear in the finding that, the liquidity ratio emerged as the most effective individual instrument in both the short and long-run periods. Apart from the liquidity ratio, in the long run, the monetary policy rate is the most efficient.

The study recommends that the CBN should strive to improve the employment rate by maintaining the stability in general price level through adjustments in the liquidity ratio, monetary policy rate and cash reserve ratio. More emphasis should be made on the liquidity ratio as it was found to be very influential on unemployment.

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## CHALLENGES AND PERSPECTIVES IN ROMANIA'S FINANCIAL-ACCOUNTING MANAGEMENT SYSTEM IN THE CONTEXT OF GLOBAL RISKS

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### **Abstract:**

*Financial-accounting management is an essential function for any organization, and it faces several challenges and perspectives that must be addressed to ensure its effectiveness. Financial-accounting management system faces several challenges in Romania, such as regulations and compliance, technology, data management, and talent management. However, there are also several perspectives that can help overcome these challenges, such as automation, sustainability, data analytics, and collaboration. By addressing these challenges and embracing these perspectives, financial-accounting management in Romania can become more effective and efficient.*

**Key words :** *financial-accounting, effectiveness, technology, automation, data analysis*



**JEL Classification:** F65, G10, M40

## Introduction

Romania's financial-accounting management system faces several challenges and perspectives in the context of global risks. These challenges are not unique to Romania but are experienced by many countries.

We consider the following key considerations for *challenges*:

1. **Global Economic Uncertainty:**The global economy is increasingly interconnected, and Romania is not immune to economic shocks originating from other parts of the world. Events such as economic recessions, trade disputes, or financial crises can have significant repercussions on Romania's financial stability.

2. **Cybersecurity Risks:**With the increasing digitization of financial transactions and data, Romania's financial institutions are vulnerable to cyberattacks. Protecting sensitive financial data and maintaining the integrity of financial systems is a growing concern.

3. **Regulatory Compliance:** Compliance with international accounting and financial reporting standards is crucial for Romania to attract foreign investment and maintain transparency. Adhering to evolving regulatory requirements can be challenging for both businesses and government agencies. (Teng, Y., & Fang, C. , 2023).

4. **Fiscal Sustainability:** Ensuring the long-term fiscal sustainability of Romania's public finances is a challenge. Balancing revenue generation, managing public debt, and addressing pension and healthcare liabilities are essential aspects of fiscal management.(European Court of Auditors, 2019)

5. **Corruption and Governance:** Corruption can undermine the effectiveness of financial management systems. Romania needs to continue its efforts to improve governance, transparency, and accountability to address corruption issues.

In the same time, we observed the following key considerations for *perspectives*:

1. **Digital Transformation:** Embracing digital technologies, such as blockchain and artificial intelligence, can enhance the efficiency and security of financial transactions and reporting. The adoption of FinTech solutions can also improve access to financial services.

2. **Risk Management:** Implementing robust risk management strategies is essential. This includes stress testing financial systems, enhancing cybersecurity measures, and developing contingency plans to mitigate the impact of global risks.

3. International Collaboration: Romania can benefit from collaborating with international organizations and neighboring countries to address common financial challenges. Sharing best practices and expertise can help strengthen the financial-accounting management system.

4. Education and Workforce Development: Investing in education and training for financial professionals is crucial. Romania should promote financial literacy among its citizens and ensure that its workforce has the necessary skills to navigate complex financial environments.

5. Sustainable Finance: Integrating environmental, social, and governance (ESG) factors into financial decision-making is becoming increasingly important. Romania can explore opportunities in green finance and sustainable investments to address global risks related to climate change and social issues. (Kusuma, H., Muafi, M., & Kholid, M. N., 2023)

6. Public-Private Partnerships: Collaborations between the public and private sectors can help address financial challenges. Public-private partnerships can fund infrastructure projects and improve the delivery of public services, contributing to economic growth.

In conclusion, Romania's financial-accounting management system must adapt to the evolving global landscape and take proactive measures to address the challenges posed by global risks. By embracing digitalization, strengthening risk management, fostering international collaboration, and investing in education, Romania can enhance its financial resilience and better navigate the uncertainties of the modern world.

Regarding challenges in the financial-accounting management system in Romania, we believe that the following ones are the most expressive of our times.

### 1. Global economic uncertainty

The European economy continues to show resilience in a difficult global context, where the outlook is improving despite a context with persistent challenges.

**Table 1. : European economic forecasts for Romania at the main macroeconomic indicators**

No.	Macroeconomic indicators	Year 2022	Year 2023	Year 2024
1.	GDP growth (% , from one year to another)	4,7	3,2	3,5
2.	Inflation (% , from one year to another)	12	9,7	4,6
3.	Unemployment rate (%)	5,6	5,4	5,1
4.	Budget deficit (% of GDP)	-6,2	-4,7	-4,4
5.	Gross public debt (% of GDP)	47,3	45,6	46,1
6.	Current account balance (% of GDP)	-8,8	-7,6	-7,4

Source: European Commission, General Directorate of Economic and Financial Affairs

Falling energy prices, easing supply constraints and a strong labor market supported moderate growth in the first quarter of 2023, dispelling fears of a recession. The better-than-expected start to 2023 raises the growth outlook for the EU economy to 1.0% in 2023 (compared to 0.8% in the winter 2022 interim forecast) and to 1.7% in 2024 (compared to 1.6% in the winter 2022 forecast.) Upward revisions for the euro area are of a similar magnitude, with GDP growth currently estimated at 1.1% in 2023 and 1.6% in 2024. Against the background of persistent pressures on core prices, inflation was also revised upwards compared to the winter 2022 scenario, reaching 5.8% in 2023 and 2.8% in 2024 in the euro area.

*Lower energy prices boost growth prospects*

According to Eurostat's preliminary signal estimate, GDP grew by 0.3% in the EU and by 0.1% in the euro area in the first quarter of 2023. The European economy managed to limit the negative impact of Russia's war of aggression against Ukraine, dealing with the energy crisis by rapidly diversifying supply and by significantly reducing gas consumption. The significant reduction in energy prices ripples through the entire economy, leading to lower production costs for companies. In turn, consumers see a decrease in energy bills, although private consumption should remain at a low level, as the pace of wage growth remains below inflation.

As inflation remains high, financing conditions are set to tighten further. While the ECB and other EU central banks are expected to be nearing the end of the interest rate hike cycle, recent financial sector turmoil is likely to increase pressure on the cost of and access to credit, slowing the pace of growth investments, especially those in the residential sector.

*Core inflation is revised upwards but is set to decline gradually*

After peaking in 2022, headline inflation continued to decline in the first quarter of 2023 amid a sharp reduction in energy prices. However, core inflation (ie total inflation excluding energy and unprocessed food) is proving to be more persistent. It reached a record high of 7.6% in March 2023, but is expected to decline gradually over the forecast period as profit margins absorb higher wage pressures and financing conditions tighten. The April 2023 flagship estimate of the harmonized index of consumer prices in the euro area, released after the spring forecast deadline, shows a marginal decline in the core inflation rate, suggesting that it may have peaked in the first quarter, according to forecasts. On an annual

basis, euro area core inflation is expected to average 6.1% in 2023, before falling to 3.2% in 2024, remaining above headline inflation in both forecast years . (Tang, W., Yang, S., & Khishe, M. , 2023)

*The labor market remains resilient in the context of the economic slowdown*

The resilience of the EU economy is currently underpinned by a stronger than ever labor market. The EU unemployment rate reached a new record high of 6.0% in March 2023, and participation and employment rates reached unprecedented levels.

The EU labor market is expected to have only a moderate reaction to the slower pace of economic expansion. Employment growth is forecast at 0.5% this year, after which it would slow to 0.4% in 2024. The unemployment rate is expected to remain just above 6%. The pace of wage growth has accelerated since the start of 2022, but has so far remained well below inflation. Wage growth is expected to be more sustained amid persistently tight labor markets, strong increases in minimum wages in several countries and, more generally, pressure on workers to regain purchasing power.

*Public deficits are expected to decrease, especially in 2024*

Despite the introduction of support measures to mitigate the impact of high energy prices, strong nominal growth and the removal of the last remaining measures from the pandemic caused the EU's aggregate public deficit to fall further to 3.4% of GDP in 2022. In 2023 and, more importantly, in 2024, falling energy prices should allow governments to phase out energy support measures, leading to further deficit reductions of up to 3.1% and 2.4% respectively % of GDP. The EU-wide debt-to-GDP ratio is projected to fall steadily to below 83% in 2024 (90% in the euro area), but will remain above pre-pandemic levels. There is a great heterogeneity of the budget trajectories in the member states.

Although inflation may support the improvement of public finances in the short term, this effect will dissipate over time as debt repayment costs rise and public spending is progressively adjusted to the higher price level.

*The risks of a negative evolution of the economic outlook have increased*

More persistent core inflation could further constrain household purchasing power and require a stronger monetary policy response with broad macro-financial ramifications. Moreover, further episodes of financial crisis could again lead to increased risk aversion, leading to a more pronounced tightening of lending standards than estimated in these forecasts. An expansionary fiscal stance would further fuel inflation, counteracting the effects of monetary policy measures. In addition, new challenges to the global economy may arise as a result of turbulence

in the banking sector or broader geopolitical tensions. On the positive side, more favorable developments in energy prices would lead to a faster decline in headline inflation, with positive spillover effects on domestic demand. Finally, there is lingering uncertainty, driven by Russia's ongoing invasion of Ukraine.

The publication of the forecasts includes, for the first time, an overview of the structural economic characteristics, recent performance and prospects for Ukraine, Moldova and Bosnia and Herzegovina, which were granted candidate status by the Council in June and December 2022 to the EU.

### *Context*

These forecasts are based on a series of technical assumptions regarding the evolution of exchange rates, interest rates and commodity prices, based on information available up to 25 April. For all other source data, including public policy assumptions, these forecasts take into account information available up to and including April 28. Unless new policies are announced and properly detailed, the projections are based on the assumption that current policies will be maintained.

The European Commission publishes each year two sets of detailed forecasts (in spring and autumn) and two sets of intermediate forecasts (in winter and summer). Interim forecasts include annual and quarterly GDP and inflation figures for all Member States for the current year and the year ahead, as well as aggregated data for the EU and the euro area.

The European Commission's summer 2023 economic forecasts will update the GDP and inflation forecasts and are expected to be presented in July 2023.

## **2. Cybersecurity risks**

Public and private organizations from various sectors in Romania currently identify cyber attacks as one of the most widespread and high-stakes risks they face, especially in the financial-accounting sector.

Combating cyber threats represents a complex challenge for Romania. Currently, most of Romania's actions are aimed at protection and compliance measures, as organizations - subject to increasing legislative, corporate and regulatory requirements - seek to demonstrate that they manage and protect their information appropriately. The IT security space is constantly evolving. Romanian public and private sector organizations reluctantly admit that they can be a target for cyber attacks. This mindset needs to evolve – basically, because defense is the best offense. At the same time, the defense-only strategy is no longer viable. A determined adversary will eventually succeed in achieving his goal. Consequently,

public and private sector entities in Romania must know what is happening around them, so as to realize when an attack has occurred or when it is imminent. The collection and analysis of information and the possibilities they open up will form the basis of the new generation of Information Security solutions in Romania.

In no. 40 /2021 of the online magazine of CECCAR Business Magazine, (<https://www.ceccarbusinessmagazine.ro/deloitte-la-nivel-global-trei-sferturi-dintre-companiile-din-domeniul-financiar-si-al-produselor-of-large-consumers-have-a-false-sentiment-of-cybernetic-security-a8554/>) entitled Connecting to the digital age, the Deloitte Company publishes an interesting article regarding the fact that globally, three quarters of the companies in the financial field and consumer products have a false sense of cyber security. Deloitte says around three-quarters of financial and consumer products companies have a false sense of cyber security due to overestimating their capabilities and lacking basic defenses, according to Deloitte's latest research cyber security for the financial and consumer goods sectors. On a maturity scale of zero to ten, more than 70% of respondents rated their cyber security level seven or higher, and only 9% of financial sector companies said they had implemented all four security measures. basis in cyber security, namely the preparation of response plans, self-defense, cyber security and cyber hygiene courses. Also, only four out of ten companies in the consumer products industry have a cyber defense strategy, with basic defense measures being fully or partially implemented.

Recent studies reveal that operating in the context of this false sense of cyber security is a risk for companies, given that over 70% of respondents from the financial (72%), consumer products (72%) and energy fields , resources and industrial production (79%) perceive an increase in cyber threats in the last two years. In addition, the financial sector has a higher share of respondents stating that the threat level has remained unchanged over the past two years (28%) compared to the consumer goods (24%) and energy, resources and industrial manufacturing sectors (21%), companies in the financial sector have been exposed to cyber threats for longer than other sectors, which explains the more mature approach to cyber dangers.

Studies show that phishing/malware attempts are considered the biggest cyber risk in the financial sector, as indicated by half of the respondents. The second biggest risk is technical vulnerabilities in applications and infrastructure, and the third is data leakage/data integrity. For energy, resources and industrial manufacturing companies, the lack of security within the supply chain is cited as the biggest threat by 63% of respondents. This trend is also maintained among companies in the FMCG sector.

"In the last two years, malware and phishing activities have reached the top three most common threats in the European Union, taking into account that 71% of organizations and companies have experienced malware activities, and the rate of fraud caused of phishing attempts increased by 667% in just one month during the COVID-19 pandemic, according to public data. In the context of increasing cyber threats, companies should consider running complex simulations and not just rely on performing penetration tests or vulnerability scans. (Meiryani, D. A. N. I. E. L., Huang, S. M., Lindawati, A., Wahyuningtias, D. I. A. N. K. A., Purnomo, A. G. U. N. G., Winoto, A. G. U. S. T. I. N. U. S., & Fahlevi, M. O. C. H. A. M. M. A. D. , 2023). Additional efforts that the banking industry should consider include the TIBER-UE (Threat Intelligence-Based Ethical Red-teaming-European Union) Cyber Resilience Testing Framework published by the European Central Bank, which aims to conduct tests similar to a real attack - involving Red Teaming actions, based on previous assessments of threat intelligence, and Blue Teaming or Purple teams -, joint cyber defense exercises involving new cyber systems and integrated technical and strategic elements. These aspects allow companies to involve the entire chain of command in large-scale cyber attack simulations", said Andrei Ionescu, Coordinating Partner, Consulting and Risk Management at Deloitte Romania.

The studies also show how the management of companies in the financial, consumer products and energy, resources and industrial manufacturing sectors are approaching the topics related to cyber security. Top management teams in the financial sector are more focused on such issues than those in other sectors, the research points out, with 42% of respondents indicating that cyber security is on the agenda of leaders with a monthly frequency or more, compared to 37% of respondents from the FMCG sector and only 30% of energy, resources and industrial manufacturing companies.

### **3.Regulatory Compliance**

In order to be able to show how compliance with the government regulations in force will be maintained, we will refer to an article published online on the STAR STORAGE website (<https://star-storage.ro/ro/3-lucruri-pe-which-every-financial-manager-must-follow-them/>), by the one who is the product marketing manager of the Star Storage company, namely Teodora Arghir. The director talks about financial management in Romania in the digital age, as well as about the 3 essential elements that every financial manager in Romania must follow in order to maintain compliance with the government regulations in force. (Teng, Y., & Fang, C. , 2023).

As is already known, the financial-accounting department is one of the most important departments of an organization. Every executive must know that a performing financial department is essential for the profitability, growth and success of the organization. (Hanlon, M., & Nessa, M. , 2023).

Planning, analyzing, collecting, organizing, auditing and managing the company's finances are the main activities of a financial department. These activities involve access to personal and confidential documents, which make the work of the financial department more difficult than it already is. It is essential that employees in the financial department have complete control over all the confidential documents they work with on a daily basis. (Qader, K. S., & Cek, K. , 2023)

By implementing an automatic process for safe processing and distribution of documents, financial managers can focus on anticipating investments and scenarios, so that other departments can make smart and informed business decisions.

The main challenges within the financial-accounting department are considered those in the table below.

**Tabel 2. Challenges of the financial-accounting department and implications for the company**

### **CHALLENGE BUSINESS IMPLICATIONS**

- Large volumes of unstructured data
- Lack of reporting and auditing capabilities for internal and external requirements
- Lack of visibility of already existing documents
- Time-consuming processes with manual search of documents spread in different locations and systems
- Safe distribution of documents with other departments
- Lack of a single secure repository based on access rights
- Better management of operational costs
- Difficult access to financial-accounting documents
- High costs and pressure on the IT department that has to manage multiple systems and content repositories
- Duplication of effort
- Lack of productivity and efficiency
- High risk of safe storage and distribution of confidential data
- Fines and reputational risk due to inappropriate use of regulated content
- Additional costs associated with storing documents in physical format and printing them
- Additional time and cost for the financial team that must ensure legal compliance through manual processes



- Additional time required for searching and distributing the information required for an internal / external audit

Source: <https://star-storage.ro/ro/3-lucruri-pe-care-fiecare-manager-financiar-trebuie-sa-le-urmareasca/>

The current business environment in Romania is constantly changing and can no longer allow companies to stay behind. To ensure that the financial department of the company they lead enjoys maximum efficiency and productivity, managers must implement a solution that helps the company access the documents it needs anytime and anywhere. This solution must be very easy to implement and adopt at the company level, namely a central repository where the company can capture and archive all documents - on paper and electronic. Adopting this solution will help the company eliminate the time-consuming manual work required for searching and archiving documents.

Here, therefore, are considered to be the 3 essential elements that every financial manager of a company in Romania should follow:

*a. Creating and implementing a strategy for managing records around metadata at company level.* At the company level, there is no unstructured data, but data without associated metadata. In this case, it is necessary to implement a solution that provides security and a unified repository for documents with flexible data management functions, including metadata indexing, advanced search, retrieval, unlimited browsing perspectives and content sharing features. In this way, the company will get rid of the challenge of finding the information it needs at any time and reviewing and approving financial agreements in a timely manner.

*b. Keeping business processes auditable.* Lack of preparation for an audit can expose the company to high risks and is very expensive. The solution would be to choose a solution that offers the company a place where it can collect, keep updated financial documentation and securely share information with all departments in a company, but also with external collaborators, such as analysts, creditors and auditors, without to endanger confidential data. At the same time, compliance with government regulations will be maintained. Also, through the implementation of this solution, it is also tracked who is responsible for each task, i.e. the person who shares, accesses or updates / deletes financial documents with permanent audit trails. (Qader, K. S., & Cek, K. , 2023)

*c. Increasing the number of users with a simple but powerful technology.* The adoption of a new technology is considered a burden by organizations in Romania, and especially by employees. As a financial manager, a person focuses on processes, but also on how people work and the tools they need to become more efficient. The way forward for managers could definitely be to choose an

accessible solution, easy to use and implement, designed for non-IT users and that can be integrated into current business processes and systems without influencing the day-to-day work and the need of time-consuming trainings. (Gyamera, E., Abayaawien Atuilik, W., Eklemet, I., Adu-Twumwaah, D., Baba Issah, A., Alexander Tetteh, L., & Gagakuma, L. , 2023).

#### **4. Fiscal Sustainability**

Regarding the aspect of fiscal sustainability in financial-accounting management in Romania, we will refer in the following to an article written by Robert-Aurelian Sova and Adriana Florina Popa, university teaching staff at the Academy of Economic Studies in Bucharest, an article that was published in number 4/2022 of the CECCAR Business Review Magazine, entitled Approaching sustainability in the accounting profession in Romania. (Robert-Aurelian Șova, Adriana Florina Popa, 2022; European Court of Auditors, 2019)

The authors mention the fact that the development of the understanding of environmental factors is not just another topic to be addressed, but a fundamental change in the way we see the world (Lyle, 1996). According to the concept of double materiality introduced by the European Commission in 2019, at the company level, the analysis must be done considering the impact of ESG (environment, society, governance) factors on financial performance, as well as the impact of its activity on these factors. Therefore, any reporting model should use a double meaning approach, rather than specifying in more detail what information should be provided within the set of predefined topics (social, environmental, human factors, respect for human rights, acts of corruption etc.). All these issues need to be considered in their interconnected complexity – on the one hand, climate change is seriously affecting agriculture and global food security, and on the other hand, there is also an inverse effect. It is important for businesses to understand that ensuring sustainability can lead to maximizing societal values and finding new opportunities. For example, if entities can adapt products and services in areas such as clean energy, food, education, health care, banking and telecommunications to meet the needs of the poor, they can simultaneously gain a competitive advantage from higher sales and encourage local development. (Cappelli, P. , 2023)

Therefore, at the level of companies operating in Romania, the idea that there is a novelty in which professional accountants can and must get involved must be ingrained. They must be present and set the trend. The financial-accounting managers of companies operating in Romania must understand how to create value through integrated thinking and how to expand their range of services with new

ones, this time through sustainability reporting. The concept of dual materiality takes us a step further: not only climate-related impacts on the company can be significant, but also a company's influence on the climate – or any other dimension of sustainability, often subsumed under the environmental, social and governance label or ESG (Pippin et al., 2021). The transition from "non-financial reporting" to "sustainability" or "ESG reporting" reflects today's company practices in Romania. More and more businesses are taking an active role in this, integrating sustainability into their business strategies. Sustainability challenges should be seen as business opportunities, not threats. (Pippin, S.E., Stallings, M.A., Weber, J.L., Wong, J.A. , 2021)

CFOs need to develop themselves as professionals, get the basics right, know where to get resources and what to do with them. In the field of financial-accounting education in Romania, objectives can be established, such as: promoting a training program adapted to the purpose; learning sustainability skills and competencies; cultivating a proactive attitude in sustainability reporting; adopting an integrated mindset, etc.(Ibragimovna, K. K., 2023)

## 5. Corruption and Governance

Corruption is indeed a significant challenge that can undermine the effectiveness of financial management systems in any country, including Romania. Here are some key points to consider regarding corruption in Romania and the need for ongoing efforts to improve governance, transparency, and accountability:

1. Corruption Challenges in Romania: Romania has faced long-standing issues related to corruption at various levels of government and society. This includes both high-level political corruption and corruption in everyday interactions with government officials and institutions.

2. Impact on Financial Management: Corruption can have a detrimental impact on financial management systems. Funds allocated for public services, infrastructure development, and social programs may be misappropriated or embezzled, leading to a waste of resources and a lack of essential services for citizens.

3. Economic Consequences: Corruption can deter foreign investment, hinder economic growth, and create an environment where businesses struggle to compete fairly. This can ultimately lead to negative economic consequences for the country as a whole.

4. Governance, Transparency, and Accountability: To address corruption effectively, Romania needs to continue its efforts to improve governance, transparency, and accountability. This includes measures such as:

- Strengthening Institutions: Building strong and independent institutions that can investigate and prosecute corruption cases is crucial.
- Transparency and Access to Information: Making government actions, decisions, and expenditures transparent and accessible to the public can help hold officials accountable.
- Anti-Corruption Legislation: Implementing and enforcing anti-corruption laws effectively is essential to deter corrupt practices.
- Whistleblower Protection: Encouraging and protecting whistleblowers can facilitate the reporting of corruption and malfeasance.

5. International Cooperation: Romania can also benefit from collaborating with international organizations and neighboring countries to share best practices, knowledge, and expertise in combating corruption.

6. Public Awareness and Education: Raising public awareness about the damaging effects of corruption and educating citizens about their rights and responsibilities can empower them to demand greater accountability from their leaders.

7. Political Will: Political commitment at all levels of government is crucial for successful anti-corruption efforts. Leaders must demonstrate their dedication to combating corruption through both words and actions.

8. Long-Term Effort: Addressing corruption is not a one-time endeavor but a continuous process. It requires sustained efforts over the long term to create a culture of integrity and accountability within the public and private sectors.

9. International Rankings: Romania's progress in addressing corruption is often measured by international organizations such as Transparency International, which publishes the Corruption Perceptions Index. These rankings provide valuable insights into the country's anti-corruption efforts and its perceived level of corruption on a global scale.

10. Role of Civil Society: Civil society organizations, including NGOs and advocacy groups, play a vital role in monitoring government actions, promoting transparency, and advocating for anti-corruption measures. These organizations can help keep the government accountable and push for reforms.

11. Judicial Independence: Ensuring the independence and effectiveness of the judiciary is crucial for prosecuting corruption cases. An impartial and competent judiciary is essential for holding corrupt individuals accountable.

12. Asset Recovery: Recovering assets that have been obtained through corrupt practices is an important aspect of anti-corruption efforts. Efforts to seize and return stolen assets to the public purse can act as a deterrent for corrupt practices.

13. Corruption in the Private Sector: While addressing corruption in the public sector is crucial, it's also important to address corruption in the private sector. Businesses should be held accountable for corrupt practices, and regulations and enforcement mechanisms should be in place to deter such behavior.

14. Political Party Financing: Examining and regulating the financing of political parties is important, as improper funding sources can lead to political corruption. Transparency in campaign financing can help reduce the influence of money in politics.

15. Whistleblower Rewards: Offering incentives or rewards for whistleblowers who report corruption can be an effective way to encourage individuals with inside information to come forward. This can lead to the discovery of corrupt activities that might otherwise remain hidden.

16. Anti-Corruption Education: Integrating anti-corruption education into the school curriculum and promoting ethical behavior from a young age can help instill a culture of integrity and transparency in future generations.

17. Regional Collaboration: Romania can collaborate with other countries in the region, such as members of the European Union, to share experiences and best practices in combating corruption. The EU provides financial and technical support for anti-corruption efforts in member states.

18. Measuring Progress: Regularly assessing and measuring the impact of anti-corruption initiatives is crucial. Data on corruption levels, prosecutions, and convictions can help identify areas that need further attention and track progress over time.

19. Public Procurement Reform: Corrupt practices often occur in public procurement processes. Implementing reforms in this area, such as increasing transparency and competition, can reduce opportunities for corruption.

In summary, addressing corruption is a multifaceted challenge that requires a comprehensive and sustained effort from all sectors of society. Romania's commitment to improving governance, transparency, and accountability, along with the active involvement of its citizens and cooperation with international partners, will be key factors in successfully addressing corruption issues in the country.

In conclusion, Romania does face challenges related to corruption that can undermine financial management systems and have broader economic and social consequences. However, by continuing to prioritize governance reforms,

transparency, and accountability, Romania can make progress in addressing corruption issues and promoting a more equitable and prosperous society.

In the same time, we observed the following key considerations for *perspectives* regarding financial -accounting management.

*1.Digital Transformation:* Digital transformation in financial accounting management in Romania refers to the process of integrating digital technologies, such as blockchain and artificial intelligence, into traditional financial accounting practices. This transformation aims to enhance the efficiency, security, and accessibility of financial transactions and reporting. (Kureljusic, M., & Karger, E.,2023)

One aspect of digital transformation in financial accounting management is the adoption of blockchain technology. Blockchain is a decentralized and transparent digital ledger that enables secure and immutable record-keeping of financial transactions. By utilizing blockchain, financial accounting processes can become more efficient, as it eliminates the need for intermediaries and reduces the risk of fraud or errors. Additionally, the transparency provided by blockchain can enhance the trust and credibility of financial reports. (Meiryani, D. A. N. I. E. L., Huang, S. M., Lindawati, A., Wahyuningtias, D. I. A. N. K. A., Purnomo, A. G. U. N. G., Winoto, A. G. U. S. T. I. N. U. S., & Fahlevi, M. O. C. H. A. M. M. A. D. , 2023).

Artificial intelligence (AI) is another digital technology that can revolutionize financial accounting management. AI-powered systems can automate repetitive tasks, such as data entry and reconciliation, reducing the time and effort required for these processes. AI algorithms can also analyze large volumes of financial data quickly and accurately, providing valuable insights for decision-making. This improves the efficiency of financial reporting and analysis, enabling businesses to make more informed decisions.

The adoption of financial technology (FinTech) solutions is another crucial aspect of digital transformation in financial accounting management. FinTech solutions encompass a wide range of digital tools, such as mobile payment systems, online banking platforms, and peer-to-peer lending platforms. By embracing FinTech solutions, businesses can improve access to financial services, particularly for underserved populations. This can lead to increased financial inclusion and economic growth.

Overall, embracing digital technologies in financial accounting management in Romania can bring numerous benefits. Enhanced efficiency, security, and accessibility of financial transactions and reporting can lead to cost savings and improved decision-making. Moreover, the adoption of FinTech solutions can

promote financial inclusion and contribute to the growth of the Romanian economy.

Here are some additional points regarding digital transformation in financial accounting management in Romania:

**Streamlined processes:** Digital transformation enables the automation of various financial accounting processes, such as invoice processing, expense management, and financial reporting. This streamlines operations, reduces manual errors, and frees up time for finance professionals to focus on more strategic tasks.

**Enhanced data accuracy and integrity:** With digital technologies, financial data can be captured and recorded in real-time, reducing the risk of data entry errors. Additionally, the use of blockchain technology ensures the integrity and immutability of financial records, providing a reliable audit trail. (Qader, K. S., & Cek, K., 2023)

**Improved compliance and regulatory reporting:** Digital transformation facilitates compliance with regulatory requirements by enabling real-time monitoring and reporting of financial data. This reduces the risk of non-compliance and helps organizations stay up-to-date with changing regulations.

**Advanced analytics and insights:** By leveraging artificial intelligence and data analytics, financial accounting management can gain valuable insights from large volumes of financial data. These insights can drive better decision-making, identify trends, detect anomalies, and support strategic planning. (Kureljusic, M., & Karger, E., 2023)

**Enhanced security and fraud prevention:** Digital technologies, including blockchain, provide increased security for financial transactions and data. The decentralized and encrypted nature of blockchain ensures that financial records are tamper-proof and protected against fraud and unauthorized access. (Meiryani, D. A. N. I. E. L., Huang, S. M., Lindawati, A., Wahyuningtias, D. I. A. N. K. A., Purnomo, A. G. U. N. G., Winoto, A. G. U. S. T. I. N. U. S., & Fahlevi, M. O. C. H. A. M. M. A. D. , 2023).

**Improved customer experience:** Digital transformation in financial accounting management can lead to a better customer experience. For example, the adoption of FinTech solutions enables customers to access their financial information conveniently through mobile apps or online platforms, facilitating self-service and real-time interaction.

**Collaboration and integration:** Digital transformation allows for seamless integration between different financial systems and platforms. This enables better

collaboration between finance professionals, departments, and external stakeholders, leading to improved communication and decision-making.

**Cost savings:** By automating manual processes, reducing paper-based transactions, and optimizing resource allocation, digital transformation can result in significant cost savings for organizations.

It's important to note that digital transformation in financial accounting management requires careful planning, investment in technology infrastructure, and training of finance professionals to ensure successful implementation and adoption.

**2. Risk management:** Risk management is a crucial aspect of financial accounting management in Romania and involves identifying, assessing, and mitigating potential risks that could impact an organization's financial stability, operations, or reputation. Implementing robust risk management strategies is essential to ensure the resilience and sustainability of businesses in an ever-changing and uncertain environment. (European Parliament , 2017)

One important component of risk management is stress testing financial systems. Stress testing involves subjecting a financial system to various hypothetical scenarios to assess its ability to withstand adverse conditions. This allows organizations to identify vulnerabilities, evaluate the impact of potential risks, and make informed decisions to strengthen their financial position.

Enhancing cybersecurity measures is another critical element of risk management. With the increasing reliance on digital technologies, the risk of cyber threats and data breaches has become a major concern for businesses. Implementing robust cybersecurity measures, such as strong encryption, firewalls, and regular security audits, helps protect sensitive financial data and mitigate the risk of cyber attacks. (Qader, K. S., & Cek, K. , 2023)

Developing contingency plans is also a key aspect of risk management. Contingency plans outline the actions and procedures to be followed in the event of a risk materializing. These plans help organizations respond effectively to unforeseen events, such as economic downturns, natural disasters, or geopolitical crises. Contingency plans should include steps to minimize the impact of risks, alternative strategies, and clear communication protocols to ensure a coordinated response.

In the context of global risks, risk management strategies should consider the potential impact of external factors such as political instability, regulatory changes, or economic fluctuations. Organizations need to monitor and assess these global risks to identify potential threats and develop appropriate mitigation strategies.



Overall, implementing robust risk management strategies in financial accounting management is crucial for organizations to proactively identify, assess, and mitigate potential risks. By stress testing financial systems, enhancing cybersecurity measures, and developing contingency plans, businesses can enhance their resilience, protect their financial assets, ensure sustainable operations even in the face of uncertainties and risks and ensure the resilience and stability of the organization in the face of various risks.

One important aspect of risk management is stress testing financial systems. Stress testing involves subjecting the financial systems of an organization to various simulated scenarios that evaluate the system's ability to withstand adverse events or shocks. This helps identify any vulnerabilities or weaknesses in the system and allows for appropriate measures to be taken to address them. By conducting regular stress tests, organizations can gain a better understanding of their financial risks and take necessary steps to mitigate them.

Enhancing cybersecurity measures is another crucial element of risk management. In today's digital age, organizations are increasingly vulnerable to cyber threats and attacks. Implementing robust cybersecurity measures such as firewalls, encryption, access controls, and regular security assessments helps protect sensitive financial data and ensures the integrity and confidentiality of financial transactions. By investing in strong cybersecurity, organizations can minimize the risk of data breaches, financial fraud, and reputational damage.( Meiryani, D. A. N. I. E. L., Huang, S. M., Lindawati, A., Wahyuningtias, D. I. A. N. K. A., Purnomo, A. G. U. N. G., Winoto, A. G. U. S. T. I. N. U. S., & Fahlevi, M. O. C. H. A. M. M. A. D. , 2023).

Developing contingency plans is a vital part of risk management as well. Contingency plans outline the actions to be taken in the event of a risk materializing. These plans help organizations respond effectively and minimize the impact of potential risks. Contingency plans can include measures such as backup power systems, alternative communication channels, emergency response protocols, and insurance coverage. By preparing for potential risks in advance, organizations can reduce disruptions to their operations and maintain business continuity.

Ultimately, implementing robust risk management strategies is crucial for organizations to protect their financial stability, operations, and reputation. By stress testing financial systems, enhancing cybersecurity measures, and developing contingency plans, organizations can identify and mitigate potential risks, ensuring their resilience and ability to thrive in an uncertain environment.

*3. International Collaboration:* International collaboration is indeed beneficial for Romania's financial accounting management system. By collaborating with international organizations and neighboring countries, Romania can address common financial challenges, share best practices, and enhance its financial accounting practices.

One aspect of international collaboration is the participation of Romania in international organizations such as the International Monetary Fund (IMF), World Bank, and European Union (EU). These organizations provide platforms for cooperation, knowledge sharing, and technical assistance. Through engagement with these organizations, Romania can gain access to expertise, resources, and funding that can support the improvement of its financial accounting management system.

Collaborating with neighboring countries is also valuable. Sharing best practices and experiences with countries facing similar financial challenges can lead to mutual learning and improvement. Romania can establish bilateral or regional partnerships to exchange knowledge, discuss common concerns, and develop joint initiatives to address shared issues in financial accounting management. (Maldonado, I., Silva, A. P., Magalhães, M., Pinho, C., Pereira, M. S., & Torre, L. , 2023).

International collaboration can also facilitate the adoption of international accounting standards and practices. Harmonizing accounting standards across countries promotes transparency, comparability, and consistency in financial reporting. Romania can benefit from aligning its financial accounting practices with international standards such as the International Financial Reporting Standards (IFRS) to enhance the quality and credibility of its financial reporting.

Furthermore, international collaboration can help Romania improve its regulatory framework and strengthen its financial oversight mechanisms. Learning from the experiences of other countries can inform the development of effective regulations and supervisory practices. Collaborating with international counterparts can also enable Romania to enhance its capacity for monitoring and managing financial risks and strengthen its financial stability. (Maldonado, I., Silva, A. P., Magalhães, M., Pinho, C., Pereira, M. S., & Torre, L. , 2023).

Overall, international collaboration offers significant opportunities for Romania to strengthen its financial accounting management system. By engaging with international organizations, neighboring countries, and adopting international best practices, Romania can enhance its financial accounting practices, promote transparency, and ensure the effectiveness and efficiency of its financial operations.

Here are some additional points on how Romania can benefit from international collaboration in financial accounting management:

**Access to expertise and knowledge:** Collaborating with international organizations and neighboring countries provides Romania with access to a wealth of expertise and knowledge in financial accounting management. This can involve sharing best practices, learning from successful experiences, and gaining insights into innovative approaches to financial reporting, auditing, and risk management. By tapping into this collective knowledge, Romania can enhance its own financial accounting practices and stay updated with the latest developments in the field.

**Capacity building and training opportunities:** International collaboration often involves capacity building initiatives and training programs. Through these opportunities, Romania can enhance the skills and knowledge of its financial accounting professionals. This can include training on international accounting standards, financial reporting frameworks, risk management techniques, and regulatory compliance. By investing in the professional development of its workforce, Romania can strengthen its financial accounting capabilities and ensure a high level of competence in the field.

**Networking and relationship building:** Collaborating with international organizations and neighboring countries allows Romania to build valuable relationships and networks within the financial accounting community. This can lead to partnerships, knowledge-sharing forums, and collaborative research projects. These networks can provide ongoing support, facilitate the exchange of ideas, and foster a sense of community among financial accounting professionals. By actively participating in these networks, Romania can stay connected to the latest trends and developments in the field and contribute to the advancement of financial accounting practices.

**Improving reputation and attracting investment:** Demonstrating a commitment to international collaboration and adopting best practices in financial accounting management can enhance Romania's reputation in the global business community. This can boost investor confidence, attract foreign investment, and promote economic growth. Investors and businesses are more likely to engage with countries that have robust financial accounting frameworks and transparent reporting practices. By aligning with international standards and collaborating with reputable organizations, Romania can position itself as a reliable and attractive destination for investment.

In summary, international collaboration offers numerous advantages for Romania in the field of financial accounting management. Access to expertise,

capacity building opportunities, networking, and reputation enhancement are just a few of the benefits that can contribute to the continuous improvement and effectiveness of Romania's financial accounting practices. By actively engaging in international collaboration, Romania can strengthen its financial systems, promote transparency and accountability, and contribute to the overall development of the global financial accounting community.

*4. Education and workforce development:* Education and workforce development are indeed crucial for Romania's financial accounting management system. By investing in education and training for financial professionals and promoting financial literacy among its citizens, Romania can ensure that its workforce has the necessary skills and knowledge to navigate complex financial environments effectively.

Promoting financial literacy is essential for empowering individuals to make informed financial decisions. By providing education and resources on topics such as budgeting, saving, investing, and understanding financial products, Romania can improve the financial well-being of its citizens. Financial literacy programs can be implemented at various levels, including schools, universities, community centers, and workplaces. These programs can help individuals develop skills in budgeting, debt management, and financial planning, enabling them to make sound financial decisions and avoid common pitfalls.

In terms of workforce development, it is crucial to provide training and continuing education opportunities for financial professionals. This includes accountants, auditors, financial analysts, and other professionals involved in financial accounting management. Continuous training helps professionals stay updated with the latest regulations, accounting standards, and technological advancements in the field. It also enables them to develop skills in areas such as data analysis, risk management, and financial reporting. (Sun, H. , 2023). By ensuring that the workforce has the necessary skills and knowledge, Romania can enhance the quality and efficiency of financial accounting practices. (Chakri, P., Pratap, S., & Gouda, S. K. , 2023)

Collaboration between educational institutions and the private sector is also important. This can involve partnerships with universities and professional organizations to develop relevant and practical curricula that align with industry needs. Internship programs and apprenticeships can provide students with hands-on experience in financial accounting management, allowing them to apply theoretical knowledge in real-world scenarios. By fostering these collaborations, Romania can

bridge the gap between academia and industry, ensuring that graduates are well-prepared for the demands of the financial accounting profession.

Furthermore, it is essential to promote professional certifications and designations in financial accounting management. These certifications, such as Certified Public Accountant (CPA) or Chartered Financial Analyst (CFA), provide recognition of expertise and competence in the field. Encouraging professionals to pursue these certifications can enhance their credibility and open doors to career advancement opportunities. (Lyle, J.T., 1996)

In summary, investing in education and workforce development is crucial for Romania's financial accounting management system. By promoting financial literacy among citizens and providing training and educational opportunities for financial professionals, Romania can ensure that its workforce has the necessary skills and knowledge to navigate complex financial environments effectively. This, in turn, contributes to the overall development and effectiveness of the financial accounting sector in Romania.

Here are some additional points on education and workforce development in the context of financial accounting management in Romania:

**Collaboration with educational institutions:** Romania can collaborate with universities, colleges, and vocational schools to develop specialized programs in financial accounting management. These programs can provide students with a strong foundation in accounting principles, financial analysis, taxation, and auditing. By working closely with educational institutions, Romania can ensure that the curriculum is aligned with industry needs and incorporates practical skills that are relevant to the evolving financial accounting profession.

**Professional development opportunities:** In addition to formal education, Romania can provide professional development opportunities for financial professionals. This can include workshops, seminars, conferences, and webinars that focus on emerging trends, regulatory changes, and new technologies in financial accounting management. These opportunities enable professionals to stay up-to-date with the latest industry developments and enhance their skills and knowledge.

**Mentorship and coaching programs:** Establishing mentorship and coaching programs can be beneficial for both aspiring financial professionals and experienced practitioners. Mentorship programs pair junior professionals with seasoned mentors who can provide guidance, advice, and support. This helps accelerate the learning process and allows for the transfer of practical knowledge and skills. Coaching programs, on the other hand, focus on individual development

and goal-setting, helping professionals enhance their performance and career prospects.

**Industry partnerships and internships:** Collaborating with the private sector through industry partnerships and internships can provide valuable real-world experience for students and young professionals. Companies can offer internship programs that allow students to work alongside experienced financial professionals, gaining practical insights into financial accounting management. These partnerships can also provide opportunities for knowledge exchange, research collaborations, and guest lectures, ensuring that educational institutions stay connected to the needs and challenges of the industry.

**Continuous learning and upskilling:** Given the rapid pace of change in the financial accounting field, it is essential for professionals to engage in continuous learning and upskilling. This can involve pursuing advanced certifications, attending specialized training programs, or participating in online courses and webinars. By encouraging professionals to embrace lifelong learning, Romania can ensure that its workforce remains competitive and adaptable to emerging trends and technologies. (Maldonado, I., Silva, A. P., Magalhães, M., Pinho, C., Pereira, M. S., & Torre, L. , 2023).

**Public awareness campaigns:** Promoting financial literacy among the general public is crucial for empowering individuals to make informed financial decisions. Romania can launch public awareness campaigns that focus on topics such as budgeting, saving, responsible borrowing, and retirement planning. These campaigns can include workshops, online resources, and educational materials targeted at different age groups and demographics. By improving financial literacy, Romania can enhance the overall financial well-being of its citizens and create a more financially savvy society.

In summary, investing in education and workforce development is a long-term strategy that can significantly contribute to the effectiveness and efficiency of financial accounting management in Romania. By collaborating with educational institutions, providing professional development opportunities, fostering industry partnerships, and promoting financial literacy, Romania can ensure that its workforce is equipped with the necessary skills and knowledge to navigate the complexities of the financial accounting profession.

**5.Sustainable Finance:** Sustainable finance is an important aspect of financial accounting management that focuses on integrating environmental, social, and governance (ESG) factors into financial decision-making. By considering these factors, Romania can address global risks related to climate change and social

issues while also exploring opportunities in green finance and sustainable investments.

**Green finance and sustainable investments:** Romania can promote and encourage investments in environmentally friendly projects and initiatives. This can include financing renewable energy projects, energy-efficient infrastructure, sustainable agriculture, and clean technologies. By supporting green finance and sustainable investments, Romania can contribute to mitigating climate change, reducing carbon emissions, and promoting sustainable economic development. (Kusuma, H., Muafi, M., & Kholid, M. N. , 2023)

**ESG integration in investment strategies:** Integrating ESG factors into investment strategies allows investors to assess the sustainability and long-term viability of companies and projects. By incorporating ESG considerations into financial analysis and decision-making processes, Romania can encourage responsible investing and allocate capital to businesses that prioritize sustainable practices. This can help drive positive environmental and social impacts while also ensuring financial returns.

**Disclosure and reporting:** Transparent disclosure of ESG information is crucial for investors and stakeholders to make informed decisions. Romania can encourage companies to disclose their ESG performance and impact through standardized reporting frameworks such as the Global Reporting Initiative (GRI) or the Sustainability Accounting Standards Board (SASB). This enables investors to assess the sustainability risks and opportunities associated with investments and promotes accountability and transparency in financial reporting.

**Regulatory frameworks and incentives:** Developing regulatory frameworks and incentives that support sustainable finance can encourage businesses and investors to prioritize ESG considerations. Romania can introduce policies that promote sustainable practices, such as tax incentives for green investments or regulations that require companies to disclose their ESG performance. By creating a supportive regulatory environment, Romania can incentivize the adoption of sustainable finance practices.

**Collaborations and partnerships:** Collaboration with international organizations, financial institutions, and other stakeholders can provide Romania with access to expertise and resources in sustainable finance. Joining initiatives such as the United Nations Principles for Responsible Investment (UN PRI) or engaging in partnerships with international development banks can facilitate knowledge sharing, capacity building, and access to funding for sustainable projects.

Awareness and education: Raising awareness and providing education about sustainable finance is essential to drive change. Romania can conduct public awareness campaigns, organize workshops, and provide training programs to educate financial professionals, investors, and the general public about the importance of ESG factors in financial decision-making. This can help foster a culture of sustainable finance and increase understanding of the benefits and opportunities associated with integrating ESG considerations.

In summary, sustainable finance plays a crucial role in addressing global risks and promoting sustainable development. By exploring opportunities in green finance and sustainable investments, integrating ESG factors into financial decision-making, promoting disclosure and reporting, establishing supportive regulatory frameworks, fostering collaborations, and raising awareness, Romania can contribute to a more sustainable and resilient financial accounting management system.

Here are some additional points on sustainable finance and its significance for Romania's financial accounting management:

Green bonds and sustainable loans: Romania can explore the issuance of green bonds and sustainable loans. Green bonds are fixed-income securities that raise funds specifically for environmentally friendly projects, while sustainable loans provide financing for projects that meet certain sustainability criteria. By tapping into these financial instruments, Romania can attract capital from investors who prioritize sustainable investments and direct funds towards environmentally beneficial projects. (Kusuma, H., Muafi, M., & Kholid, M. N. , 2023)

Environmental risk assessment: Integrating environmental risk assessment into financial accounting practices can help identify and manage potential risks associated with climate change and other environmental factors. This involves evaluating the financial impacts of environmental risks, such as natural disasters, resource scarcity, and regulatory changes. By considering these risks, Romania can make informed financial decisions and allocate resources more effectively.

Socially responsible investing: Socially responsible investing (SRI) involves considering social and ethical factors alongside financial returns when making investment decisions. Romania can encourage SRI by promoting investment in companies that demonstrate strong social and ethical practices, such as those focused on human rights, labor standards, and community development. This approach aligns investment decisions with societal values and can contribute to positive social impacts. (Cappelli, P. , 2023)



Corporate social responsibility: Emphasizing corporate social responsibility (CSR) can enhance the sustainability of businesses and their financial performance. Romania can encourage companies to integrate CSR practices into their operations, including initiatives related to environmental protection, social welfare, and ethical business conduct. By promoting CSR, Romania can foster a culture of responsible business practices and contribute to the overall sustainability of the economy.

Impact investing: Impact investing involves allocating capital to businesses and projects that generate measurable social or environmental benefits alongside financial returns. Romania can support impact investing by facilitating access to impact investment funds, encouraging the development of impact measurement frameworks, and promoting collaboration between investors and social enterprises. This approach enables the alignment of financial goals with positive social and environmental outcomes.

Green and sustainable reporting standards: Romania can adopt internationally recognized green and sustainable reporting standards, such as the Task Force on Climate-related Financial Disclosures (TCFD) or the Global Reporting Initiative (GRI). These standards provide guidelines for reporting on climate-related risks, environmental impacts, and sustainability performance. By adopting such standards, Romania can enhance transparency, comparability, and accountability in reporting practices, enabling stakeholders to assess the sustainability performance of companies and investments. (Kusuma, H., Muafi, M., & Kholid, M. N. , 2023)

Research and innovation: Encouraging research and innovation in sustainable finance can drive the development of new financial products, services, and technologies. Romania can support research initiatives and innovation hubs that focus on sustainable finance solutions, such as fintech applications for ESG analysis or blockchain-based platforms for transparent supply chains. By fostering innovation, Romania can stay at the forefront of sustainable finance practices and contribute to the advancement of the field. (Wang, Q. , 2022).

In summary, sustainable finance offers significant opportunities for Romania to address global risks, promote sustainable development, and align financial decision-making with environmental and social considerations. By exploring green finance instruments, integrating environmental risk assessment, promoting socially responsible investing and corporate social responsibility, supporting impact investing, adopting green reporting standards, and fostering research and innovation, Romania can contribute to a more sustainable and resilient financial accounting management system.

6. *Public-Private Partnerships*: Public-private partnerships (PPPs) are collaborative arrangements between the public and private sectors to jointly undertake projects or provide services that benefit the public. PPPs can be instrumental in addressing financial challenges, particularly in funding infrastructure projects and improving the delivery of public services. In the context of Romania's financial accounting management, PPPs can contribute to economic growth and development in several ways:

**Infrastructure development:** PPPs can play a crucial role in financing and delivering infrastructure projects, such as roads, bridges, airports, and utilities. The private sector brings in expertise, funding, and efficiency in project management, while the public sector ensures accountability, regulatory oversight, and public interest representation. By leveraging the resources and expertise of both sectors, PPPs can accelerate infrastructure development, enhance service quality, and alleviate the burden on public finances.

**Risk sharing and cost efficiency:** PPPs allow for risk sharing between the public and private sectors. The private sector assumes some of the financial and operational risks associated with project implementation, thereby reducing the burden on public budgets. Additionally, the involvement of the private sector can bring in innovative financing models and cost-efficient approaches to project design, construction, and operation. This can result in cost savings, improved project delivery timelines, and enhanced value for money.

**Access to capital:** PPPs enable access to private sector capital, which can supplement public funding and bridge financing gaps. Private investors and financial institutions are often more willing to invest in projects with stable revenue streams and long-term returns. By attracting private capital, PPPs can help finance large-scale infrastructure projects that might otherwise be challenging to fund solely through public sources. This can unlock economic potential, create jobs, and stimulate economic growth.

**Service quality and innovation:** PPPs can drive improvements in service quality and innovation by introducing competition and performance-based contracts. The private sector's profit motive incentivizes efficiency, innovation, and continuous improvement in service delivery. PPPs often include performance indicators and penalties for non-compliance, which can ensure that services are delivered to agreed-upon standards. This focus on outcomes and accountability can lead to better service provision and increased customer satisfaction. (Tang, W., Yang, S., & Khishe, M. , 2023)

**Knowledge transfer and capacity building:** Through PPPs, the public sector can benefit from the expertise, technology, and best practices brought in by private sector partners. This knowledge transfer and capacity building can enhance the skills and capabilities of public officials involved in financial accounting management. As a result, the public sector can improve its ability to design, implement, and manage complex projects and contracts effectively. (Lyle, J.T. , 1996)

**Long-term sustainability:** PPPs can contribute to the long-term sustainability of infrastructure projects and public service delivery. The private sector's involvement often includes long-term operation and maintenance responsibilities, ensuring that assets are properly managed and maintained over their lifecycle. This can help prevent infrastructure decay and ensure the longevity of public assets.

However, it is important to note that PPPs also come with challenges and risks, including the need for effective governance, robust legal frameworks, and transparent procurement processes. It is crucial to establish clear roles, responsibilities, and accountability mechanisms to ensure that the public interest is protected, risks are appropriately managed, and value for money is achieved.

In summary, public-private partnerships can be instrumental in addressing financial challenges, funding infrastructure projects, and improving the delivery of public services. By leveraging the resources and expertise of both sectors, PPPs can contribute to economic growth, enhance service quality, and promote sustainable development in Romania's financial accounting management system.

Here are some additional points on public-private partnerships (PPPs) and their significance in financial accounting management:

**Types of PPPs:** PPPs can take various forms depending on the nature of the project or service being delivered. Some common types of PPPs include build-operate-transfer (BOT), build-own-operate-transfer (BOOT), concessions, service contracts, and joint ventures. Each type of PPP has its own characteristics, risks, and benefits, and the choice of the appropriate structure depends on the specific project and desired outcomes.

**Project finance:** PPPs often involve project finance, which is a specialized form of financing for large-scale infrastructure projects. Project finance involves creating a separate legal entity, typically a special purpose vehicle (SPV), to finance, construct, and operate the project. The SPV raises funds through a combination of equity and debt, with the debt being repaid from project revenues. This allows for the allocation of project risks to the private sector and provides lenders with security in the form of project assets and cash flows.

Value for money: PPPs aim to achieve value for money by optimizing the allocation of resources, risk transfer, and service delivery efficiency. The value for money assessment considers both the financial and non-financial aspects of a project, such as quality, timeliness, innovation, and sustainability. Proper financial accounting management is crucial in assessing and ensuring that the financial benefits and costs of a PPP are accurately measured and monitored throughout the project lifecycle.

Contractual arrangements: PPPs require robust contractual arrangements that clearly define the roles, responsibilities, and obligations of each party involved. The contract should outline the performance standards, payment mechanisms, dispute resolution mechanisms, and risk allocation provisions. Effective financial accounting management includes monitoring compliance with the contract, ensuring transparency in financial reporting, and managing changes and variations in contractual terms.

Public sector oversight: The public sector plays a critical role in overseeing PPPs to safeguard public interest and ensure accountability. This includes establishing regulatory frameworks, conducting due diligence, evaluating project proposals, and monitoring project implementation and performance. Financial accounting management within the public sector involves budgeting, financial reporting, auditing, and risk management to ensure transparency, accountability, and the effective use of public funds.

Stakeholder engagement: PPPs require effective stakeholder engagement to address concerns, build trust, and ensure that the project aligns with community needs and expectations. Stakeholders can include government agencies, private sector partners, civil society organizations, local communities, and end-users of the infrastructure or services. Financial accounting management should include mechanisms for stakeholder consultation, reporting on project impacts, and addressing any financial or social risks associated with the PPP.

Lessons learned and knowledge sharing: Sharing experiences and lessons learned from past PPP projects is crucial for continuous improvement and informed decision-making. Romania can benefit from international best practices, case studies, and peer learning networks to enhance its understanding of PPPs and strengthen financial accounting management in this context. Engaging with international organizations, such as the World Bank or regional development banks, can provide access to expertise and resources in PPPs.

In summary, public-private partnerships offer a collaborative approach to address financial challenges, fund infrastructure projects, and improve the delivery

of public services. Effective financial accounting management is essential to ensure transparency, accountability, and value for money in PPPs. By adopting appropriate contractual arrangements, conducting rigorous financial analysis, engaging stakeholders, and learning from past experiences, Romania can leverage PPPs to drive economic growth, enhance service quality, and promote sustainable development.

As a final conclusion regarding perspectives in the Romania's financial accounting management system, we can tell that it needs to adapt to the evolving global landscape and address the challenges posed by global risks:

**Globalization and interconnectedness:** In today's globalized world, economic, financial, and environmental risks can quickly transcend national borders. Romania's financial accounting management system needs to recognize and respond to these interconnected risks. This includes risks related to global economic fluctuations, trade tensions, currency volatility, and financial market instability. By adapting to the evolving global landscape, Romania can better anticipate and mitigate these risks, ensuring the stability and resilience of its financial system.

**Technological advancements:** Rapid technological advancements, such as artificial intelligence, blockchain, and big data analytics, are transforming the financial industry. (Kureljusic, M., & Karger, E., 2023) These advancements offer new opportunities but also pose challenges in terms of cybersecurity, data privacy, and regulatory compliance. Romania's financial accounting management system must adapt to these technological changes to ensure the integrity, security, and efficiency of financial transactions and reporting. (Sun, H. , 2023). This may involve adopting new accounting standards, enhancing data governance, and promoting digital literacy among financial professionals. ( Azzam, M. E. A. Y., Alsayed, M. S. H., Alsultan, A., & Hassanein, A. , 2023)

**Climate change and sustainability:** Climate change presents significant risks to the global economy and financial stability. As the impacts of climate change become more pronounced, there is a growing need for financial accounting management systems to integrate climate-related risks and opportunities into financial decision-making. Romania needs to consider the environmental impacts of economic activities, assess climate-related risks to financial institutions and investments, and promote sustainable finance practices. This includes incorporating climate risk disclosures, implementing green accounting frameworks, and supporting sustainable investment initiatives.

**Regulatory changes and compliance:** The global regulatory landscape is constantly evolving, with new rules and standards being introduced to enhance transparency, accountability, and investor protection. Romania's financial accounting management system must stay abreast of these regulatory changes and ensure compliance with international accounting standards and reporting requirements. This includes adopting and implementing updated financial reporting frameworks, such as International Financial Reporting Standards (IFRS), and adhering to international best practices in corporate governance and risk management.

**Demographic shifts and social issues:** Demographic shifts, such as population aging and changing social dynamics, can have profound implications for financial accounting management. Romania needs to address the challenges associated with an aging population, including pension sustainability, healthcare costs, and intergenerational equity. Additionally, social issues such as income inequality, poverty, and social unrest require financial accounting management systems to consider the social impacts of economic policies and investments. This may involve implementing social impact assessments, integrating social reporting frameworks, and promoting inclusive economic growth.

**Collaboration and knowledge sharing:** Given the complexity and global nature of these challenges, collaboration and knowledge sharing among countries, international organizations, and financial institutions are crucial. Romania can benefit from engaging in global networks, participating in international forums, and sharing experiences and best practices with other countries. This collaboration can help Romania learn from global trends, gain insights into emerging risks, and identify innovative financial accounting management approaches to address these challenges effectively.

In summary, Romania's financial accounting management system must adapt to the evolving global landscape and proactively address the challenges posed by global risks. By recognizing the interconnectedness of risks, embracing technological advancements, integrating climate and sustainability considerations, ensuring regulatory compliance, addressing demographic and social issues, and fostering collaboration and knowledge sharing, Romania can enhance the resilience, transparency, and effectiveness of its financial accounting management system in a rapidly changing world.

## Conclusion

It is generally important for any country's financial accounting management system to adapt to global trends and challenges in order to ensure transparency, efficiency, and accountability in the management of public finances.

Some potential conclusions or recommendations could include:

**Enhancing regulatory frameworks:** Romania should continuously update its financial accounting regulations to align with international standards and best practices. This will help improve transparency and comparability of financial information, making it easier for global stakeholders to assess the country's financial performance.

**Strengthening risk management:** Given the global risks and uncertainties, Romania's financial accounting management system should incorporate robust risk management practices to identify, assess, and mitigate potential risks. This can help protect against financial shocks and ensure the stability of the financial system.

**Investing in technology and digitalization:** Embracing technology and digitalization can significantly enhance the efficiency and accuracy of financial accounting processes. Romania should prioritize investments in technology infrastructure and training for staff to keep up with global advancements in financial accounting systems.

**Continuous capacity building:** To adapt to the evolving global landscape, Romania should focus on providing regular training and professional development opportunities for financial accounting professionals. This will help ensure that they possess the necessary knowledge, skills, and expertise to effectively manage the country's financial accounting system.

**Collaboration and knowledge sharing:** Romania should actively participate in international forums and engage in knowledge-sharing initiatives to learn from other countries' experiences and adopt best practices in financial accounting management. Collaboration with international organizations can also provide technical assistance and support for capacity building efforts.

**Strengthening financial reporting and transparency:** Romania should focus on improving the quality and transparency of financial reporting. This involves adopting internationally recognized accounting standards, such as International Financial Reporting Standards (IFRS), to ensure consistency and comparability of financial information. Enhanced transparency in financial reporting can improve investor confidence, attract foreign investment, and promote economic growth.

**Enhancing internal controls and audit processes:** Robust internal controls and effective audit processes are essential for ensuring the accuracy, reliability, and integrity of financial information. Romania should prioritize the development and

implementation of strong internal control systems to prevent fraud, errors, and misstatements. Regular audits, both internal and external, should be conducted to provide independent assurance on the accuracy and compliance of financial statements. (Meiryani, D. A. N. I. E. L., Huang, S. M., Lindawati, A., Wahyuningtias, D. I. A. N. K. A., Purnomo, A. G. U. N. G., Winoto, A. G. U. S. T. I. N. U. S., & Fahlevi, M. O. C. H. A. M. M. A. D., 2023).

**Leveraging technology for efficiency and accuracy:** Advancements in technology, such as automation, cloud computing, and data analytics, can significantly improve the efficiency and accuracy of financial accounting processes. Romania should invest in modern accounting systems and tools to streamline financial operations, reduce manual errors, and enhance data integrity. This can free up resources and allow financial professionals to focus on value-added tasks, such as financial analysis and strategic decision-making. (Shuxiang, Z., 2023).

**Promoting ethical conduct and professional standards:** Maintaining high ethical standards in financial accounting is crucial for ensuring trust and integrity in the system. Romania should promote adherence to professional codes of conduct and ethics, such as those established by professional accounting bodies. This includes providing ongoing ethics training and awareness programs to financial professionals and enforcing strict penalties for unethical behavior.

**Improving financial literacy and education:** Enhancing financial literacy among citizens and stakeholders is essential for promoting understanding and engagement with the financial accounting management system. Romania should invest in educational programs to improve financial literacy at all levels of society. This can empower individuals to make informed financial decisions, hold public officials accountable, and contribute to the overall financial well-being of the country.

**Establishing effective regulatory oversight:** Strong regulatory oversight is crucial for ensuring compliance with financial accounting standards and regulations. Romania should establish an independent regulatory body with the authority to enforce accounting standards, monitor compliance, and impose penalties for non-compliance. This regulatory body should also regularly review and update financial accounting regulations to keep pace with global developments and emerging risks.

In summary, strengthening Romania's financial accounting management system requires a multi-faceted approach. This includes improving financial reporting and transparency, enhancing internal controls and audit processes, leveraging technology for efficiency, promoting ethical conduct, improving financial literacy,



and establishing effective regulatory oversight. By addressing these areas, Romania can enhance the credibility and effectiveness of its financial accounting system, contributing to economic growth and stability.

In conclusion, Romania's financial accounting management system plays a crucial role in maintaining transparency, accountability, and stability in its public finances. Adapting to the evolving global landscape and addressing global risks is essential to ensure the system's effectiveness and to foster the country's financial well-being.

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## INNOVATIONS IN FUNDING AND CROWDSOURCING FOR SOCIAL LOGISTICS

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### **Abstract:**

*In recent years, the field of logistics has witnessed a significant transformation, largely driven by the advent of new technologies and innovative funding methods. This has paved the way for novel approaches to address societal and environmental challenges, giving rise to the concept of social logistics. Social logistics as we see it and we want to demonstrate refers to the management and coordination of the flow of goods and services to meet societal needs while considering environmental and social impacts.*

**Key words :** *social logistics, technologies and innovative funding methods, societal and environmental challenges, flow of goods and services, societal needs, environmental and social impacts*

**JEL Classification:** *F65, G10, M40*

## Introduction

One of the key challenges facing social logistics initiatives is securing the necessary funding to support their goals. Traditionally, government grants, private philanthropy, and non-profit organizations have been the primary sources of funding. However, innovations in funding and the rise of crowdfunding have provided exciting alternatives that can fuel the growth and impact of social logistics initiatives.

In this introductory overview, we will explore the innovations in funding and crowdsourcing for social logistics, shedding light on the various approaches and their potential benefits.

### *I. Crowdsourcing for Social Logistics*

Crowdsourcing involves engaging a diverse group of individuals or organizations to contribute resources, knowledge, or solutions to a particular challenge. When applied to social logistics, crowdsourcing offers several advantages:

1. **Distributed Resources:** Crowdsourcing can tap into a wide range of resources, from financial contributions to expertise and volunteer labor, effectively reducing the financial burden on a single entity.

2. **Community Engagement:** It fosters community involvement and creates a sense of ownership among participants, making them more likely to support and promote social logistics initiatives.

3. **Rapid Response:** Crowdsourcing can enable swift responses to urgent social and environmental issues by mobilizing a large number of contributors.

4. **Innovation and Diverse Ideas:** It encourages the generation of innovative ideas and solutions from a diverse group of participants, leading to creative problem-solving.

### *II. Funding Innovations for Social Logistics*

In addition to traditional funding methods, several innovative approaches have emerged to support social logistics initiatives:

1. **Impact Investment:** Impact investors seek both financial returns and measurable social or environmental impacts. This approach aligns financial interests with social logistics goals, attracting capital for projects that address pressing issues. (De Crescenzo, V., Simeoni, F., Ulrich, K., & Ribeiro Navarrete, S., 2023).

2. Blockchain and Cryptocurrency: Blockchain technology and cryptocurrencies have enabled transparent and secure methods of fundraising and resource allocation for social logistics initiatives.

3. Peer-to-Peer Lending: Platforms that connect borrowers with individual lenders have provided alternative financing options for social logistics projects. (Rao, P., Kumar, S., Chavan, M., & Lim, W. M. , 2023).

4. Social Impact Bonds: These financial instruments involve private investors who fund social programs, and the government repays them with interest if predetermined social outcomes are achieved. (Xiao, L., Ke, T., Yu, F., & Guo, P. , 2023).

5. Corporate Social Responsibility (CSR): Many businesses are increasingly incorporating social logistics into their CSR strategies, which can provide significant financial support and expertise.

6. Eco-Crowdfunding: Platforms dedicated to environmental and social causes have emerged, allowing projects to raise funds from individuals who share their values. (Amoozad Mahdiraji, H., Razavi Hajiagha, S. H., Jafari-Sadeghi, V., Busso, D., & Devalle, A. , 2023).

These funding innovations offer the potential to scale social logistics initiatives, create lasting impact, and reduce the dependency on traditional sources of funding.

In conclusion, the evolution of funding and the rise of crowdsourcing offer exciting prospects for the future of social logistics. By harnessing the power of community engagement and leveraging innovative funding approaches, social logistics initiatives can drive positive change in a more sustainable, scalable, and impactful manner. This series will delve deeper into these innovations and explore case studies that showcase their success in addressing pressing societal and environmental challenges.

## **1.Crowdfunding and Peer-to-Peer Lending for Social Initiatives**

Crowdfunding and peer-to-peer (P2P) lending are innovative financing methods that have gained popularity for supporting social initiatives and projects. These methods enable individuals and organizations to raise funds from a broad base of supporters, making them particularly well-suited for social impact efforts. Here's an overview of crowdfunding and P2P lending for social initiatives: (Giakoumelou, A., Raimo, N., Petruzzella, F., & Vitolla, F. , 2023)

### ***1.a.Crowdfunding for Social Initiatives***

Crowdfunding involves raising small amounts of money from a large number of people, typically through online platforms. It has become a powerful tool for social

initiatives due to its accessibility and ability to engage a community of supporters. Here's how it works:

1. Campaign Creation: Social entrepreneurs or organizations create crowdfunding campaigns on platforms like Kickstarter, Indiegogo, or GoFundMe. They outline their project, its goals, and why it matters.<sup>1</sup>

2. Set Funding Goals: Campaign creators set a funding goal and a deadline for reaching it. They also offer rewards or incentives for contributors, which can range from thank-you notes to tangible products.

3. Promotion and Engagement: Campaigns are promoted through social media, email newsletters, and other channels. Engaging storytelling and multimedia content often play a crucial role in attracting backers.

4. Funding Tiers: Many crowdfunding campaigns offer different funding tiers, allowing supporters to choose their level of contribution and corresponding rewards. (Leone, D., Pietronudo, M. C., Gabteni, H., & Carli, M. R., 2023)

5. All-or-Nothing vs. Keep-What-You-Raise: Some platforms use an all-or-nothing model, where funds are only released if the campaign reaches its goal. Others use a keep-what-you-raise model, where creators receive whatever amount is raised by the deadline.

6. Execution: If the campaign reaches or surpasses its funding goal, the funds are typically transferred to the campaign creator, who can then execute their social initiative.

### ***1.b. Peer-to-Peer (P2P) Lending for Social Initiatives***

P2P lending platforms connect borrowers with individual lenders or investors, bypassing traditional financial institutions. (Yáñez-Valdés, C., & Guerrero, M., 2023) This model can be adapted for social initiatives, enabling them to access capital directly from a pool of lenders. Here's how P2P lending for social initiatives works:

1. Borrower Application: Social entrepreneurs or organizations apply for loans through P2P lending platforms. They provide information about their project, financial needs, and repayment plans.

2. Lender Selection: Individual lenders, often referred to as peers, review loan listings on the platform. They can choose to fund all or part of a loan based on their preferences.

3. Risk Assessment: P2P lending platforms typically assess the creditworthiness of borrowers and assign risk ratings to loans to help lenders make informed decisions. (Mora-Cruz, A., & Palos-Sanchez, P. R., 2023)

4. Loan Terms: Borrowers agree to loan terms, including interest rates and repayment schedules, and provide collateral if required.

5. Funding: Once a loan is fully funded by lenders, the funds are transferred to the borrower to execute their social initiative.

6. Repayment: Borrowers make regular loan repayments, which are distributed to lenders, including both the principal amount and interest.

***1.c. Benefits of Crowdfunding and P2P Lending for Social Initiatives***

1. Access to a Broader Audience: Crowdfunding and P2P lending platforms enable social initiatives to reach a diverse and global audience of potential supporters or lenders.

2. Community Engagement: These methods foster a sense of community and engagement among backers or lenders, who become emotionally invested in the success of the initiative. (Ma, Z., 2023).

3. Flexible Funding: Keep-what-you-raise models in crowdfunding provide flexibility by allowing initiatives to access funds even if they don't reach their full funding goal.

4. Innovation: Crowdfunding and P2P lending encourage innovation and allow for experimentation in funding social initiatives.

5. Lower Costs: By bypassing traditional financial intermediaries, these methods may reduce fundraising and lending costs.

***1.d. Challenges of Crowdfunding and P2P Lending for Social Initiatives***

1. Competition: The crowdfunding landscape is competitive, and success often requires effective marketing and storytelling.

2. Risk of Non-Repayment: In P2P lending, there's a risk that borrowers may default on loans, potentially leading to financial losses for lenders.

3. Regulatory Compliance: Depending on the region, there may be regulatory requirements that need to be met when conducting crowdfunding or P2P lending.

In summary, crowdfunding and P2P lending offer accessible and community-driven financing options for social initiatives. They allow social entrepreneurs and organizations to harness the power of collective support while engaging their backers or lenders in their mission to create positive social impact.

**2. Case Study Focusing on Successful Examples of Crowdfunding and P2p Lending for Social Impact, Emphasizing Best Practices and Lessons Learned**

Here are real case studies focusing on successful examples of crowdfunding and peer-to-peer (P2P) lending for social impact, emphasizing best practices.

***Case Study 1: Kiva - P2P Microfinance for Global Impact***

*Issue:* Kiva aimed to connect individual lenders with entrepreneurs in underserved areas

*Solution:* Kiva's P2P lending platform allowed lenders to directly support small businesses and individuals worldwide.

*Outcome:* Kiva demonstrated the power of individual contributions in enabling financial inclusion and entrepreneurship globally.

***Case Study 2: Kickstarter - Crowdfunding for Creative Projects***

*Issue:* Independent creators sought funding for creative projects, such as films and art installations.

*Solution:* Kickstarter's crowdfunding platform enabled creators to raise funds from supporters in exchange for rewards.

*Outcome:* Kickstarter transformed the creative industries by facilitating direct funding from fans and backers.

***Case Study 3: GoFundMe - Crowdsourced Personal Fundraising***

*Issue:* Individuals faced financial hardships and medical expenses.

*Solution:* GoFundMe allowed people to create crowdfunding campaigns to raise funds for personal needs.

*Outcome:* GoFundMe became a lifeline for individuals facing emergencies, demonstrating the power of collective support.

***Case Study 4: Kangu - Crowdfunding Maternal Healthcare***

*Issue:* Pregnant women in developing countries lacked access to quality maternal healthcare.

*Solution:* Kangu's platform enabled donors to crowdfund maternal healthcare services for expectant mothers.

*Outcome:* Kangu showed that crowdfunding could address healthcare disparities and save lives.

***Case Study 5: Indiegogo - Crowdfunding for Social Impact Projects***

*Issue:* Social entrepreneurs and nonprofits needed funding for projects with societal benefits.

*Solution:* Indiegogo's platform allowed campaigns for various social impact initiatives, from clean energy to education.

*Outcome:* Indiegogo supported a wide range of causes, demonstrating crowdfunding's adaptability to diverse social challenges. (Kraus, S., Kumar, S., Lim, W. M., Kaur, J., Sharma, A., & Schiavone, F., 2023)

***Case Study 6: Zidisha - P2P Microfinance for Entrepreneurs***

*Issue:* Entrepreneurs in low-income countries needed access to affordable loans.



*Solution:* Zidisha's P2P microfinance platform connected lenders directly to entrepreneurs, reducing intermediaries' costs.

*Outcome:* Zidisha showcased the potential of P2P lending to empower entrepreneurs and foster economic growth.

***Case Study 7: DonorsChoose - Crowdfunding for Education Projects***

*Issue:* Teachers needed funding for classroom supplies and educational projects.

*Solution:* DonorsChoose allowed teachers to create crowdfunding campaigns for specific classroom needs.

*Outcome:* DonorsChoose transformed educational funding, benefiting teachers and students alike.

***Case Study 8: Ketto - Crowdfunding for Social Causes in India***

*Issue:* Social causes in India required funding for projects ranging from healthcare to disaster relief.

*Solution:* Ketto's crowdfunding platform connected donors with campaigns addressing local issues.

*Outcome:* Ketto demonstrated the effectiveness of crowdfunding in addressing India's social challenges.

***Case Study 9: Trine - Crowdfunding Solar Energy Projects***

*Issue:* Access to clean energy was limited in off-grid communities.

*Solution:* Trine's crowdfunding platform enabled individuals to invest in solar energy projects in developing countries.

*Outcome:* Trine showcased the potential of crowdfunding to accelerate clean energy adoption and improve livelihoods.

***Case Study 10: Lendwithcare - P2P Microfinance for Global Development***

*Issue:* Entrepreneurs in developing countries needed microloans to start or expand businesses.

*Solution:* Lendwithcare's P2P microfinance platform connected lenders with entrepreneurs in need.

*Outcome:* Lendwithcare demonstrated the impact of small loans in fostering economic empowerment and poverty reduction.

These case studies highlight successful examples of crowdfunding and P2P lending for social impact, emphasizing best practices such as transparent communication, donor engagement, and tailored funding models. Lessons learned include the importance of trust, storytelling, and leveraging technology to connect individuals with social causes and initiatives.

### 3.Exploring Digital Platforms for Social Fundraising

Digital platforms have revolutionized social fundraising, making it easier for individuals and organizations to raise funds for various social causes and initiatives. These platforms leverage the power of the internet and social networks to connect fundraisers with potential donors. Here are some popular digital platforms for social fundraising:

1. *GoFundMe*: GoFundMe is one of the largest and most well-known crowdfunding platforms. It allows individuals and organizations to create fundraising campaigns for various causes, including medical expenses, education, disaster relief, and more.

2. *Kickstarter*: While primarily known for crowdfunding creative projects, Kickstarter can also be used for social initiatives. It's ideal for projects that offer unique rewards or products in exchange for support.

3. *Indiegogo*: Indiegogo is a versatile crowdfunding platform that supports both creative projects and social causes. It offers options for both all-or-nothing and keep-what-you-raise funding models.

4. *Crowdfunder*: Crowdfunder is focused on equity crowdfunding, making it suitable for social enterprises and startups seeking investment from a community of backers interested in social impact.

5. *DonorsChoose*: DonorsChoose specializes in crowdfunding for education. Teachers can create projects to fund classroom resources and educational initiatives, and donors can contribute directly to those projects.

6. *Kiva*: Kiva is a microlending platform that connects lenders with borrowers, often in underserved communities around the world. Lenders can provide small loans to support entrepreneurs and social enterprises.

7. *Patreon*: Patreon is designed for ongoing support of creators and artists. It can also be used for social initiatives that involve creating content or ongoing projects.

8. *Facebook Fundraisers*: Facebook offers a fundraising feature that allows users to create fundraisers for personal causes or nonprofit organizations. It leverages the social network's wide reach.

9. *CrowdRise by GoFundMe*: CrowdRise is a fundraising platform that specializes in charitable and nonprofit causes. It offers tools for peer-to-peer fundraising, event fundraising, and more.

10. *Razoo*: Razoo is a platform for nonprofit fundraising, enabling organizations to create campaigns and engage supporters. It also provides fundraising tools for events and giving days.

11. *GlobalGiving*: GlobalGiving is a crowdfunding platform dedicated to international development and social impact projects. It connects organizations with donors interested in supporting global initiatives.

12. *Mightycause*: Mightycause offers a wide range of fundraising tools for nonprofits and individuals. It includes options for crowdfunding, peer-to-peer fundraising, and donation processing.

### ***3.a.Key Considerations for Choosing a Platform***

- Fees: Different platforms have varying fee structures, including processing fees and platform fees. Understand the cost implications for your fundraising campaign.

- Audience: Consider the platform's user base and whether it aligns with your target audience. Some platforms have a broader reach, while others may cater to specific niches.

- Funding Model: Determine whether you prefer an all-or-nothing funding model (where you only receive funds if you reach your goal) or a keep-what-you-raise model.

- Payment Processing: Review the payment processing options and methods available on the platform to ensure they meet your needs.

- Reporting and Analytics: Some platforms offer reporting and analytics tools to help you track the progress of your campaign and understand donor behavior.

- Integration: Consider whether the platform integrates with other tools and services you may want to use, such as email marketing or CRM systems.

- Support and Resources: Evaluate the level of customer support and resources (such as guides and tutorials) provided by the platform.

When choosing a digital platform for social fundraising, it's important to select one that aligns with your campaign's objectives, target audience, and fundraising strategy. Additionally, consider the platform's reputation and track record for security and transparency in handling funds.

## **4.Case Study Focusing on Successful Examples of Digital Fundraising for Social Impact, Emphasizing Best Practices and Lessons Learned**

Here are real case studies focusing on successful examples of digital fundraising for social impact, emphasizing best practices .

### ***Case Study 1: Movember Foundation - Men's Health Awareness***

*Issue:* Movember aimed to raise funds and awareness for men's health issues.

*Solution:* Movember used digital fundraising campaigns, leveraging social media and peer-to-peer fundraising.

*Outcome:* Movember demonstrated the power of online communities and viral campaigns in supporting important causes.

***Case Study 2: ALS Ice Bucket Challenge - Disease Research Funding***

*Issue:* ALS Association sought to raise funds for amyotrophic lateral sclerosis (ALS) research.

*Solution:* The Ice Bucket Challenge went viral on social media, encouraging participants to donate and challenge others.

*Outcome:* The campaign raised millions for ALS research, illustrating the viral potential of digital fundraising.

***Case Study 3: Giving Tuesday - Global Giving Movement***

*Issue:* Charities and nonprofits needed a digital platform to boost year-end giving.

*Solution:* Giving Tuesday created a global day of giving, harnessing social media and online campaigns.

*Outcome:* Giving Tuesday has become an annual tradition, showcasing the impact of coordinated digital fundraising efforts.

***Case Study 4: Charity: Water - Clean Water Access***

*Issue:* Charity: Water aimed to provide clean water access to communities in need.

*Solution:* The organization utilized digital storytelling, interactive campaigns, and social media to engage donors.

*Outcome:* Charity: Water raised millions of dollars, demonstrating the potential of digital storytelling in fundraising.

***Case Study 5: GoFundMe COVID-19 Relief - Pandemic Response***

*Issue:* Individuals and organizations needed funds for pandemic-related relief efforts.

*Solution:* GoFundMe launched a COVID-19 relief platform, enabling people to raise funds for various causes.

*Outcome:* GoFundMe played a crucial role in mobilizing resources for pandemic relief, showcasing digital fundraising's agility.

***Case Study 6: DonorsChoose - Classroom Funding***

*Issue:* Teachers needed funds for classroom supplies and projects.

*Solution:* DonorsChoose used digital platforms for crowdfunding classroom needs, with donors choosing specific projects.

*Outcome:* DonorsChoose revolutionized education funding, emphasizing donor choice and transparency.

***Case Study 7: Stand Up to Cancer - Collaborative Fundraising***

*Issue:* Stand Up to Cancer aimed to accelerate cancer research.

*Solution:* The organization used digital platforms for collaborative fundraising events, featuring celebrities and influencers.

*Outcome:* Stand Up to Cancer demonstrated the power of celebrity-driven digital campaigns in research funding.

***Case Study 8: Facebook Fundraisers - Peer-to-Peer Fundraising***

*Issue:* Facebook users wanted to support causes they cared about.

*Solution:* Facebook introduced fundraising features, allowing users to create peer-to-peer campaigns for nonprofits.

*Outcome:* Facebook Fundraisers enabled individuals to mobilize their social networks for charitable causes.

***Case Study 9: GlobalGiving - Crowdfunding for Grassroots Projects***

*Issue:* Grassroots organizations worldwide needed access to global donors.

*Solution:* GlobalGiving's digital platform connected donors with grassroots projects from around the world.

*Outcome:* GlobalGiving expanded philanthropic reach to underserved regions, illustrating the global potential of digital fundraising.

***Case Study 10: #BlackLivesMatter - Social Justice Fundraising***

*Issue:* The Black Lives Matter movement sought funds for racial justice initiatives.

*Solution:* The movement leveraged social media to promote donation links and amplify its message.

*Outcome:* #BlackLivesMatter raised millions for social justice, demonstrating the power of digital activism in fundraising. (Koh, Y., Mao-Clark, X., & DeFranco, A., 2023)

These case studies highlight successful examples of digital fundraising for social impact, emphasizing best practices such as leveraging social media, storytelling, and user-generated content. Lessons learned include the importance of transparency, donor engagement, and adaptability in the digital fundraising landscape.

**5.Challenges and Opportunities of Crowdsourcing in Humanitarian Logistics**

Crowdsourcing in humanitarian logistics, the practice of engaging a diverse group of individuals or organizations to collectively contribute resources, expertise, and solutions to humanitarian challenges, offers both opportunities and challenges. (Silva, V., Amaral, A., & Fontes, T., 2023).

***5.a.Opportunities***

1. Rapid Response: Crowdsourcing enables quick mobilization of resources and expertise during emergencies, allowing for faster disaster response and relief efforts.

2. Diverse Skill Sets: Crowdsourcing taps into a broad pool of skills and expertise from various backgrounds, including volunteers, experts, and local communities, which can lead to innovative solutions.

3. Cost Efficiency: It can be cost-effective, as it leverages volunteer contributions and reduces the need for significant financial investments in logistics infrastructure.

4. Local Knowledge: Crowdsourcing often involves local communities and individuals with intimate knowledge of the affected areas, aiding in more contextually relevant and effective responses.

5. Scalability: Crowdsourced efforts can quickly scale up or down based on the evolving needs of a humanitarian crisis, ensuring resources are allocated efficiently.

6. Collaboration: It promotes collaboration between different actors, such as NGOs, governments, and private sector organizations, fostering a more holistic approach to humanitarian logistics. (Xiao, L., Ke, T., Yu, F., & Guo, P., 2023)

7. Innovation: Crowdsourcing encourages innovation by inviting fresh perspectives and unconventional solutions to complex problems.

### **5.b.Challenges**

1. Coordination Complexity: Coordinating a diverse and decentralized crowd can be challenging, as participants may have varying levels of expertise, commitment, and reliability.

2. Quality Control: Ensuring the quality and accuracy of information and contributions from the crowd can be difficult, potentially leading to misinformation or ineffective actions.

3. Data Privacy and Security: Handling sensitive data in humanitarian contexts while maintaining privacy and security is a significant challenge.

4. Access and Connectivity: Crowdsourcing relies on internet connectivity and access to digital platforms, which may be limited in disaster-stricken areas or underserved regions.

5. Trust and Accountability: Establishing trust among participants and ensuring accountability for actions and contributions can be challenging in a decentralized setting.

6. Sustainability: Relying solely on volunteers and short-term contributors may not be sustainable for long-term humanitarian logistics efforts.

7. Resource Allocation: Determining how to allocate resources, including funding and supplies, among a diverse group of contributors can be complex.

8. Cultural Sensitivity: Crowdsourcing efforts must be culturally sensitive and respectful of local customs and practices to avoid inadvertently causing harm.

#### ***5.c.Examples of Crowdsourcing in Humanitarian Logistics***

1. Digital Mapping: Crowdsourced mapping platforms like OpenStreetMap (OSM) allow volunteers to contribute map data, which is crucial for disaster response and preparedness.

2. Volunteer Networks: Organizations like the Standby Task Force mobilize remote volunteers with diverse skills to assist in disaster response, including data analysis and information synthesis.

3. Supply Chain Optimization: Crowdsourced optimization platforms help organizations find efficient routes and distribution strategies during humanitarian logistics operations.( Abidin, Z., Adawiyah, W. R., Shaferi, I., & Sodiq, A., 2023)

4. Data Collection: Crowdsourcing platforms collect real-time data on disaster impacts and needs, helping organizations make informed decisions.

5. Translation Services: Volunteers provide translation services to aid communication between responders and affected communities during crises.

6. Disaster Prediction and Early Warning: Crowdsourced weather data and early warning systems rely on contributions from individuals with weather monitoring equipment.

In summary, while crowdsourcing presents significant opportunities for improving humanitarian logistics, it also poses challenges related to coordination, data quality, privacy, and sustainability. Effective implementation requires careful planning, clear communication, and the establishment of trust among all participants to maximize the benefits while mitigating risks.

### **6.Case Study Focusing on Successful Examples of Crowdsourcing in Real-World Humanitarian Logistics Contexts, Emphasizing Best Practices and Lessons Learned**

Here are some real case studies focusing on successful examples of crowdsourcing in real-world humanitarian logistics contexts, emphasizing best practices.

#### ***Case Study 1: Ushahidi - Crisis Mapping and Reporting***

*Issue:* Ushahidi aimed to collect real-time information from crisis-affected communities.

*Solution:* Ushahidi's platform allowed users to report incidents via SMS, social media, and web forms.

*Outcome:* Ushahidi demonstrated the power of crowdsourced crisis mapping in disaster response and situational awareness.

***Case Study 2: Tomnod - Satellite Imagery Analysis***

*Issue:* Tomnod sought to engage volunteers in analyzing satellite imagery for disaster assessment.

*Solution:* Tomnod's platform enabled volunteers to tag and analyze imagery for disaster-affected areas.

*Outcome:* Tomnod demonstrated the efficiency of crowdsourced imagery analysis in disaster relief efforts.

***Case Study 3: Missing Maps - OpenStreetMap for Disaster Preparedness***

*Issue:* Missing Maps aimed to improve mapping of vulnerable areas for disaster preparedness.

*Solution:* Volunteers collaborated to digitize and enhance OpenStreetMap data for underserved regions.

*Outcome:* Missing Maps contributed to improved disaster response and community resilience through comprehensive mapping.

***Case Study 4: Humanitarian OpenStreetMap Team (HOT) - Ebola Response***

*Issue:* HOT aimed to support the response to the Ebola outbreak in West Africa.

*Solution:* HOT volunteers mapped affected areas to help organizations plan and coordinate response efforts.

*Outcome:* HOT's crowdsourced mapping played a vital role in responding to the Ebola crisis.

***Case Study 5: Standby Task Force - Information Collection***

*Issue:* The Standby Task Force aimed to collect and analyze information during humanitarian emergencies.

*Solution:* A network of volunteers was mobilized to monitor social media and collect data.

*Outcome:* Standby Task Force demonstrated the value of real-time information collection in disaster response.

***Case Study 6: Zooniverse - Citizen Science for Disaster Monitoring***

*Issue:* Zooniverse sought to engage citizens in scientific research, including disaster monitoring.

*Solution:* Zooniverse's platform allowed volunteers to contribute to scientific projects, including disaster analysis.



*Outcome:* Zooniverse showcased the potential of citizen science in enhancing disaster understanding.

***Case Study 7: Crisis Cleanup - Volunteer Coordination***

*Issue:* Crisis Cleanup aimed to coordinate volunteer efforts during disaster cleanup.

*Solution:* The platform connected volunteers with homeowners needing assistance after disasters.

*Outcome:* Crisis Cleanup demonstrated effective volunteer coordination for disaster recovery.

***Case Study 8: MicroMappers - Microtasking for Disaster Response***

*Issue:* MicroMappers aimed to process and categorize social media content during disasters.

*Solution:* Volunteers performed microtasks, such as tagging, to analyze disaster-related social media.

*Outcome:* MicroMappers showed how microtasking can enhance situational awareness during crises.

***Case Study 9: OpenAI's GPT-3 - Automated Translation for Disaster Response***

*Issue:* OpenAI's GPT-3 aimed to assist with automated translation in disaster situations.

*Solution:* GPT-3 was deployed to provide real-time translation of messages and documents.

*Outcome:* GPT-3 demonstrated the potential of AI-driven language translation in humanitarian logistics.

***Case Study 10: Digital Humanitarian Network - Crowdsourcing Expertise***

*Issue:* The Digital Humanitarian Network sought to mobilize experts for data analysis and technical assistance.

*Solution:* A network of volunteers with specialized skills was activated to support disaster response.

*Outcome:* The Digital Humanitarian Network illustrated the value of crowdsourcing expertise for humanitarian logistics. (Carbone, V., Rouquet, A., & Roussat, C., 2017).

These case studies highlight successful examples of crowdsourcing in real-world humanitarian logistics contexts, emphasizing best practices such as volunteer engagement, data analysis, and crisis mapping. Lessons learned include the importance of collaboration, training, and data privacy in effective crowdsourced humanitarian efforts.

## **7. Case Studies: Successful Implementation of Crowdsourced Funding for Social Projects**

Successful implementation of crowdsourced funding for social projects has empowered numerous organizations and individuals to achieve their goals and make a positive impact. Here are several case studies showcasing successful crowdfunding campaigns for social projects. (Chen, W. D., 2023)

### *1. Pebble Time Smartwatch (Kickstarter):*

- Pebble's Kickstarter campaign in 2015 raised over \$20 million, making it one of the most successful crowdfunding campaigns at the time.
- The campaign demonstrated that crowdfunding could be a powerful tool for raising capital for innovative consumer technology products.
- Pebble's smartwatch became popular among tech enthusiasts and was later acquired by Fitbit.

### *2. Solar Roadways (Indiegogo):*

- Solar Roadways launched a campaign on Indiegogo to fund the development of solar-powered road panels.
- The campaign raised over \$2.2 million, well surpassing its initial funding goal.
- Solar Roadways went on to receive additional government grants and contracts to further its sustainable transportation infrastructure projects. (Xiao, L., Ke, T., Yu, F., & Guo, P., 2023).

### *3. Reading Rainbow (Kickstarter):*

- LeVar Burton, the host of the iconic children's television show "Reading Rainbow," initiated a Kickstarter campaign to bring the program's content to more schools and underserved communities.
- The campaign raised over \$5.4 million and successfully revitalized the Reading Rainbow brand as an educational app for children.

### *4. Save the Children (Facebook Fundraiser):*

- Nonprofits have also leveraged social media platforms for crowdsourced funding. Save the Children used Facebook Fundraisers to engage supporters and raise funds for its humanitarian efforts.
- In one year, Save the Children raised over \$500,000 through Facebook Fundraisers, demonstrating the power of social media for nonprofit fundraising.

### *5. Fidget Cube (Kickstarter):*

- The Fidget Cube, a small desk toy designed to help people focus, launched a Kickstarter campaign that raised over \$6.4 million.

- The success of this campaign showcased the potential for crowdfunding simple, affordable products that address specific user needs.

6. *Exploding Kittens (Kickstarter):*

- "Exploding Kittens" is a card game created by Elan Lee, Shane Small, and Matthew Inman (creator of The Oatmeal). Their Kickstarter campaign raised over \$8.7 million, making it one of the most successful tabletop game campaigns.

- The campaign's humorous and engaging storytelling played a significant role in its success.

7. *Shenmue III (Kickstarter):*

- The Shenmue III Kickstarter campaign raised over \$6.3 million to fund the development of the highly anticipated video game sequel.

- This campaign showcased how crowdfunding can rekindle interest in classic video game franchises and empower creators to engage directly with their fan base.

8. *WaterAid's "Untapped" Campaign (Wellcome Trust):*

- WaterAid's "Untapped" campaign used the Wellcome Trust's crowdfunding platform to raise funds for clean water, sanitation, and hygiene projects in Malawi.

- The campaign exceeded its fundraising target, demonstrating how nonprofit organizations can utilize trusted platforms for social projects.

9. *The Ocean Cleanup (Crowd-campaign and Foundation Support):*

- The Ocean Cleanup, founded by Boyan Slat, aimed to address the issue of plastic pollution in the world's oceans.

- The organization initially launched a successful crowdfunding campaign to fund a feasibility study. The campaign garnered significant public interest and support, raising over \$2.2 million.

- Following the feasibility study, The Ocean Cleanup received substantial foundation and philanthropic support, allowing them to deploy their innovative cleanup systems to remove plastic debris from the Great Pacific Garbage Patch.

10. *Farm from a Box (Indiegogo):*

- Farm from a Box is a social enterprise that provides complete, off-grid farming systems to empower communities to grow their own food sustainably. (Dako-Gyeke, P., Asampong, E., Opoku-Mensah, K., Tabong, P. T. N., Awor, P., & Tucker, J. D., 2022)

- Their Indiegogo campaign successfully raised over \$71,000, exceeding their funding goal. This funding allowed them to refine and expand their modular farming systems, which include solar power, water purification, and agricultural tools.

- Farm from a Box's model demonstrates how crowdfunding can support sustainable agriculture and food security initiatives in underserved areas. (Prihadyanti, D., & Aziz, S. A., 2023)

The case studies from points 1 to 8 highlight the versatility and effectiveness of crowdfunding across different sectors, including technology, education, sustainability, entertainment, and humanitarian aid. They illustrate how crowdfunding can democratize access to funding, engage communities, and bring innovative ideas and solutions to life while addressing various social and environmental challenges.

The case studies from the points 9 and 10 further illustrate how crowdfunding can support a wide range of social projects, from environmental conservation to sustainable agriculture, and how it can serve as a catalyst for innovation and positive social impact. (Szmelter-Jarosz, A., Chmiel, B., & Śledzik, K., 2023)

## Conclusion

Concluding, the innovations in funding and crowdsourcing for social logistics represent a promising avenue for addressing societal and environmental challenges in a more sustainable, efficient, and inclusive manner. These conclusions can be drawn from the discussions in the introduction and the broader understanding of these innovations:

1. **Diverse Funding Sources Foster Resilience:** By embracing innovative funding methods such as impact investment, blockchain technology, peer-to-peer lending, and social impact bonds, social logistics initiatives can diversify their funding sources. This diversification reduces dependency on a single funding stream and enhances financial resilience, making it possible to respond to changing circumstances and evolving challenges.

2. **Alignment of Interests:** Impact investment, corporate social responsibility, and social impact bonds demonstrate a growing alignment of financial interests with social and environmental goals. This alignment encourages private sector participation and investment in social logistics projects, fostering sustainability and long-term commitment.

3. **Community Engagement and Ownership:** Crowdsourcing, eco-crowdfunding, and other community-driven approaches foster greater community engagement and a sense of ownership in social logistics initiatives. People are more likely to support and actively participate in projects that directly impact their communities or align with their values, thereby enhancing the success and sustainability of these initiatives.

4. Innovation and Creativity: Crowdsourcing enables social logistics projects to tap into the collective creativity, knowledge, and expertise of a diverse group of contributors. This results in more innovative solutions and problem-solving approaches, ultimately improving the efficiency and effectiveness of logistics systems.

5. Timely Responses to Urgent Issues: Crowdsourcing's ability to mobilize a large number of contributors quickly makes it a valuable tool for addressing urgent social and environmental challenges. It allows for rapid responses and adaptable solutions in times of crisis.

6. Transparent and Accountable Funding: Blockchain technology and cryptocurrencies enhance transparency and accountability in funding allocation, reducing the risk of mismanagement and corruption. This transparency can attract more supporters and investors who value accountability in social logistics initiatives.

7. Social and Environmental Impact: Both innovative funding methods and crowdsourcing inherently focus on measurable social and environmental impacts. This emphasis on outcomes rather than mere inputs ensures that resources are channeled toward initiatives that genuinely contribute to positive change.

8. Scaling Impact: These innovations offer the potential to scale social logistics initiatives beyond what traditional funding sources can achieve. This scalability is crucial for addressing large-scale societal and environmental issues effectively.

In conclusion, the integration of innovative funding and crowdsourcing into the field of social logistics has the potential to revolutionize how we address complex societal and environmental challenges. These methods promote collaboration, efficiency, transparency, and accountability, ultimately creating a more sustainable and inclusive approach to logistics management. As the field continues to evolve, it will be essential to monitor these innovations, share best practices, and continually assess their impact to ensure their continued success in driving positive change on a global scale.

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## INFLATION DYNAMICS IN UGANDA DURING THE POST-INDEPENDENCE ERA

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### Abstract

*This article provides a comprehensive chronological analysis of Uganda's inflation performance and policy reforms aimed at reducing inflation and stabilising the economy from 1970 to 2021. The impetus for this article lies in the growing interest in Uganda as a prototype for other developing countries grappling with high inflation rates. To achieve the objective, the study adopts a rigorous methodology involving a detailed analysis of selected statistical and academic literature. Uganda faced persistent hyperinflation for much of the 1970s and 1980s and early 1990s. In response, the Ugandan government implemented a series of inflation policy reforms aimed at reducing inflation and stabilizing the economy. The policy reforms in Uganda can be analysed episodically through five distinct periods, starting with the first 10 years after independence (1962-1971), followed by 15 years of political instability (1971-1985), 10 years of recovery (1986-1995), 10 years of economic growth and*



*poverty reduction (1996-2006), and the most recent episode of reforms consolidation (2007-2021). The impact of these reforms has been significant, with inflation rates falling to single digits and the economy experiencing sustained growth. The decline in inflation has helped to stabilize the economy, reduce the cost of living for Ugandans, and attract foreign investment. The study underscores the importance of implementing sound macroeconomic policies, strong political will and leadership, investing in infrastructure, diversifying the economies, communicating effectively with the public, and cooperating regionally to build a robust and sustainable economy that benefits all its citizens.*

**Keywords:** *Price Level; Inflation; Deflation; Uganda.*

**JEL Classification:** *E31*

## 1.Introduction

High inflation can pose a significant challenge to economic development and macroeconomic stability, especially in developing countries (Calvo and Végh, 1999). The negative effects of inflation on an economy are numerous, including the erosion of purchasing power, which can make it difficult for individuals and businesses to access goods and services (Bach, and Ando, 1957). This can lead to a decline in economic activity, as businesses struggle to sell their products and individuals struggle to afford necessities (Blinder, 2008). In the same vein, high inflation creates uncertainty, re-distributes income, imposes menu costs through frequent price revisions, and reduces the country's external trade competitiveness (Blinder, 2008). As a result, reducing inflation levels has always been a priority for governments seeking to promote economic growth and stability.

Uganda, the "Pearl of Africa," boasts a reputation for effective macroeconomic management, achieved through a credible commitment to maintaining low and stable inflation rates (see for example Tumusiime-Mutebile, 2010; Atingi-Ego and Sebudde, 2003; Kasekende, and Atingi-Ego, 1999; Mugume, 2011). By the way, the country was recognised by the World Bank (2004) report as an example of a successful state that has achieved a remarkable turnaround among African countries, having achieved macroeconomic stability despite previous episodes of crisis (World Bank, 2004).

Throughout most of the 1970s, 1980s and also the first half of the 1990s, Uganda struggled with persistent double-digit inflation rates, a challenge that was not unique to the country, as historically, the post-independence era was marred by

decades of social and political unrest that led to economic stagnation and decline (Franses and Janssens, 2018; Ha, Kose and Ohnsorge, 2021; Bigsten and Kayizzi-Mugerwa, 1999).

In response, following a change in leadership, Uganda began implementing economic and institutional reforms in 1986, which included targeted interventions and comprehensive policy reforms (Tumusiime-Mutebile, 2010; Atingi-Ego and Sebudde, 2003; Kasekende and Atingi-Ego, 1999). These measures aimed to manage both monetary and fiscal policies and combat persistent inflation (Tumusiime-Mutebile, 2010; Atingi-Ego and Sebudde, 2003; Kasekende and Atingi-Ego, 1999). Specifically, Uganda's inflation policy reforms included fiscal discipline, monetary policy tightening, and increased exchange rate flexibility, along with subsidies for vulnerable populations and food price stabilisation initiatives (Kasekende and Atingi-Ego, 1999). The country also implemented trade and financial sector reforms to promote export and foster financial deepening, leading to sustained economic growth and stability (Bwire, Anguyo and Opolot, 2013).

The impact of these reforms has been significant, with inflation rates falling from double digits levels in the 1970s, 1980s and first half of the 1990s to single digits in the second half of the 1990s (Franses and Janssens, 2018; Ha, Kose and Ohnsorge, 2021). The decline in inflation has helped to stabilize the economy, reduce the cost of living for Ugandans, and attract foreign investment (Tumusiime-Mutebile, 2010). As a result, the Ugandan economy has witnessed sustained growth, with an average annual real GDP growth of approximately 6 percent in recent years (World Bank, 2022).

In light of this background, Uganda's experience with inflation policy reforms provides valuable insights and lessons for other developing countries grappling with high inflation rates. Specifically, Uganda's efforts to achieve macroeconomic stability and development through inflation policy reforms are worth studying.

Given the aforementioned context, the main objective of this article is to conduct an exploratory review of the key policy reforms and institutional characteristics that have defined the Ugandan economy since the 1970s, chronologically, with a focus on the economic reform era that commenced in the latter half of the 1980s. Additionally, based on the analysis of selected statistical and academic sources, the current article examines the factors, both internal and external, that have influenced the inflation trend during the study period.

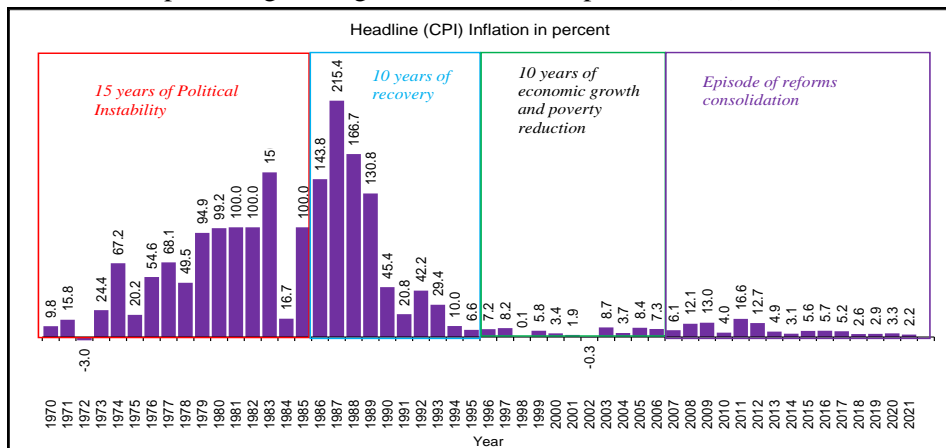
This study is important as it offers a comprehensive review of the impact of inflation policy reforms on macroeconomic stability in Uganda. It fills a gap in the existing literature by examining the relationship between policy reforms and

inflation performance during five distinct periods in Uganda's history. The findings provide valuable insights into the effectiveness of policy reforms in reducing inflation, promoting economic stability, and achieving sustained economic growth in developing countries. Additionally, the paper highlights the importance of coordinated policy approaches, political will, and leadership in implementing successful inflation policy reforms. The research has significant implications for policymakers, researchers, and scholars interested in inflation policy reform and macroeconomic stability in developing countries.

The subsequent sections of this article are arranged in the following manner. Section 2 analyses policy reforms and inflation performance in Uganda episodically in five distinct episodes. Section 3 discusses lessons learned from policy reforms and inflation performance in Uganda. The research is summarised and concluded in Section 4.

## 2. Policy Reforms and Inflation Performance in Uganda

Since gaining independence, based on available literature including Tumusiime-Mutebile (2010), Atingi-Ego and Sebudde (2003), Kasekende and Atingi-Ego (1999) as well as Mugume (2011), Uganda has made an unwavering commitment to implementing a series of reforms aimed at reducing inflationary pressures and maintaining macroeconomic stability conducive for growth and development (see figure 1 which illustrates inflation performance in Uganda since 1970, expressed as the annualised percentage change in the consumer price index (CPI).



**Figure 1: Evolution of Headline Inflation in Uganda since 1970.**

*Source: Ha, Kose, and Ohnsorge (2021), World Bank (2022)*

Inflation-related reforms in Uganda can be analysed episodically through five distinct periods, starting with the first 10 years after independence (1962-1971), followed by 15 years of political instability (1971-1985), 10 years of recovery (1986-1995), 10 years of economic growth and poverty reduction (1996-2006), and the most recent episode of reforms consolidation (2007-2021) (Franses and Janssens, 2018; Ha, Kose and Ohnsorge, 2021; Mwenda and Tangri, 2005; Ulriksen and Katusiimeh, 2014; Bigsten and Kayizzi-Mugerwa, 1999; Loxley, 1989).

### **2.1 The First 10 Years After Independence, 1962-1971**

Uganda, a small open East African economy gained independence in 1962 under civilian leadership (Jamal, 1976; Jamal, 1997). During the first 10 years after independence (1962-1971), Uganda was one of the most vibrant and promising economies in sub-Saharan Africa (Loxley, 1989; Jamal, 1997; Rugumamu and Gbla, 2003). To ensure rapid economic growth and macroeconomic stability, the government assumed a commanding role in directing economic activities (Bigsten and Kayizzi-Mugerwa, 1999). In this regard, most of the early post-independence policies in Uganda were based on central planning, an inward-looking import-substitution industrial strategy and a fixed exchange rate regime (Atingi-Ego and Sebudde, 2003; Bwire, Anguyo and Opolot, 2013; Bigsten and Kayizzi-Mugerwa, 1992). Inflation policy reforms during this period included also price controls that were aimed at stabilizing the economy and reducing the high levels of inflation that had been experienced in the years leading up to independence (Bigsten and Kayizzi-Mugerwa, 1999).

During this period, a five-year development plan from 1961/62 to 1966/67 was executed as per the advice of the World Bank (Bigsten and Kayizzi-Mugerwa, 1999). The objective of the plan was to elevate the living conditions of all Ugandans, with the ultimate aim of completely eradicating poverty. In addition, as per Ulriksen and Katusiimeh (2014), the plan was to modernize the economy by increasing production with the support of local private investors. Unfortunately, the implementation of this development plan was disrupted when the new government came to power.

The political landscape of Uganda underwent a seismic shift in 1966 with the revocation of the 1962 Constitution and the adoption of a socialist agenda outlined in the 1969 "Common Man's Charter" (Loxley, 1989; Jamal, 1997). This marked the beginning of Uganda's participation in the African Socialist movement, which

was sweeping across the region during that period, as evidenced in Tanzania, Ghana, and Zambia.

During this period, a notable policy reform introduced in Uganda was the creation of the Bank of Uganda via the Bank of Uganda Act of 1966 after the East African Currency Board was disbanded (Musunguzi and Katarikawe, 2001). This policy change had a considerable impact on the country's economy and monetary policies. The Bank of Uganda was tasked with designing a monetary policy directed towards regulating the money supply to control inflation (Musunguzi and Katarikawe, 2001). The Bank was also given the power to set interest rates, issue currency, and regulate the operations of commercial banks (Musunguzi and Katarikawe, 2001). The old Ugandan shilling was replaced with a new shilling, which was pegged to the US dollar to stabilize the exchange rate (Atingi-Ego and Sebudde 2003; Musunguzi and Katarikawe, 2001). The government also introduced strict controls on the amount of currency that could be imported or exported from the country, to prevent capital flight and stabilize the exchange rate (Atingi-Ego and Sebudde 2003; Musunguzi and Katarikawe, 2001).

From 1962 to 1970, Uganda implemented a fixed exchange rate policy (Atingi-Ego and Sebudde, 2003; Bigsten and Kayizzi-Mugerwa, 1992). During the majority of the period, the official exchange rate of the Ugandan shilling with the US dollar remained close to the original rate at which the East African shilling had been fixed, which the Ugandan shilling inherited in 1966 after the dissolution of the East African Currency Board (Jamal, 1976; Jamal, 1997). However, due to economic mismanagement and the artificial shortages created by the fixed exchange rate regime, a parallel foreign exchange market emerged (Atingi-Ego and Sebudde, 2003).

Therefore, despite the policy reforms, most of the period during the first 10 years after independence (1962-1971), Uganda was characterised by decades of stagnation and decline with social and political unrest that heavily impacted the economy. However, the policy reforms implemented during the first decade after independence such as price controls and direct monetary policy helped to attain macroeconomic stability and laid the foundation for future economic stability in Uganda and paved the way for further reforms in the years to come.

## **2.2 The 15 Years of Political Instability, 1971-1985.**

In the period between (1971-1985), Uganda was ruled by two political regimes the first one under military rule from 1971–1979 and the second one from 1980-

1985, see for example Loxley (1989), Rugumamu and Gbla (2003), Jamal (1976), Jamal (1997).

In 1971, a coup led to political instabilities and economic mismanagement, leading to a significant decline in the economy, political uncertainty, and civil unrest (Rugumamu and Gbla, 2003; Loxley, 1989). According to available literature, the economy was characterised by increased state intervention in key productive sectors of the economy, uncertain business environment, and high inflation as a result of scarcity of basic commodities following the forced removal of the Asian community that had previously dominated much of the country's trade and industry, excessive overvaluation of the Ugandan Shilling, a large deficit in the balance of payments, deterioration in revenue-generating capacity, the demise of the EAC and the associated economic sanctions against Uganda (Rugumamu and Gbla, 2003; Musinguzi and Katarikawe, 2000; Kuteesa et al., 2009; Simson and Wabwire, 2016; Jamal, 1976; Jamal, 1997).

During this period, the Ugandan economy was subjected to far-reaching administrative controls over agricultural prices, foreign exchange, imports and financial markets resulting in severe distortions and the contraction of the formal and monetised economy. This was due to the State's dominant stake in the heavily regulated financial sector, as evidenced by various sources (Mugume, 2011; Atingi-Ego and Sebudde, 2003; Bwire, Anguyo and Opolot, 2013; Bigsten and Kayizzi-Mugerwa, 1992). The monetary policy in Uganda during this period was characterised by administered interest rates, directed credit, and high legal reserve requirements, exercised through direct means such as interest rate and credit controls, but ultimately considered dormant due to its weak effectiveness and subordination to fiscal considerations (Nyorekwa and Odhiambo, 2014).

The collapse of the public revenue base on the fiscal side engendered significant deficits, which were subsequently funded by the Central Bank, thereby giving rise to exorbitantly high inflation rates (Di John and Putzel, 2005; Langford and Namanya, 2014; Robinson, 2007; Simson and Wabwire, 2016). Also, as a result of the prolonged economic decline, the government opted for external financing of development plans which led to a massive increase in debt (Kuteesa et al., 2009). The situation was made worse following the decline of the world economy and the surge in international oil prices during the 1970s, (Ulriksen and Katusiimeh, 2014). There was no significant economic reform during the military regime era and at the end of 1979, the economy was in a terrible situation.

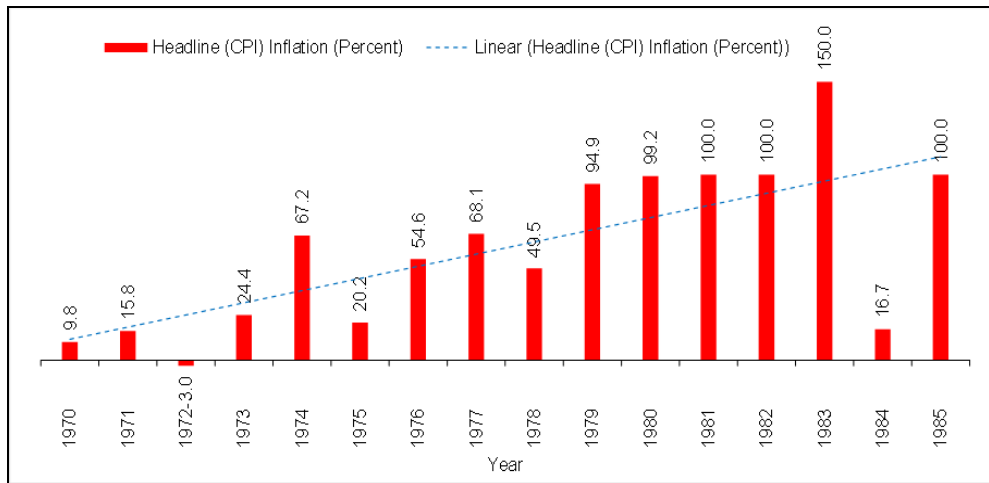
The Amin Government was brought down in 1979 by the coordinated action of the Tanzanian army and the United National Liberation Front, a rebel group that

operated in Uganda (Jamal, 1991). New Government held by Milton Obote assumed power for the second time amidst a severely damaged infrastructure and economic crisis (Loxley, 1989; Jamal, 1991).

During the second regime (1980–1985), some policy reversals were adopted from the earlier emphasis on controls and nationalisation towards market-based policies that were geared towards stimulating foreign investments (Kuteesa et al., 2009). The implementation of these policies was supported by funds from the Bretton Woods institutions through Structural Adjustment Program (Ggoobi et al (2017). The program aimed to achieve a set of goals, including promoting economic growth, managing inflation, boosting exports, improving the balance of payments, reducing the deficit, and limiting credit, particularly credit to the government, through the establishment of credit ceilings (Loxley, 1989). As a result of civil wars, these funds were abandoned in 1983. Later, the economic reforms were unsuccessful following the second regime's failure to establish a viable political coalition to ensure longevity and the program collapsed in 1984 (Jamal, 1991; Ggoobi et al (2017).

In 1981, the premium on the parallel foreign exchange market underwent a considerable surge, and foreign currency prices surpassed the official exchange rate by over ten times (Atingi-Ego and Sebudde 2003). The discrepancy between the official exchange rate and the parallel market rate continued to escalate, reaching more than 30 times the official exchange rate by the same year (Jamal, 1997). To rectify the macroeconomic instability, a reform program was initiated in 1982, which introduced a managed float exchange rate regime (Jamal, 1997). In 1983, a dual exchange rate regime was briefly implemented; however, the two windows were merged in May 1984 before reverting to a fixed exchange rate regime in 1986 (Jamal, 1997). In May 1987, a currency reform was implemented, resulting in a 77 percent devaluation of the exchange rate in an attempt to correct the external sector imbalances (Atingi-Ego and Sebudde, 2003; Bwire, Anguyo and Opolot, 2013; Bigsten and Kayizzi-Mugerwa, 1992).

The graphical representation in Figure 2 showcases the evolution of headline inflation in Uganda from 2007 to 2021, expressed as the annual percentage change in the consumer price index (CPI).



**Figure 2: Evolution of Headline Inflation in Uganda from 1970-1985**

*Source: Ha, Kose, and Ohnsorge (2021)*

As can be seen from the figure, during most of the 1970s and early 1980s, a war-driven Uganda experienced several episodes of volatile hyperinflation with a general increasing trend (Ha, Kose, and Ohnsorge, 2021). Inflation maintained a general upward trend from the single-digit level of 9.8 percent recorded in 1970 to 100.0 percent recorded in 1985 (Ha, Kose, and Ohnsorge, 2021). The high inflation situation was aggravated by expansionary monetary policy following growing fiscal expenditure (budget deficits) to fund military operations, scarcity of basic commodities following the expulsion of the country's Asian community, the huge deficit in the balance of payments and deterioration in revenue base, the demise of the EAC and the associated economic sanctions against Uganda (Franses and Janssens, 2018; Rugumamu and Gbla, 2003; 2012; Musinguzi and Katarikawe, 2000; Kuteesa et al., 2009; Simson and Wabwire, 2016; Jamal, 1997). Inflation was reinforced further by the 90 percent devaluation of the Ugandan Shilling that took place in 1981 (Jamal, 1997). As noted by Kuteesa et al., (2009), the high inflation during the period was also attributed to external factors such as the oil price shock of 1973/74 and 1979.

### **2.3 The 10 Years of Recovery under the National Resistance Movement (NRM), 1986-1995.**



In 1986, the new government inherited a country in ruins characterised by a low level of economic activity, a high cost of doing business due to political instability economic mismanagement and inaccessibility to international markets (Loxley, 1989; Di John and Putzel, 2005; SIDA, 2006). As noted by Di John and Putzel (2005) and Loxley (1989), Uganda's economy was devastated by destroyed physical infrastructure, a collapsed tax base, plummeting per capita income, vanished export revenues, capital flight, and a skyrocketing degree of informal economic activity, leaving the country's economic future in jeopardy (Loxley, 1989). Nevertheless, the government made far-reaching political, economic and institutional reforms over the review period such as political stability (peace dividend) and adoption of neo-liberal stabilisation policy programmes that contributed to remarkable economic development and reduction of inflation (Di John and Putzel, 2005; SIDA, 2006).

Initially, after assuming power in 1986 the government introduced reforms geared towards building an independent, integrated, self-sustaining economy, the rehabilitation of war-ravaged areas, and the restoration and improvement of social services (Ulriksen and Katusiimeh, 2014). These earlier reforms by the government advocated nationalism and state interventions. The government considered the Washington consensus as an imperialistic imposed package and started to build strong bilateral trade relationships with Libya, North Korea and Cuba (Ulriksen and Katusiimeh, 2014).

However, following a scarcity of financial resources needed to implement development programmes within a year of taking power, the new government reversed the state-interventionist economic reconstruction policies and turned to the Structural Adjustment Program (SAP) with the IMF and the World Bank to Obtain financial assistance (Mwenda and Tangri, 2005), (Ulriksen and Katusiimeh, 2014). The structural adjustment program incorporated various conventional measures focusing on liberalizing the economy, deregulating, adopting fiscal discipline, determining the exchange rate based on the market, liberalizing crop processing and marketing, reducing licensing controls, returning seized Asian properties, and actively promoting domestic and foreign capitalist investment and privatisation (Brett, 2006). This made Uganda one of the first countries in Africa to embrace the basket of economic liberalisation reforms labelled the Washington Consensus (Ggoobi et al, 2017).

In 1987, under the financial support of the IMF, African Development Bank, World Bank and member countries of the Paris Club, the NRM government launched the Economic Recovery Programme (ERP) (Bigsten and Kayizzi-

Mugerwa,1999). The programme intended to attain macroeconomic stability, quickly halt further decline of the economy and reduce runaway inflation swiftly (Kuteesa et al., 2010; Bigsten and Kayizzi-Mugerwa,1999).

In October 1989, a policy was introduced to maintain a constant real effective exchange rate through a "crawling peg" system (Atingi-Ego and Sebudde, 2003; Bwire, Anguyo and Opolot, 2013; Bigsten and Kayizzi-Mugerwa, 1992). This involved adjusting the nominal exchange rate every month to achieve the desired real effective exchange rate.

In 1990, the Ugandan government legalised the parallel foreign exchange market, and licensed foreign exchange bureaux to serve as money shops, and as a result, the Ugandan Shilling was significantly devalued and agricultural exports increased (see Kasekende and Atingi-Ego, 1999). The Ugandan government granted permission for the foreign exchange bureaux to engage in spot transactions at exchange rates determined by the market. However, they placed moderate restrictions on invisible payments, in an attempt to alleviate concerns about capital flight (see Kasekende and Atingi-Ego, 1999).

In 1991, the Uganda Revenue Authority (URA) and the Uganda Investment Authority (UIA) were set up to improve domestic revenue mobilisation and facilitate the development of the private sector (Kuteesa et al., 2010).

In the 1991/92 fiscal year, the Ministry of Finance and Economic Development enforced a rigorous cash budget and pursued fiscal consolidation, resulting in a decrease in the fiscal deficit and a rapid reduction in inflation (Di John and Putzel, 2005; Langford and Namanya, 2014; Robinson, 2007; Simson and Wabwire, 2016; Tumusiime-Mutebile, 2010). The government likewise abolished export taxes to promote exports, (Tumusiime-Mutebile, 2010). Similarly, the government liberalised the foreign exchange market and adopted a floating exchange rate regime during the year 1993. Later in 1997, the capital account of the Balance of Payment was liberalised to allow the free flow of capital in and out of the country (Kuteesa et al., 2010).

The year 1991/1992 also marked the beginning of the implementation of financial sector reforms under the support of the Bretton Wood institutions (Cihak and Podpiera, 2005; Brownbridge, 1996). These reforms intended to strengthen monetary control, restructure insolvent banks, improve prudential regulation and supervision, boost deposit mobilisation, stimulate competition in financial markets, promote the diversification of financial markets, enhance the efficient delivery of financial services and ultimately promote growth (Cihak and Podpiera, 2005; Brownbridge, 1996; Brownbridge and Harvey, 1998).

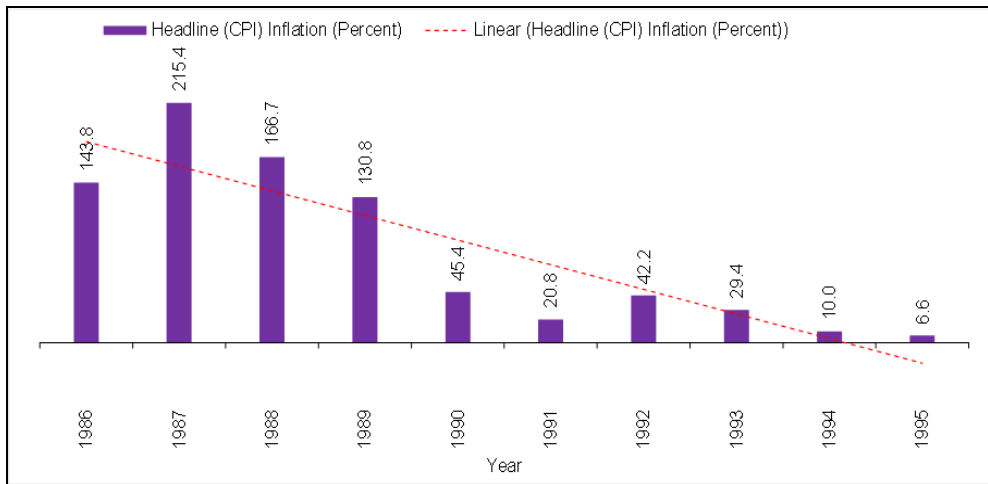
In 1993, The Bank of Uganda was made accountable for monetary policy after the enactment of the BOU Act (1993) directed to achieving and maintaining economic stability and introduced the Reserve Money Program (RMP) based on monetary aggregate targeting with Reserve Money as an operating target (Mugume, 2011; Opolot, et al., 2013). The RMP was built on the assumption of stable and predictable velocity and money multiplier, and the monetary policy stance was determined by the deviation of the actual reserve money from the target (Mugume, 2011; Opolot, et al., 2013). The primary instruments utilised in implementing the monetary policy during this period included Treasury securities, BOU Bills (which were subsequently replaced by REPOs/reverse REPOs), and foreign exchange interventions (Mugume, 2011; Opolot, et al., 2013). However, as confirmed by Weil et al. (2013) and Sichei and Kamau (2011), financial innovations and globalisation posed a challenge to the effectiveness of the monetary targeting policy.

To address the issue of a segmented foreign exchange market and achieve a convergence of exchange rates, an inter-bank foreign exchange market system was implemented in November 1993 (Kasekende and Atingi-Ego, 1999). This system was designed to provide a better and more reliable way to determine the official exchange rate and distribute limited foreign exchange resources (Atingi-Ego and Sebudde, 2003; Bigsten and Kayizzi-Mugerwa, 1992).

On April 5, 1994, Uganda made a pivotal commitment to inflation-related reforms by accepting the obligations of Article VIII, Sections 2, 3, and 4 of the IMF's Articles of Agreement, which established a free and open exchange rate system (Atingi-Ego and Sebudde, 2003; Bwire, Anguyo and Opolot, 2013; Bigsten and Kayizzi-Mugerwa, 1992). This commitment was a significant turning point in the country's economic history, signalling a commitment to macroeconomic stability.

Therefore, the 10 years of recovery under the National Resistance Movement (NRM) aided by resources from donors can be regarded as a foundation for macroeconomic stability and development. After the implementation of the Economic Recovery Program (ERP), remarkable strides have been made in Uganda's economic landscape, which has earned it the distinction of being one of the select few success stories in sub-Saharan Africa. These accomplishments include the attainment of low inflation which is conducive to macroeconomic stability, economic expansion, poverty reduction, and advancements in human development.

The annual percentage change in the consumer price index (CPI) is utilised as the measure of headline inflation performance in Uganda from 2007 to 2021, as depicted in Figure 3.



**Figure 3: Trends in Headline Inflation in Uganda from 1986-1995**

*Source: World Bank (2022)*

As can be seen from Figure 3, inflation reached 215.4 percent in 1987, the record high in the sample before maintaining a general declining trend afterwards reaching 6.6 percent in 1995 (Ha, Kose, and Ohnsorge, 2021; World Bank, 2019). After decades of double digits, inflation was restored to a single-digit level of 6.6 percent in 1995 and stabilised afterwards, thanks to inflation stabilisation measures through Economic Recovery Program (ERP) that went in parallel with reforms in the foreign exchange market as well as reforms in the fiscal and monetary policy (Kuteesa et al., 2010; Bigsten and Kayizzi-Mugerwa, 1999). The decline in inflation also mirrored the economic recovery program (ERP) that was introduced in 1987 (Kuteesa et al., 2010; Bigsten and Kayizzi-Mugerwa, 1999).

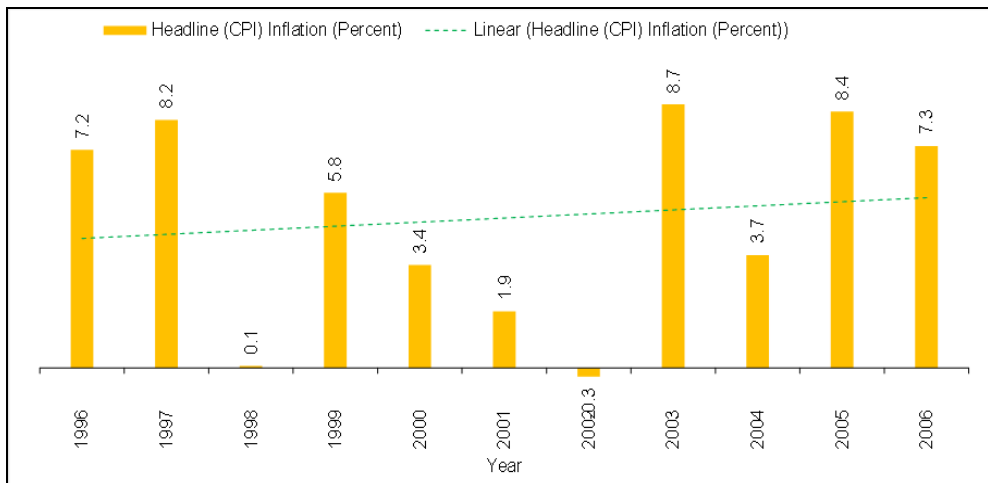
### **2.4 The 10 Years of Growth and Poverty Reduction, 1997-2006**

After the promulgation of a new constitution in 1995 and the parliamentary and presidential elections held in 1996, the Ugandan government prioritised allocative issues (Simson and Wabwire, 2016). The Poverty Eradication Action Plans

(PEAPs) were implemented in 1997, serving as Uganda's domestic antecedent to the Poverty Reduction Strategy Papers (PSRPs) of the International Monetary Fund and the World Bank, and were consistent with earlier economic recovery programs (Ulriksen and Katusiimeh, 2014). The PEAPs garnered significant donor funding, rendering Uganda one of the first nations to benefit from debt relief and donor funding under the Highly Indebted Poor Countries Initiative (HIPC), with budget support accounting for a considerable portion of the funding.

In July 1997, Uganda fully liberalised its external payments system, including the capital account, thereby eliminating all quantitative capital control on capital movements in or out of the country (Berg et al., 2013; Kasekende and Atingi-Ego, 1999).

Figure 4 demonstrates the patterns of headline inflation in Uganda between 2007 and 2021, which is represented as the annual percentage change in the consumer price index (CPI).



**Figure 4: Pattern of Headline Inflation in Uganda from 1996-2006**

*Source: World Bank (2022)*

As can be seen from the figure, the period from 1996 to 2006 was a period of great inflation moderation in Uganda ranging between -0.3 percent and 8.7 percent (World Bank, 2022). The main outcomes of the policies adopted in the previous episode from 1986 to 1995 were reflected in a positive inflation response

and further progress in macroeconomic stability (Berg et al., 2013; Kasekende and Atingi-Ego, 1999).

## 2.5 The Episode of Reform Consolidation (2007-2021)

This period witnessed a policy shift from Poverty Eradication Action Plans (PEAPs) to National Development Plans (NDPs) which were launched in 2010 (Hickey, 2013). The NDPs culminated in two editions, NDP I implemented from 2010/11 to 2014/15 and NDP II from 2015/16 to 2019/20 (Ggoobi et al., 2017). Unlike PEAPs, the NDPs emanated from internal deliberations and focused on structural transformation, infrastructure development, and expansion of productive sectors which are important in managing inflation and attaining macroeconomic stability (Ggoobi et al., 2017). Both NDP I and NDP II aim to achieve the Uganda Vision 2040, which seeks to transform the country from a low-income economy to an upper-middle-income one (Ugandan National Planning Authority (NPA), 2007; Hickey, 2013; Ggoobi et al., 2017).

In addition to medium and long-term development plans, several other reform programs were undertaken during the period in the areas of monetary policy, fiscal policy as well as exchange rate policies. The implementation of these reform programs in Uganda has contributed to attaining macroeconomic stability, characterised by robust economic growth and low and stable inflation rates (Hickey, 2013; Ggoobi et al., 2017).

In 2007, as part of the inflation control policy reforms in Uganda, the Bank of Uganda (BOU) introduced some flexibility to the Reserve Money Program (RMP) framework that aimed at enabling the BOU to react to unanticipated shocks such as huge foreign exchange inflows (Opolot and Kyeyune, 2012). This included redefining the monetary target as an objective through the use of Net Domestic Assets (NDA) (Opolot and Kyeyune, 2012). This decision was expected to provide the BOU with greater flexibility in handling changes in money velocity and the multiplier arising from transformations in the economy and financial sector. Additionally, it aimed to enable the BOU to respond to unexpected shocks, such as large foreign exchange inflows (Opolot and Kyeyune, 2012).

Following the policy reform agenda, public finances were aimed at achieving macroeconomic stability, improving the effectiveness of public expenditure, reducing distortions, and building capacity in taxation and expenditure (Langford and Namanya, 2014). In recent years, the government has consistently adhered to fiscal discipline in carrying out its budgetary operations (Langford and Namanya, 2014; Robinson, 2007; Simson and Wabwire, 2016). The main purpose was to

control the fiscal deficit at viable levels and reduce the government's debt to the banking sector (Langford and Namanya, 2014).

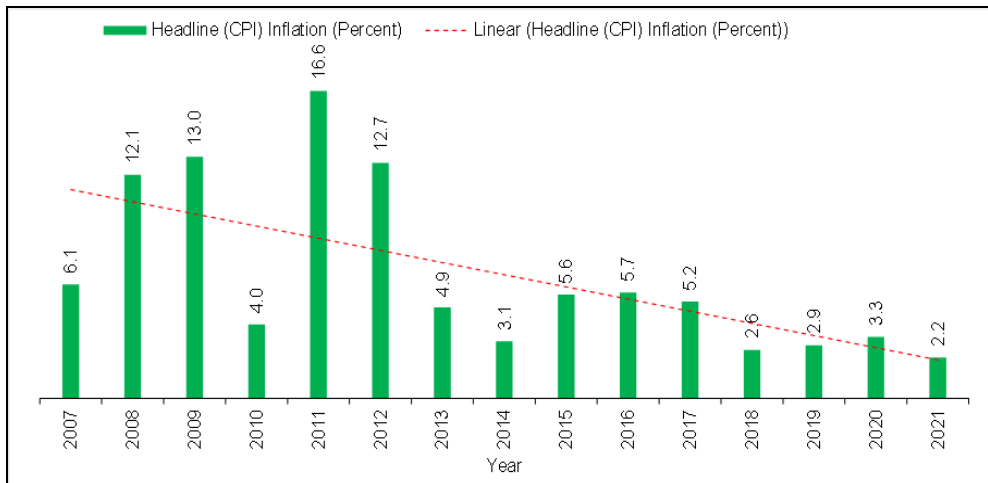
As alluded to by Drummond et al., (2015), Uganda's excellent macroeconomic stability is in part attributed also to the fact that Uganda is a pioneer in the East African Community in opening its capital account completely for inward and outward investments. In comparison to other countries in the region, it also has fewer constraints on capital movement (Drummond et al., 2015).

The period also saw the consolidation of reforms in Uganda's financial sector, which resulted in a decrease in the cost of financial services, an expansion of the range of available financial services, and an increase in access to these services (Ayoki, 2014). The proliferation of digital financial services has become an increasingly prominent feature of the country's banking industry, in line with other countries in the region. These developments have been noted by observers such as Ayoki (2014), who have highlighted the positive impact of these reforms on the economy as a whole.

In response to challenges posed by the rapid transformation of Uganda's economy, such as innovations in electronic payments, instability of money demand, and instability in the relationship between money supply and general price level, the Bank of Uganda abandoned its money growth targeting framework in 2011 (Opolot, et al., 2013). Subsequently, in July 2011, Uganda implemented a monetary policy framework called inflation-targeting-lite (ITL) to maintain the annual core inflation rate at 5 percent in the medium term and realign real output with the potential output of the economy (Tumusiime-Mutebile, 2012; Opolot, et al., 2013). Under the current ITL regime, the Central Bank Rate (CBR) based on the 7-day money market rate is used as an operating target and signals the monetary policy stance while REPOs, reverse REPOs, Rediscounting, and Lombard loans are used as the main instruments for managing the monetary policy (Opolot, et al., 2013). Furthermore, the Bank of Uganda engages in foreign exchange market interventions to mitigate unjustified fluctuations in exchange rates that are not supported by underlying economic fundamentals (Opolot, et al., 2013). Effective communication has also played a key role in the Bank of Uganda's success in controlling inflation under the current regime (Nabbosa and Andersson, 2017). The central bank has made efforts to communicate its policy decisions to the public through regular press briefings, engagement with stakeholders, and the use of social media and digital channels (Nabbosa and Andersson, 2017). This has helped to build trust and confidence in the country's monetary policies, ensuring

that its policies are well understood and receive broad support (Nabbosa and Andersson, 2017).

Figure 5 portrays the performance of headline inflation in Uganda from 2007 to 2021 using the annual percentage change in the consumer price index (CPI) as an indicator.



**Figure 5: Performance of Headline Inflation in Uganda from 2007 to 2021**

*Source: World Bank (2022)*

As illustrated by the figure, Inflation moderated significantly during this period except for two episodes where Uganda faced double-digit inflation during the period under review (World Bank, 2022).

The first period was during 2008 and 2009 when inflation reached 12.1 percent and 13.0 percent respectively (Word Bank, 2022). As per the literature, the reasons behind the aforementioned spikes were purportedly attributed to the repercussions of the worldwide financial catastrophe and the escalating global prices of food and fuel (Maweje and Lwanga, 2016; Kabundi, 2012).

The second period was during 2011 and 2012 when inflation reached 16.6 percent and 12.7 percent respectively (Word Bank, 2022). In 2011, when the central bank embraced the inflation-targeting framework, consumer prices were escalating due to a series of domestic and external factors (Maweje and Lwanga, 2016; Kabundi, 2012). Domestic factors include accommodative monetary policy,



depreciation in the exchange rate and supply shocks in agricultural production, which resulted in food scarcity and a rise in domestic food prices (Mawejje and Lwanga, 2016; Kabundi, 2012). External factors include the sharp hike in global food and fuel prices (Mawejje and Lwanga, 2016; Kabundi, 2012). However, after attaining its peak in 2011, inflation has been on a downward trajectory (World Bank, 2022). The primary factors contributing to the decline in inflation during this period were the appreciation of the exchange rate and the implementation of contractionary monetary policies (Mawejje and Lwanga, 2016; Kabundi, 2012).

In summary, The Ugandan government's response to high inflation rates has been to implement a series of policy reforms aimed at reducing inflation and stabilizing the economy. These policy changes have had a significant impact on the Ugandan economy, both in the short and long term. While there have been challenges associated with these reforms, the overall impact has been positive, and Uganda has become a model for other developing countries grappling with high inflation rates. It is important to continue to monitor the impact of these policy changes on different sectors of the economy and to ensure that the benefits are felt by all segments of society.

### **3.Challenges Facing Uganda in Inflation Management**

As discussed in Section 2, inflation has been one of the major economic issues in Uganda, causing significant concern for the government. To effectively manage this issue, the government has implemented several policy initiatives. However, there are still several challenges that need to be addressed to successfully curb inflation. Currently, Uganda is facing several major challenges concerning inflation as follows.

Uganda's economic growth is on the rise, fueled by investment in developmental projects that come with a high cost. Unfortunately, this has led to a significant increase in public debt, putting some pressure on the economy. Furthermore, the high public debt has made it increasingly difficult for the government to control inflation, a challenge that has been compounded by expansionary fiscal policies. The Ugandan government's spending has surged, resulting in inflationary pressures that have somehow destabilized the economy further. To tackle this issue, it will be crucial for the Bank of Uganda and the government to work together closely to align fiscal policies with inflation targets and ensure that the economy remains stable.

In today's globalized world, no economy is immune to external shocks. Uganda's economy is no exception. Despite its robust economic policies, Uganda's

economy is vulnerable to external shocks, such as changes in global oil and food prices that can cause inflation rates to soar. Being a landlocked country with a limited capacity to control the flow of goods and services across its borders, Uganda is susceptible to external market forces which can have a ripple effect on its economy. In addition, Uganda's reliance on oil and food imports makes it particularly susceptible to changes in global commodity prices. Therefore, policymakers must come up with effective strategies to diversify the economy and mitigate the impact of external shocks.

Despite the efforts made by the government to boost the agricultural sector which is the backbone of Uganda's economy, the country's low agricultural productivity continues to be a significant challenge. As a result, food shortages have become a common issue in the country, leading to high food prices and inflation. The demand for food is high, but the supply is low, which has resulted in frequent food shortages and high food costs. The low agricultural productivity in Uganda has had a severe impact on the population, making it difficult to meet the food needs of its people. In recent years, this issue has become more severe, with several instances of food shortages reported in the nation. The government of Uganda recognizes the importance of addressing this challenge to boost the country's economy and improve the living standards of its people. Therefore, it continues to implement policies aimed at improving agricultural productivity, increasing food production and addressing food shortages.

Uganda is a country that is still grappling with deficient infrastructure, particularly in the transport sector. The transport network is poor, and means of transportation are inadequate, making it difficult to move goods from rural to urban areas. The impact of this is felt heavily in the urban areas, where there is a shortage of goods, leading to high prices and contributing to inflation. The majority of Ugandans reside in urban areas, and the high prices of basic needs make it difficult for them to afford a decent standard of living.

Uganda, like many developing countries, is also grappling with the challenge of the steady depreciation of the Ugandan shilling compared to major foreign currencies. This depreciation has had far-reaching consequences on the country's economy, particularly on inflation. With the rise in prices of imported goods, inflationary pressures have increased, making it increasingly challenging for Ugandans to afford necessities.

In addition to the aforementioned challenges, it is worth noting that Uganda's financial markets are currently still relatively underdeveloped. This poses a significant hurdle for the Bank of Uganda when it comes to implementing its

policies effectively. The primary concern here is the lack of depth in the country's money market, which can significantly limit the effectiveness of open market operations in influencing interest rates and inflation. This issue is further compounded by the limited availability of financial instruments, which results in a lack of diversification and liquidity in the market. As a result, the Bank of Uganda must navigate these challenges carefully to ensure that its policies are as effective as possible.

#### **4.Lessons Learned from Uganda's Policy Reforms and Inflation Performance**

Uganda's endeavour to attain macroeconomic stability and development through inflation policy reforms offers valuable insights and lessons for other developing countries contending with high inflation rates.

To begin with, a paramount lesson learned from Uganda's experience is the imperative of a comprehensive and coordinated policy approach to inflation policy reform. The government has adopted a pragmatic approach towards inflation policy reforms that involved comprehensive fiscal and monetary policy measures, and both of these measures were implemented in a coordinated manner to achieve the desired outcomes. The Central Bank has been given operational independence to control the money supply by adjusting interest rates and reserve requirements, while the finance ministry has prioritised prudent and sound fiscal management to reduce budget deficits and ensure efficient tax collection and investment in infrastructure to reduce inflationary pressures on the economy. Increased exchange rate flexibility involved allowing the Ugandan shilling to float more freely against other currencies, which helped to stabilize the exchange rate and reduce inflationary pressures on the economy. Additionally, targeted interventions such as food price stabilisation initiatives and subsidies for vulnerable populations have also been introduced.

Moreover, Uganda's experience demonstrates the potential benefits of inflation policy reforms for developing countries. By reducing inflation and promoting economic stability, these reforms can help to attract foreign investment, reduce the cost of living for citizens, and promote sustained economic growth. The success of Uganda's inflation policy reforms has led to increased interest in similar reforms in other developing countries, and Uganda has become a model for countries looking to achieve similar results.

Furthermore, Uganda's experience demonstrates the importance of strong political will and leadership in implementing inflation policy reforms. These reforms are often difficult to implement and require significant coordination and

collaboration between different government agencies. Without strong leadership and political will, it can be difficult to implement these reforms effectively. The Ugandan government's commitment to implementing inflation policy reforms was one of the key factors in the success of these reforms. For example, the authorities established an initial agreement for the structural adjustment program through the convening of a national assembly of all interested parties, including trade unions, commercial cultivators, manufacturers, importers and exporters, intellectuals, and legislators. Annual deliberations on the budget and economic policies reinforced the agreement.

Another lesson learned is that effective communication is key. Uganda's central bank has been successful in building trust and confidence in the country's monetary policies by effectively communicating its policy decisions to the public. Through regular press briefings, engagement with stakeholders, and the use of social media and digital channels, the bank has ensured that its policies are well understood and receive broad support. This has contributed to lower inflation and set an example for other central banks in the region to follow.

Last but not least, regional cooperation can be beneficial. Since 1999, Uganda has been a part of the East African Community (EAC). This regional bloc has helped to facilitate trade and investment within the region, which has contributed to lower inflation. Additionally, the EAC has provided a platform for member countries to coordinate their macroeconomic policies, which has helped to promote stability in the region.

## **5. Conclusions**

This article has provided a detailed chronological review of Uganda's policy reforms and inflation performance over the period 1970-2021. The motivation for this article stems from Uganda's success in achieving macroeconomic stability and reducing inflation rates, which could make it a model for other developing countries grappling with high inflation rates. Uganda's experience is particularly interesting because it achieved these results through a comprehensive and coordinated policy approach to inflation policy reform, including fiscal and monetary policy measures, exchange rate flexibility, and targeted interventions.

The Ugandan government's response to high inflation rates has been to implement a series of comprehensive and coordinated policy reforms aimed at reducing inflation and stabilising the economy. The policy reforms in Uganda can be analysed episodically through five distinct periods, starting with the first 10 years after independence (1962-1971), followed by 15 years of political instability

(1971-1985), 10 years of recovery (1986-1995), 10 years of economic growth and poverty reduction (1996-2006), and the most recent episode of reforms consolidation (2007-2021). Despite external challenges, such as global oil price changes, natural disasters, and political instability, Ugandan inflation policy reforms have been a game-changer for the country's economy. By reducing inflation and promoting economic stability, these reforms have helped to attract foreign investment, reduce the cost of living for Ugandans, and promote sustained economic growth. While there have been challenges associated with these reforms, the overall impact has been positive, and Uganda can be a model for other developing countries grappling with high inflation rates.

Uganda's economy faces several challenges, particularly with inflation. The country's debt and expansionary fiscal policies have made it difficult for the government to control inflation. Uganda's economy is also vulnerable to external shocks due to its reliance on oil and food imports. Low agricultural productivity has resulted in food shortages, leading to high food prices and inflation. The transport network is poor, and the country's financial markets are relatively underdeveloped, posing a hurdle for the Bank of Uganda. These challenges must be addressed to ensure that Uganda's economy remains stable and that effective policies are implemented.

Uganda's experience provides valuable lessons for other countries that are looking to improve their macroeconomic policy frameworks and inflation performance including the importance of strong political will and leadership in implementing inflation policy reforms. By implementing sound macroeconomic policies, investing in infrastructure, diversifying their economies, communicating effectively with the public, and cooperating regionally, countries can achieve better macroeconomic outcomes.

Although Uganda has made significant strides in achieving macroeconomic stability and reducing inflation rates through policy reforms, that have helped to attract foreign investment, reduce the cost of living for Ugandans, and promote sustained economic growth, there is still much work to be done to ensure the sustainability of the success. The government needs to continue to prioritize prudent fiscal management and invest in infrastructure to create a more resilient economy. Additionally, efforts should be made to diversify the economy and reduce over-reliance on a few key sectors, such as agriculture. By addressing these challenges, Uganda can continue to build a strong and sustainable economy that benefits all its citizens.

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## CONSTRUCTION INDUSTRY PROJECTS AND QUALITY: THEORETICAL AND PRACTICAL APPROACHES

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### Abstract

*The largest share in the growth of the country's economy belongs to sectors such as agriculture, industry, and construction. Among these sectors, the construction sector has the largest share. It is possible to complete the projects produced in the construction sector, which has a significant share of the country's economy, within the required time, quality and within a certain budget, with coordinated work. This coordinated work is created within the concept of project management. Successful implementation of project management in a construction project is achieved through the coordination of project management techniques and project management methodologies. In this study, the construction industry and quality concepts, construction project management methodologies, project knowledge areas in this sector, project management processes in the construction industry and quality-oriented project techniques are explained and theoretical and practical experiences are aimed at understanding the effects of project management in construction on the success of the project.*

**Keywords:** *quality, construction projects, industry, project management*

**JEL Classification:** *C51*

### *Introduction*

The construction sector plays an important role in the social and economic development of countries. The sector can be affected by many factors such as lack of quality, labor productivity, management, finance and weather conditions. Extension of time due to delays in the process causes serious problems in construction projects. [4] The impact of any delay in the construction industry should be examined not only on a project basis, but also on a sector and country basis. Unlike other sectors, the uniqueness of the construction industry on a project basis causes different reasons to arise that cause delays in each project. In increasingly complex projects, delays can cause a significant loss and have negative effects on important components of a project, such as time, cost and quality.

Quality is defined as "the sum of the features of a product or service based on its ability to meet determined or possible needs" and the three basic elements of quality in terms of customer satisfaction are listed as "expected quality, satisfying quality and satisfying quality". [13]

Based on this definition, I would like to examine the current quality phenomenon in our sector, which produces for the most basic needs of people, such as food and drink, for shelter. [6] The construction industry is gradually moving away from quality, as its structure does not require a certain standardization and qualification and has become a sector that people from all sectors can enter. However, while a license is required even for a cook, it is a great deficiency that the necessary license and standardization have not been brought to such a sector that is in direct relationship with the property and lives of many people.

In the contracting sector where government tenders are made and in international tenders, certain criteria and criteria are sought from companies that can do this job. Companies can participate in that tender if they meet these criteria. But unfortunately, since there is no authorized organization yet that looks for these criteria in special projects, everyone can develop construction-related projects, obtain licenses and try to carry out those projects. [14] Talking about quality in projects carried out by such incompetent people is futile.

As I just mentioned above, in order to ensure that the job can be done, either with the municipalities or the ministries to be assigned for this job, as in state tenders, it is necessary to check whether the important criteria and elements such as the company's past work experience, financial situation, technical personnel, machinery and equipment status are suitable for it to be able to do this job.

Quality-related practices in the construction industry in the world started in the 1970s, but problems such as the characteristics of the product, the differentiation of the production process, workforce and organization, the inability to define the customer, sociopolitical and climatic influences, etc. were encountered. Already conducted studies show that the practices related to total quality management, which is an integrative management concept for the continuous improvement of product or service quality with the participation of everyone in the organization, have largely failed, and this situation is mainly based on the reasons that can be gathered under the name of lack of quality culture. [1] Over the past 30 years, Quality Management System practices have been adopted by construction companies in developed countries. Construction companies operating abroad have pioneered the adoption of the Quality Management System approach.

In the study, first of all, the concept of quality, the Quality Management System and how this system is implemented in the construction industry, the difficulties and benefits of the application process will be detailed analyzed.

### ***Theoretical background***

There are many definitions regarding the concept of quality, but there is no unity of definition among them. Quality used to be defined with adjectives such as the most beautiful, the best, and the greatest. From a technical perspective, quality was defined by some concepts such as optimum level, within tolerance limits, according to specifications. However, in today's business environment, it is becoming difficult to produce and sell the largest, most expensive goods. In parallel with this, in order to sell goods today, it is necessary to first determine the customer group and then produce goods or services that will meet the desires and demands of the customer. In this sense, the current definition of quality is determined as "features that meet customer expectations". [19]

Quality, which is now briefly defined as "degree of fitness for purpose", was previously expressed as "compliance with standards". However, as consumer demands and expectations changed over time, quality began to be perceived as "suitability for use". In the light of this definition, it is possible to see quality as an important strategic weapon for companies with many dimensions in terms of a product's performance, qualities, reliability, compliance with standards, durability, aesthetics and perceptibility. [15] Because, while quality plays a determining role in many internal business criteria such as efficiency, cost, and the degree of qualification or agreement of all employees, including managers, on the one hand,

it has also become an indispensable element for the whole society with its contribution to health, education, culture and moral norms.

Project management is the planning, implementation and control of all steps necessary for the project to achieve the specified time, scope and cost targets. It is the bringing together and management of different organizations needed to achieve the project's goal in accordance with the volume, duration, cost, and size of the project. Project management can be defined as the realization of determined resources using certain techniques and methodologies to achieve the time, cost, scope and quality targets of unique and one-off projects.

To achieve the targeted quality, all members of the organization must participate in quality management, the responsibility of which lies with the top management. Quality management includes other activities for quality such as strategic planning, allocation of resources, and the operation and evaluation of quality planning. [3]

But total quality management is a management concept applied in companies to improve activities and increase performance. It can be defined as a system of practices that have a systematic impact on company practices and performance. [5] Total quality management, which is the main factor in the success of many world organizations, especially Japanese organizations, is today expressed in its most general form as the continuous improvement of all activities in an organization and achieving profitability by satisfying employees, customers, and society with the active participation of all employees in the organization.

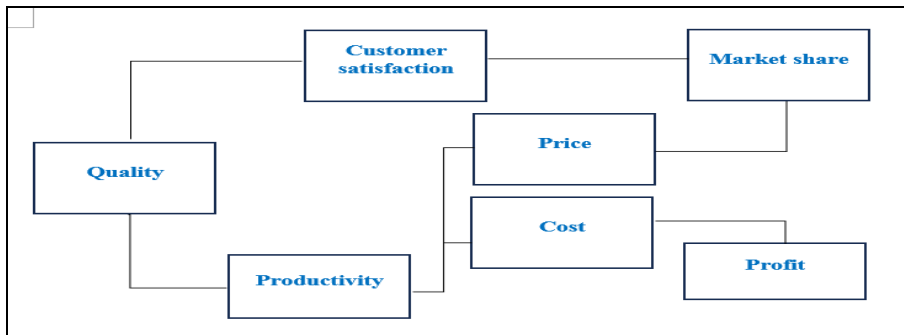
In the construction industry, total quality management can be applied at the project and company level. Project level is a concept specific to the construction industry. [9] However, in the construction industry, there are multiple projects that the company carries out at the same time, and when looked at the company level, there are certain characteristics that also emerge in other sectors.

The implementation steps for implementing total quality management in the construction industry are as follows [20]:

- *Being aware of the need for improvement*
- *Determination of quality policy*
- *Determining customer expectations*
- *Designing the quality process*
- *Establishment of quality organization*
- *Evaluating employees' opinions and creating corporate culture*
- *Education*
- *Suppliers' participation in quality*

- *Quality celebrations*
- *Measuring the performance of total quality management*
- *Continuous improvement of the process*

Reasons such as the fact that the previously mentioned product in the construction industry has different features than the products in other sectors, that is, the projects are one-off, the participation of too many disciplines in the process, and the differentiation of the organization in each project, make it difficult to implement total quality management in the construction industry.



**Figure 1: Results achieved with Total Quality Management**

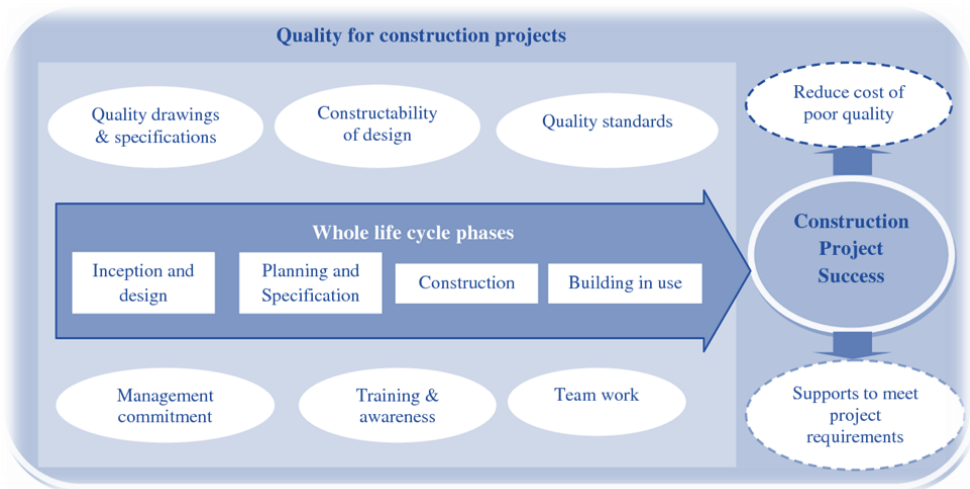
*Source: made by myself*

The concept of quality should be implemented by all employees in construction companies. Failure of the warehouse to keep track of its stocks properly causes delays due to lack of materials, purchasing manager's not recording orders but giving them verbally causes misunderstandings and delays in orders, projects not being completed on time, and work schedules being disrupted. Trying to eliminate all these delays and negatives with haphazard productions during the application reduces the quality. [11] Nowadays, as the quality system is becoming more and more advanced, many quality consultant companies have been opened. Due to the reasons caused by our managers who apply to these companies with the reason "I need to get a quality certificate to enter the tender", documents that meet the requirements of the quality standard are written within a few weeks. These consultant companies, who are unaware of the management and operating situation of construction companies, are on the way to making a living through quality. [7] In addition, receiving a quality certificate does not mean that the company works

and/or will work well. The main thing is to ensure product quality and customer satisfaction.

***The effects of project management on success of construction projects***

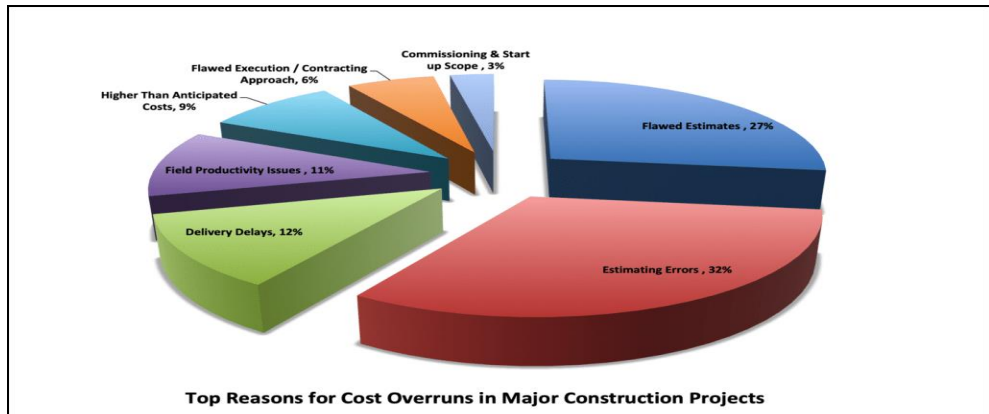
Nowadays, the advancement of technology and the increase in functionality and diversity in demanded products have revealed that project management is an absolute necessity in project production processes. Because project management ensures shorter results, reduced costs in product acquisition, high quality, and a profit margin. [17]



**Figure 2. Structure of quality for construction projects**

Source: H. Mallawaarachchi, S. Senaratne, 2016

One of the conditions for the success of project management is that it is important to determine in which projects the management will be applied, in what way and with which techniques and methodologies, according to the size and risk of the project. When looking at the contents and qualities of the project, it is necessary to determine that the path determined in large and complex projects will be different from the path determined in small projects.



**Figure 3. The ways to Minimize Cost Overruns in Construction Projects**

*Source: Project Control Academy*

One of the conditions for successful project management requires knowledge of this basic information. One of the criteria for project success is measured by how efficiently the target, budget and time elements are used and the desired target is achieved.

### ***Review of international experiences in construction projects***

If we look at the world in general, continuing low interest rates and stable commodity prices in Asia Pacific and North America show that the construction industry will make a solid start to 2018. Growth and stability are also predicted for the USA and Canada. Revenue allocated to major infrastructure projects and housing construction could increase by 4 to 6 percent. [10] In Latin America, we estimate that the ongoing stagnation in the construction industry due to budget cuts and project cancellations due to various corruption scandals will continue in 2018. China will maintain its momentum in the same way with the growth rates called the new normal and maintain the dynamism in the construction field. A general recession can be predicted in the construction industry in Europe in general. Brexit still causes many sectors to remain uncertain in Europe as well as in the UK. The construction industry is one of the sectors most affected by uncertainty. An annual growth rate of 1.76 percent is expected in the Russian construction industry until 2020. In line with the government's target of providing housing to middle- and low-income groups, the construction of 500,000 houses will be completed. [16]

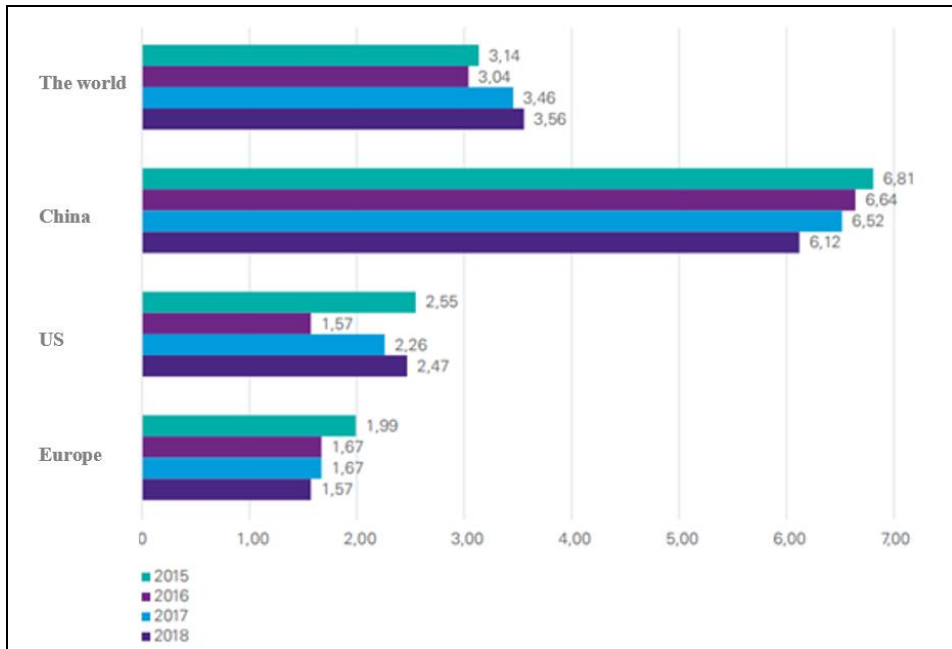
The fact that the construction sector in Russia is generally on a recovery trend is also an important development for Turkish companies, which are very strong in the Russian market. In addition to Russia, there are important market opportunities in markets such as the Caucasus and Ukraine, which are increasing with the demands that have been postponed until now. The construction industry in Turkey went through an active period due to the intensity of housing and infrastructure projects.

Construction, which is one of the most important economic sectors of the country with the added value it creates, increases its share in the economy to 30 percent with the sectors it indirectly affects, in addition to its 9 percent share in GDP. We predict that the construction industry in the world and in Turkey will continue to grow in the coming years. [21] Research shows that the world's largest construction market in 2020 will be China, followed by the USA, India, Japan, and Canada. While no significant change is expected in the market size range, significant changes are expected in the growth rate ranking of the construction industry. Between 2018 and 2020, the Middle East and Africa regions will surpass Asia Pacific in the growth rate of the construction industry. In addition to the impact of China's slowing growth, the large infrastructure investments in the Gulf countries also play an important role in this development. In 2020, the sector will have grown by 67 percent compared to 2010.

The performance of the construction industry can only increase with the effective and harmonious use of governance, technology, and people's trinity. Attracting qualified workforce to the sector and ensuring that they stay, using and analyzing data correctly, and incorporating advanced technologies into their activities as soon as possible emerge as the criteria that will determine the success of the construction industry of the future. Construction creates significant opportunities for the use of new technologies such as mobile platforms, advanced data analytics and robotic workforces. However, the results of the Global Construction Survey 2017 show that the rate of use of these technological developments in companies remains at a low level of 10 percent.

According to the research, 18 percent of the participants think that this rate will increase with the use of artificial intelligence and robotic workforce in the next few years, 6 percent say that robotic technologies are already used, and the remaining 76 percent think that industry needs more time for such technologies. Research, including the results of the Global Construction Survey 2017, reveals that Industry 4.0 and digitalization will continue to impact the construction industry.





**Figure 4. 2015-2018-Growth indicators in the world construction industry (%)**

*Source: Euler Hermes*

Finally, it would be mentioned that in the construction industry, 3D technologies have already begun to be used in modeling, project management and sample projects, and successful results have been achieved. The efficient combination of technology, governance and qualified human factors will accelerate the sector while building a new world.

### **Conclusion**

It is essential for companies to be open to technological innovations and equipped with project management techniques and project methodologies for a successful project. It has been explained how and in what way project management techniques should be determined for project management in construction to create a successful project. Project management techniques are chosen depending on the size and complexity of the projects. Project management techniques reveal the order of the work to be done, their start and end times, and create an organizational

chart. This scheme ensures the successful completion of the project by minimizing the delays in the formation of the project and therefore the cost. Choosing project methodologies according to the scope of the projects is one of the criteria for the success of the project. Management processes and knowledge areas conveyed within the concept of project methodologies are important tools in project management practice. Processes must be managed completely.

The successful implementation and successful completion of these different disciplines in the construction project is ensured by the project management system. In many projects implemented in the construction sector, there are many elements included in the scope of the project. It is imperative that resources, constraints, costs, and time are managed together throughout the entire process from the initiation, planning, execution, control and closing phases of the projects. Successful completion of the project without disruption at every stage of the project is only possible with management techniques.

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## **DETERMINANTS OF DELAY IN THE DELIVERY OF MATERIALS TO OILFIELDS IN RIVERS STATE, NIGERIA**

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### **Abstract**

*The role of the petroleum industry in Nigeria cannot be overemphasized. This work identified the determinants of delay in the delivery of materials to oilfields in Rivers State. A cross sectional survey with a sample size of 190 respondents was adopted for this study. Questionnaires were hand distributed to respondents. For the research instrument, a reliability coefficient of 0.82 was obtained using Cronbach alpha reliability test. The data obtained from the respondents were analyzed with product moment correlation coefficient. The outcome of the test show that poor planning with 0.72, government policies 0.86, weather conditions 0.74 and logistics 0.782 were key determinants of delay in the delivery of materials to Oilfields in Rivers State, Nigeria. If these sources of delay are addressed, profitability in the industry could increase through reduction in unit cost of production. Poor planning*

*and logistics can be addressed through efficient staff recruitment and training.*

**Keywords:** *Petroleum, industry, Oilfields, Materials Delivery. Logistics*

**JEL Classification:** *R41; R42*

## 1. Introduction

The petroleum industry is very vital to the Nigerian economy. This has been increasingly so, since 1958, when Nigeria joined the league of oil exporters. Currently, Nigeria is the seventh largest exporter of crude oil amongst countries in the Organization of Petroleum Exporting Countries (OPEC). This position is, a slide from its previous fifth position when the issues of crude oil theft in Nigeria were not very dominant as they had been in recent times. The crude oil production output then was in the neighborhood of 2.6 million barrels per day and the government had encouraged the international oil companies to target a daily output of four million barrels per day (bpd). Today (2023), output levels hover between 1 million and 1.5 million bpd.

Petroleum accounts for about ninety percent (90%) of export revenue to Nigeria and over eighty percent of government revenue. In fact, since 1973 all national budgets in Nigeria have been predicated on daily production and price of crude oil as core benchmark. In 2013, when there was no agreement between the Senate and the Federal House of Representatives on the benchmark, the former President of the country (President Goodluck Jonathan) could not present the National budget until there was a consensus between both legislative houses. In the 2023 budget, 1.69 million bpd and \$75 per barrel of crude oil was projected. This is why Nigeria is described as a mono product economy.

Petroleum (crude oil, gas and associated products) generate huge returns to its producers and many oil-bearing economies such as Kuwait, Saudi Arabia, Iran, Oman and Qatar among others are doing absolutely well. Nigeria is however in dire straits, and in spite of six decades of oil exports, poverty, unemployment and misery levels are high. The country is neck deep in debt. Between 2015 and 2023, the government in power at the federal level generated a debt burden of approximately seventy trillion naira from different sources. Prices have hit the roof, so much so, that even in Rivers State, which is a petroleum bearing State, within the yuletide of 2022 petrol was scarce and roadside marketers sold a litre of premium motor spirit for about N800-N1000. As expected, the cascading effect of

such price hike happened and made the season difficult. How can one really explain such paradox?

Production of oil stems from oilfields and if the cost of production is high, profit margins are likely to be low, more so, because crude oil prices are internationally determined through market mechanism. Thus, inefficiencies of local production negatively affect the local producers, stakeholders and the economy in general. Each of these oilfields as a project goes through a typical cycle of planning, engineering, procurements, construction, and closure (Koskela and Howell, 2022). Several factors can contribute and affect the cost of production in Oilfields either at the construction stage, the production stage or any other stage. Materials supply is fundamental in the production process of crude oil and is often implicated for Oilfield project delays in many countries (Yate, 2007). This work attempts to identify the determinants of delays in the delivery of materials to oilfields in Rivers State.

### 1.1 Research Objectives

The objectives of this paper are:

- (i) To determine the effect of poor planning on delay in the delivery of materials to Oilfields in Rivers State
- (ii) To examine the effect of government policies on delay in the delivery of materials to Oilfields in Rivers State
- (iii) To analyse the effect of Covid19 protocols on delay in the delivery of materials to Oilfields in Rivers State,
- (iv) To examine the effect of weather conditions on delay in the delivery of materials to Oilfields in Rivers State.
- (v) ascertain the effect of logistics on delay in the delivery of materials to Oilfields in Rivers State.

### 1.2 Research Hypotheses

To support the above research objectives the following null hypothesis have been formulated:

**H1<sub>0</sub>:** Poor planning/scheduling does not have any statistically significant relationship with delay in delivery of materials to oil company's oil fields in Niger Delta.

**H2<sub>0</sub>:** Government restrictions have no significant relationship with delay in delivery of materials to oil company's oil fields in Niger Delta.

- H3<sub>0</sub>:** There is no statistically significant relationship between covid-19 protocol and delay in delivery of materials to oil company’s oil fields in Niger Delta.
- H4<sub>0</sub>:** There is no significant relationship between weather condition and delay in delivery of materials to oil company’s oil fields in Rivers State.
- H5<sub>0</sub>:** There is no significant relationship between logistics and delay in delivery of materials to oil company’s oil fields in Rivers State.

## **2. Theoretical foundation**

Production is simply the creation of utilities, which could be the transformation of inputs to some marketable output, creating space utility by moving a product from source to places of need, time utility through storage and warehouse services among others. In other words, production in economics has to do with value addition, value enhancement and solving various types of human problems.

Oilfields surface in this process of extraction and conversion of the hydrocarbon substances buried under the earth crust to usable resources that can further human welfare. It has to do with value addition in the value chain of the petroleum industry (Ikoku, 2000). An Oilfield is a place where crude oil resources lie under. It can also be described as a field where crude oil resources are mined or drilled. It may also be understood as land where exploitation of petroleum resources such as natural gas or crude oil from beneath the earth's surface takes place. One can also refer to it as a production site for petroleum activities including drilling, exploitation, or excavation (Ikoku,2000)

In Nigeria, specific oilfields are manned by different contractors in accordance with the law on leasing out oilfields and fiscal regime (Otto, 2014). Currently, the production sharing agreement (PSA) is in vogue for major contracts, especially offshore. This work is, however, restricted to onshore fields. In the sourcing, extraction or drilling and conversion of crude oil resources to usable forms such as automotive gas oil (AGO) also referred to as diesel, household kerosene (HHK), aviation kerosene also known as jet fuel or querosene de aviacao (QAV) translated from Portuguese or Jet Ai and the premium motor spirit (PMS) among others, there are transformative ancillaries and processes that can either enhance or slow down these activities. Materials supply is a core in this nexus. A normal project cycle involves initiating, planning, execution, control, and closure (Howell 2006). However, Otto and Tamuno (2006) refer to these stages as conceptualisation, identification, preparation, appraisal, execution, and review. Any challenge in any of these stages especially the execution stage affects the overall project outcomes.

Over the years, it has been observed that natural factors such as weather condition could be a challenge to construction projects in many developing societies. Social factors such as government policies, community intervention, logistics among others can also impact on the stages of a project, leading to delays in delivery and the associated consequences such as cost overruns in an inflationary economy like Nigeria, as well as increased on site labour and administrative expenses. In oilfields in Nigeria, these increased costs will subsequently impact on the unit cost of producing each barrel of crude oil and lower the amount of oil rent available for distribution to stakeholders including contractors and government. In point, the effect of delay in the delivery of materials to oilfields in Nigeria could include increased unit cost per barrel of crude, lower oil rent incomes, reduced revenue to the different tiers of government who mainly depend on oil revenue monthly, which could lead to paucity of funds to implement public projects.

In oilfields, materials supply is often blamed for project delays (Yates 2007). The effect of delays has been observed in Lebanon, Saudi Arabia, United Kingdom and Nigeria among others. Some of the suspected sources of delays include delays in the delivery of materials, damage to items, which are urgently needed and late procurement of materials, misspecification of materials and financial constraints (Ahmed 2017; Perdomo-Rivera, 2004). The fact is that materials logistics issues can significantly explain the success, failure or speed of oilfield construction and crude oil drilling in Nigeria. The arrival or availability of various chemicals required in their specifications and quantities, pipes, valves and various other tools and consumables required at an oilfield can define the speed and cost of project execution. Incidentally, many construction projects suffer delays at the execution stage. For example, the Governor of Rivers State, His Excellency, E. N. Wike, during the flag off ceremony of Ekeaghor-Anyu-Adada Road in the Odual axis, complained of delays by the same contractor on a Road Project in Abua after due mobilization funds had been paid by the state.

### **2.1 Oil Fields in Rivers State**

The historical evolution of crude oil and natural gas exploration as well as exploitation in Nigeria started in 1956 at Oloibiri within the Niger Delta. Shell-BP (the sole concessionaire then) spearheaded the drive towards crude oil discovery in the country. Accordingly, by 1958, Nigeria became an oil producing nation with its first oil field producing about 5,100 bpd. Nigerian economy like those of other major producers of oil and gas in the world has manifested how important this



commodity is to nation building. Beginning from the early 1970s, the petroleum industry assumed a more prominent role in the country's economy. Besides agriculture, oil and gas industry have over the years dictated the pace of economic, political, social, and cultural progress in Nigeria. Despite the dwindling fortunes of the oil and gas sector across the globe, the oil and gas sector still hold the key to the nation's economic prosperity, and its prospects of achieving successful economic restructuring depends heavily on this important commodity. Hence, it is a very relevance commodity in the scheme of things in Nigeria.

The Oloibiri oilfield is estimated to be approximately 13.75 square kilometers, which is approximately 5.31 square miles. The oilfield is in a swamp within OML 29. The Oilfield in this area is called Oloibiri Oilfield because it is situated in a small and remote creek community. In the country, the naming of oilfields is usually associated with the historical and cultural heritage of the host community where it is located. Shell Petroleum Development Company of Nigeria Limited (SPDC) operates more oilfields in Nigeria than other oil companies.

### 3. Research method

This work adopted a cross-sectional research design, and the data was obtained from questionnaire responses collected from six operational Oilfields with administrative staff strength of 190. Using Taro Yarmene sampling technique, a sample size was achieved through the formular below:

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{190}{1 + 190(0.05)^2}$$

$$n = 128$$

Where:

N= Population of the study

n=Sample size

The sampling technique was purposive.

To test the instrument's reliability, a baseline study of 25 respondents was done. The data obtained was subjected to Cronbach Alpha reliability test, which yielded a coefficient of 0.82, indicating that the instrument was reliable.

### 4. Data Analysis and Result

This section examines the data collected during the field survey and statistical analyses performed on it. The data was acquired through a carefully administered questionnaire, which offers the framework to respond to the research questions as well as testing the hypotheses. The data was properly cleaned and presented

simple tables and graphs as well as frequency distributions, percentage, and inferential statistics. This study employed the Pearson product moment correlation analysis for inferential statistics.

Table 4.1 reveals that the respondents were given one hundred and twenty-eight questionnaires (128), out of which one hundred and twenty-four (124) copies were filled and returned, while one hundred and twenty (120) copies were correctly filled accounting for 93.8% of the instruments distributed.

**Table 4.1: Samples of Questionnaire Distributed to Respondents**

Questionnaire	Frequency	Response Rate (%)
<b>Distributed</b>	<b>128</b>	<b>100%</b>
<b>Collecte</b>	<b>124</b>	<b>96.9%</b>
<b>Used 120</b>	<b>93.8%</b>	

Source: Fieldwork data, 2021

### Demographic Characteristics of the Respondents

**Table 4.2: Gender distribution of the Respondents**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	82	68.3	68.3	68.3
	Female	38	31.7	31.7	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

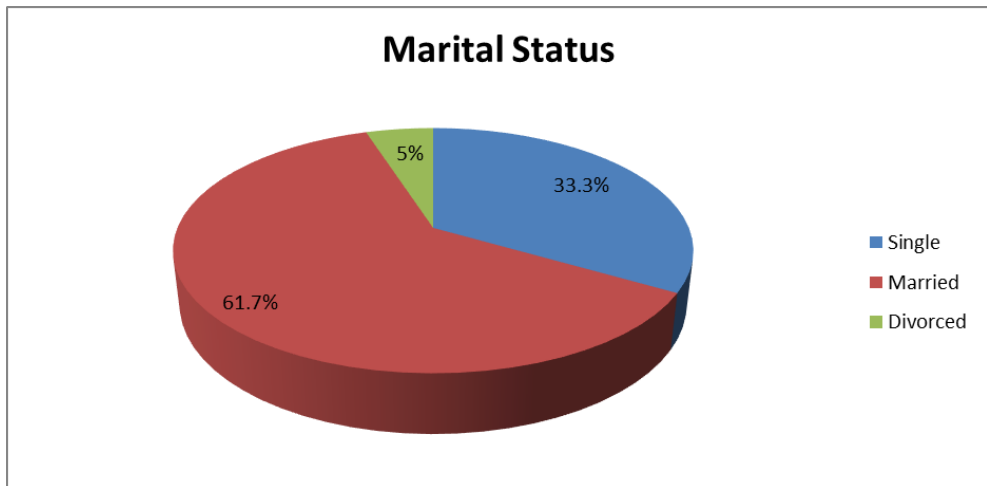
The gender breakdown of the responders is seen in Table 4.3. According to the data, 82 of the 120 respondents were male who accounted for more than half (68.3%) of the total respondents, while the remaining 38 (31.7%) were female.

**Table 4.3: Age distribution of the Respondents**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 20	20	16.7	16.7	16.7
	20-30	32	26.7	26.7	43.4
	31-40	42	35.0	35.0	78.4
	Above 40	26	21.6	21.6	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

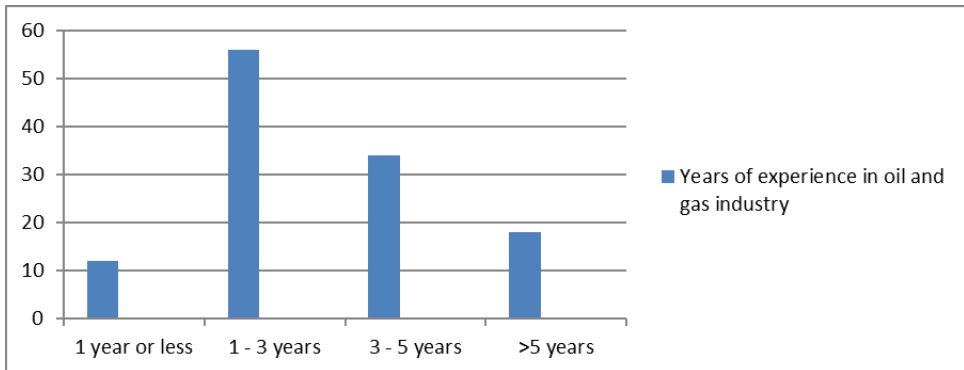
The age distribution of the respondents is presented in Table 4.4, along with the proportion of the sample they represent. Respondents in the age bracket of 31-40 years were the majority, accounting for 35% of the population, followed by respondents in the age bracket of 20-30 years, who accounted for 32 (26.7%), while respondents in the age bracket of below 20 years accounted for 20 (16.7%), and those in the age bracket of 40 and above accounted for 21.6%.



**Figure 4.2: Marital Status**

*Source: Fieldwork data, 2021*

Figure 4.2 depicts the respondents' marital status. According to the data, 74 (61.7%) of the 120 respondents were married, 40 (33.3%) were single, and the remaining 6 (5%) were divorced.



**Figure 4.3: Respondents Years of Experience**

*Source: Fieldwork data, 2021*

Figure 4.3 depicts the respondents’ years of experience of working in the oil industry. 12% of the 120 respondents had 1 year or less of oil industry experience, 56% had 1-3 years of oil industry experience, 34 percent had 3-5years of experience in the oil industry and the remaining 15% had more than 5 years of oil industry experience.

**Table 4.5: Educational Level of Respondents**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No formal Education	10	8.3	8.3	8.3
	Primary Six	20	16.7	16.7	16.7
	JSSCE\SSCE	26	21.7	21.7	21.7
	ND	16	13.3	13.3	13.3
	HND\NCE	24	20.0	20.0	20.0
	First Degree	20	16.7	16.7	16.7
	Postgraduate Degree	4	3.3	3.3	100.0
	Total	120	100.0	100.0	

*Source: Fieldwork data, 2021*

As shown on table 4.5, 10 (8.3%) of respondents had no formal education, 20 (16.7%) had attained primary education, while 21.7% of the respondents had JSSCE/SSSCE. The table further showed that 16 (13.3%) had National Diploma

(ND), while 24 (20.0%) had HND/NCE. Furthermore, 16.7% had first degree certificate while the remaining 3.3% had postgraduates' degree.

**Table 4.6: Frequency of material delay**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Every day	32	26.7	26.7	26.7
	Every week	60	50.0	50.0	76.7
	Once / twice a month	18	15.0	15.0	91.7
	Once / twice a year	10	8.3	8.3	100
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

According to table 4.6, more than half of the respondents said they suffered material delay every week, while 32 percent said it happened every day, and 15% said it happened once or twice a month. Only 8.3 percent said it happened once or twice a year.

### Poor planning and Scheduling

**Table 4.7: Poor site supervision and delay in material delivery**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	10	8.3	8.3	8.3
	Disagree	6	5.0	5.0	13.3
	Agree	58	48.3	48.3	61.6
	Strongly agree	46	38.4	38.4	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.7 shows respondents' view regarding poor site supervision and delay in material delivery. When respondents were asked whether poor site supervision causes delays in material delivery in oil fields, 48.3% agreed, while 38.4% strongly agreed that poor site supervision causes delays in material delivery in oil fields. Meanwhile, 5% disagreed, while 8.3 strongly disagreed that poor site supervision causes delays in material delivery in oil fields.

**Table 4.8: Improper selection of mode of transportation and delay in material delivery**

57		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	18	15.0	15.0	15.0
	Disagree	20	16.7	16.7	31.7
	Agree	50	41.7	41.7	73.4
	Strongly agree	32	26.6	26.6	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The respondents' views regarding improper selection of mode of transportation and delay in material delivery were presented in Table 4.8. When asked if improper mode of transportation causes delays in material delivery in oil fields, 50 (41.7%) of respondents agreed, while 32 (26.6%) strongly agreed. Meanwhile, 18% of respondents strongly disagree that improper selection of mode of transportation causes material delivery delays at oil field sites, while 20% disagree that improper selection of mode of transportation causes material delivery delays at oilfield project sites.

**Table 4.9: Poor time management and delay in material delivery.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	12	10.0	10.0	10.0
	Disagree	10	8.3	8.3	18.3
	Agree	38	31.7	31.7	50.0
	Strongly agree	60	50.0	50.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.9 depicts the respondents' views on poor material planning and delay in material delivery. When asked if poor time management causes delay in material delivery, 12 (10%) strongly disagreed, whereas 10 (8.3%) disagreed. Meanwhile, 60 percent of respondents strongly agreed that poor time management causes delay in material delivery, with the remaining 38 percent agreeing that poor time management causes delay material delivery.

**Table 4.10: Travel management and delay in material delivery**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	20	16.7	16.7	16.7
	Disagree	22	18.3	18.3	35.0
	Agree	38	31.7	31.7	66.7
	Strongly agree	40	33.3	33.3	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.10 depicts the respondents' views on travel management and delay in material delivery to oil field projects. When asked if poor travel management causes delay in material delivery, 20 (16.7%) strongly disagreed, while 22 (18.3%) disagreed. Meanwhile, 40 (33.3%) of respondents strongly agreed that poor travel management causes delay material delivery, while 38 (31.7%) agreed that poor travel management causes delay in material delivery.

### Government restrictions

**Table 4.11: Restriction of movement and delay in material delivery to field project of oil firms**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	22	18.3	18.3	18.3
	Disagree	20	16.7	16.7	35.0
	Agree	36	30.0	30.0	65.0
	Strongly agree	42	35.0	35.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The respondents' views on government restrictions of movement and delay in material delivery to field project of oil firms are shown in Table 4.11. When asked if movement restrictions cause delays in material supply to oil firms' field projects, 22 (18.3%) strongly disagreed, while 20 (16.7%) disagreed. Meanwhile, 42 percent of respondents strongly agreed that movement restrictions cause material delivery delays to oil firms' field projects, while 36 percent agreed that movement restrictions cause material delivery delays to oil firms' field projects.

**Table 4.12: Public holidays and delay in material delivery to oil fields**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	42	35.0	35.0	35.0
	Disagree	50	41.7	41.7	76.7
	Agree	16	13.3	13.3	90.0
	Strongly agree	12	10.0	10.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The opinions of respondents on public holidays and delays in material delivery to oil fields are shown in Table 4.12. When asked if public holidays cause delays in material supply to oil fields, 16 (13.3%) agreed, while 12 (10%) strongly agreed. Meanwhile, 35% of respondents strongly disagree that public holidays create material supply delays to oil fields, while 50% disagree that public holidays cause material delivery delays to oil fields.

**Table 4.13: Government policies and material delivery lead time**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	26	21.7	21.7	21.7
	Disagree	26	21.7	21.7	43.4
	Agree	36	30.0	30.0	73.4
	Strongly agree	32	26.6	26.6	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The opinions of respondents on government policies and material delivery lead time are shown in Table 4.13. When respondents were asked if government policies generate increases in material supply lead time, 36 (30%) agreed, while 32 (26.6%) strongly agreed. Meanwhile, 26 (21.7 percent) of respondents strongly disagreed that government policies cause increases in material delivery lead time, while another 26 (21.7 percent) disagreed.

**Table 4.14: Social distancing rule and delay in delivery of materials to oil fields**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	38	31.7	31.7	31.7
	Disagree	36	30.0	30.0	61.7
	Agree	22	18.3	18.3	80.0
	Strongly agree	24	20.0	20.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021



Table 4.14 shows respondents’ opinion on the social distancing rule and delays in material delivery to oil field projects. When asked if the social distancing rule causes delays in the delivery of materials to oil fields, 22 (18.3%) agreed, with 24 (20%) strongly agreeing. Meanwhile, 38.7% of respondents strongly believe that the Social Distancing Rule causes delays in the delivery of materials to oil fields, while 37% disagree.

**Table 4.15: Working from home order and delay in delivery of materials to firms’ oil fields.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	26	21.7	21.7	21.7
	Disagree	26	21.7	21.7	43.4
	Agree	36	30.0	30.0	73.4
	Strongly agree	32	26.6	26.6	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The respondents' views on working from home orders and delay in delivery of material to firms’ oil fields are shown in Table 4.15. When asked if working from home orders causes delay in the delivery of materials to their company's oil field, 36% of respondents agreed that working from home orders cause delays in the delivery of materials to their company's oil field, while 32% strongly agreed. Meanwhile, 26.7% of respondents strongly disagree that working from home orders created delays in material delivery to their company's oil field, while the remaining 26.7% disagree that working from home orders cause delays in material delivery to their company's oil field.

**Table 4.16: Boarder closure and delay in delivery of materials to oil fields project**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	14	11.7	11.7	11.7
	Disagree	20	16.7	16.7	28.4
	Agree	46	38.3	38.3	66.7
	Strongly agree	40	33.3	33.3	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.16 displays the respondents' opinion on the border closure and delay in material delivery to the oil field project. When asked if boarder closure causes delays in the delivery of materials to oil fields projects, 46 (38.3%) agreed, while 40 (33.3%) strongly agreed. Meanwhile, 14 (11.7%) of respondents strongly disagreed that boarder closure causes delays in the delivery of materials to oil field projects, while the remaining 20 (16.7 percent) disagreed.

**Table 4.17: Bad weather and delay in material delivery**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	22	18.3	18.3	18.3
	Disagree	20	16.7	16.7	35.0
	Agree	36	30.0	30.0	65.0
	Strongly agree	42	35.0	35.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The respondents' views on bad weather and material delivery delays are shown in Table 4.17. When respondents were asked if bad weather causes delays in material delivery, 30 percent agreed that bad weather causes delays in material delivery to oil company field projects, and 35 percent strongly agreed that bad weather causes delays in material delivery to oil company field projects. Meanwhile, 18.3% of respondents strongly disagree that bad weather causes material delivery delays to oil company field projects, while the remaining 16.7% disagree that bad weather causes material delivery delays to oil company field projects.

**Table 4.18: Flooding and delay in material delivery**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	26	21.6	21.6	21.6
	Disagree	30	25.0	25.0	46.6
	Agree	32	26.7	26.7	73.3
	Strongly agree	32	26.7	26.7	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.18 shows how respondents felt about unforeseen events such as flooding and material delivery delays. When asked if incidental events such as flooding causes delay in material delivery, 32 (26.7%) agreed, while another 32

(26.7%) strongly agreed. Meanwhile, 21.6% of respondents strongly disagree that unplanned events such as floods cause material delivery delays, while the remaining 25% disagree.

**Table 4.19: Heavy rainfall and material delivery lead time**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	8	6.7	6.7	6.7
	Disagree	10	8.3	8.3	15.0
	Agree	52	43.3	43.3	58.3
	Strongly agree	50	41.7	41.7	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The respondents' views on heavy rainfall and material supply lead time are shown in Table 4.19. When asked if heavy rainfall affects material delivery lead time, 52 (43.3%) agreed, with 50 (41.7%) strongly agreeing. Meanwhile, 8 (6.7%) of respondents strongly disagreed that heavy rainfall affects material delivery lead time, while the remaining 10 (8.3%) disagreed.

**Table 4.20: Ordered materials/products and standard shipping container**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	42	35.0	35.0	35.0
	Disagree	56	46.7	46.7	81.7
	Agree	10	8.3	8.3	90.0
	Strongly agree	12	10.0	10.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The opinions of respondents on requested materials/products and standard shipping containers are shown in Table 4.20. When asked if ordered materials/products are insufficient to fit into a standard shipping container, 10 (8.3%) agreed, while 12 (10%) strongly agreed. Meanwhile, 35% of respondents strongly disagreed that ordered materials/products are insufficient to be shipped in a standard shipping container, while 46.7% disagreed.

**Table 4.21: Lack of Marine boats and barges**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	22	18.3	18.3	18.3
	Disagree	20	16.7	16.7	35.0
	Agree	36	30.0	30.0	65.0
	Strongly agree	42	35.0	35.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

The opinion of respondents on the shortage of marine vessels and barges is shown in Table 4.21. When asked if a lack of marine boats and barges delays the transportation of materials to an oil field site, 30% agreed that it does, and 35% strongly agreed. Meanwhile, 18.3% of respondents strongly disagreed that a lack of marine boats and barges causes delays in material delivery to oil field project sites, while 16.7% disagree.

**Table 4.22: Inexperience Suppliers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	18	15.0	15.0	15.0
	Disagree	20	16.7	16.7	31.7
	Agree	40	33.3	33.3	65.0
	Strongly agree	42	35.0	35.0	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.22 shows how respondents felt about inexperienced suppliers and material delivery delays. Respondents were asked whether inexperience Suppliers causes delay in delivery of materials to oil field site, 40(33.3%) of the respondents agreed that inexperience Suppliers causes delay in delivery of materials to oil field site, while 42(35%) strongly agreed that inexperience Suppliers causes delay in delivery of materials to oil field site. Meanwhile 18(15%) of the respondents strongly disagreed that inexperience Suppliers causes delay in delivery of materials to oil field site while the remaining 20(16.7%) disagreed that inexperience Suppliers causes delay in delivery of materials to oil field site.

**Table 4.23: High cost of delivery**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	26	21.7	21.7	21.7
	Disagree	26	21.7	21.7	43.4
	Agree	36	30.0	30.0	73.4
	Strongly agree	32	26.6	26.6	100.0
	Total	120	100.0	100.0	

Source: Fieldwork data, 2021

Table 4.23 indicates the respondents' opinions on high delivery costs. When respondents were asked if high delivery costs create delivery delays, 30% agreed that high delivery costs cause material delivery delays in the oil sector, while 26% strongly agreed that high delivery costs cause material delivery delays in the oil industry. Meanwhile, 21.7% of respondents strongly disagree that high delivery costs create material delivery delays in the oil sector, while the remaining 21.7% disagreed that high delivery costs cause material delivery delays in the oil industry.

#### 4.1 Correlation coefficient and test of hypotheses

**Objective I:** To ascertain the effect of poor planning and scheduling on delay in delivery of materials to oil Companies oil fields in Niger Delta.

**H<sub>10</sub>:** Poor planning/scheduling does not have any statistically significant relationship with the delay in delivery of materials to oil company's oil fields in Niger Delta.

In testing this hypothesis, data on planning/scheduling and delay in material delivery we analysed the data using Pearson correlation coefficient and the result obtained is presented in the table below.

**Table 4.24: Result of Pearson correlation coefficient on planning/scheduling and delay in material delivery**

		Planning/Scheduling	Material delivery delay
Planning/Scheduling	Pearson Correlation	1	.720**
	Sig. (2-tailed)		.000
	N	120	120
Material delivery delay	Pearson Correlation	.720**	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS ver. 26.0 Output window

As shown in table 4.24, poor planning/scheduling is correlated with material delivery delay as shown by the coefficient of 0.720 with a p-value of 0.000. This result indicates that poor planning/scheduling and delay in material delivery exhibits a strong and positive linear relationship. Thus, we fail to accept the null hypothesis and report that poor planning/scheduling frustrate the delivery of materials to oil company’s oil fields in Niger Delta.

**Objective II:** To examine the effect of government restriction on delay in delivery of materials to oil company’s oil fields in Niger Delta.

**H2<sub>0</sub>:** Government restrictions have no significant relationship with delay in delivery of materials to oil company’s oil fields in Niger Delta.

To test this hypothesis, data on government restrictions and material delivery delay were analysed with Pearson correlation coefficient and the result is shown in Table 4.25.

**Table 4.25: Result of Pearson correlation coefficient on government restriction and material delivery delay**

		Government Restriction	Material delivery delay
Government Restriction	Pearson Correlation	1	.860**
	Sig. (2-tailed)		.000
	N	120	120
Material delivery delay	Pearson Correlation	.860**	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS ver. 26.0 Output window

As shown in table 4.25, government restrictions correlated with material delivery delay. The result indicated a coefficient of 0.860 with a p-value of 0.000. This indicates that restrictions by the government causes delay in the delivery of materials to oilfields in the Niger Delta.

**Objective I11:** To analyze the effect of covid-19 protocol on delay in delivery of materials to oil company’s oil fields in Niger Delta.

**H3<sub>0</sub>:** There is no statistically significant relationship between covid-19 protocol and delay in delivery of materials to oil company’s oil fields in Niger Delta

To test this hypothesis, data on covid-19 protocol as well as material delivery delay were correlated, and the result obtained is presented in the Table 4.26 below.

**Table 4.26: Result of Pearson correlation coefficient on covid-19 protocol and material delivery delay**

		Covid-19 Protocol	Material delivery delay
Covid-19 Protocol	Pearson Correlation	1	.880**
	Sig. (2-tailed)		.000
	N	120	120
Material delivery delay	Pearson Correlation	.880**	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS ver. 26.0 Output window

As shown in table 4.26, Covid-19 protocol is correlated with material delivery, and has a coefficient of 0.880, with a p-value of 0.000, which indicates a strong positive linear relationship between the two variables. Consequently, we reject the null hypothesis and report that there is significant relationship between covid-19 protocol and delay in delivery of materials to oil company’s oil fields in Rivers

**Objective IV:** To examine the effect of weather condition on delay in delivery of materials to oil company’s oil fields in Rivers State.

**H4<sub>0</sub>:** There is no significant relationship between weather condition and delay in delivery of materials to oil company’s oil fields in Rivers State.

To test this hypothesis, data on weather condition and material delivery delay were also correlated. The obtained result is presented in Table 4.27 below.

**Table 4.27: Result of Pearson correlation coefficient on weather condition and delay in delivery of materials**

		Weather condition	Material delivery delay
Weather Condition	Pearson Correlation	1	.740**
	Sig. (2-tailed)		.000
	N	120	120
Material delivery delay	Pearson Correlation	.740**	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS ver. 26.0 Output window

As shown in table 4.27, the result reveals a coefficient of 0.740 and a p-value of 0.000. This reveals that Weather Condition correlated with material delivery delay in the Niger Delta. Based on the above result, we therefore reject the null hypothesis and conclude that there is significant relationship between weather condition and delay in delivery of materials to oil company’s oil fields in Rivers State.

**Objective V:** To ascertain the effect of logistics on delay in delivery of materials to oil company’s oil fields in Rivers State.

**H5<sub>0</sub>:** There is no significant relationship between logistics and delay in delivery of materials to oil company’s oil fields in Rivers State.

To Test this hypothesis, logistics and material delivery delay data were correlated, and the result obtained is as shown in the table below.

**Table 4.28: Result of Pearson correlation coefficient on logistics and delay in delivery of materials**

		Weather condition	Material delivery delay
Weather Condition	Pearson Correlation	1	.782**
	Sig. (2-tailed)		.000
	N	120	120
Material delivery delay	Pearson Correlation	.782**	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS ver. 26.0 Output window

As shown in Table 4.28, Logistics correlated with material delivery delay. The reported coefficient is 0.782 with a p-value of 0.000, indicates that there is a strong positive linear relationship between the two variables. The direction of relationship is the same (i.e. as one increases, so does the other). We therefore reject the null hypothesis and confirm that there is significant relationship between logistics and delay in delivery of materials to oil company’s oil fields in Rivers State.

## 5. Discussion of Findings

The initial goal was to determine the impact of inadequate planning and scheduling on material delivery delays. Poor planning/scheduling was shown to be associated with material delivery delays, as captured by a coefficient of 0.720 with a p-value of 0.000, indicating a strong and positive linear association between



these two variables of interest. This implies that as one increases, so does the other. According to Dosumu and Aigbavboa (2017), poor planning, weak forecasting, and scheduling in the execution of projects are some of the determinants of project failure in Nigeria. Poor estimation by contractor, poor time management in project implementation, and weak estimation of cost have all been associated with project failures in Nigeria. Most of the planning flaws in Nigeria were the result of weak goals setting and the absence of clearly defined roadmaps to achieve targets. As a result, several projects have been flung at random, without noticeable progress (Nzekwe, et al., 2015).

The second goal was to consider the impact of government policies and regulations on material delivery delays. This study also found that material delivery delays were connected to government restrictions. This is reflected in the coefficient of 0.860 and a p-value of 0.000, revealing that the two variables have a strong positive linear association. Rahman et al. (2017) argued that certain materials (e.g. metal) require permits from government departments before completing import orders, which can be time-consuming if not prepared on time. Approval of permit focuses mainly on the declaration of the source, type, standard, and quantity of goods to ordered. This measure is to guarantee that exact goods are imported, and that the quantity and kind of materials imported match exactly what was initially ordered.

The third goal was to look at the impact of the Covid-19 protocol on material delivery delays in oil companies in Rivers State. The covid-19 procedure is correlated with material delivery delay in this study, with a coefficient of 0.780 and a p-value of 0.000, indicating that the two variables have a strong positive linear association. For the fact the p-value is 0.000, which is less than the level of significance ( $= 0.05$ ), the direction of association is the same.

The weather condition related to material delivery delay with a coefficient of 0.740 and a p-value of 0.000, indicating that the two variables have a strong positive linear association. That is in line with the conclusion drawn by Mydin, Sani, Taib and Alias (2014). Weather affects materials supply when importing materials from foreign countries through sea freight and when materials are being delivered at the site of project. Weather conditions affect the importation of materials from overseas through the sea, depending on where the goods are being shipped from. This in turn affects loading as well as unloading. The supply of various materials to construction sites may be affected by rain. Ready-mixed concrete suppliers, for example, do not produce concrete during rainy spells since water penetration is uncontrollable.

Logistics was found to relate to material delivery delay with a coefficient of 0.782 and a p-value of 0.000, revealing that the two variables had a strong positive linear association. On-site logistics can improve the overall success of oil field project. It can, for example, reduce time and material waste, both of which have a negative impact on construction costs. With regards to supply, handling, processing, and storage, logistics involves the scheduling, execution, and controlling of resources for construction (Regassa, 2015). Nevertheless, problems could arise owing to poor logistics at the sites. Errors in ordering materials, particularly when materials are ordered in smaller quantities (Bossink and Brouwers, 1995); material delivery delays (Aibinu and Odeyinka, 2006); challenges related to handling, transportation, and storage of material (Glass, Osmani, and Price, 2008); substandard supplies (Formoso et al., 2002); and inefficient control of resource on site (Poon, Yu and Jaillon, 2004).

### **5.1 Summary of Findings**

The study investigated the factors that contribute to material delivery delays to oil fields in Rivers State. Poor planning and scheduling, the effect of government restrictions on delay in delivery of goods to oil company's oil fields, the covid-19 protocols, and the effect of weather conditions were all highlighted as sources of delay in delivery of materials to oil fields in the current study. The study also considered the impact of logistics on material delivery delays to oil company oil fields in Rivers State. Clearly, the study demonstrates that:

1. Poor planning/scheduling is a factor in material supply delays to oil fields in Rivers State.
2. Government restrictions were also linked to material supply delays, indicating that the two variables had a significant positive linear relationship. As a result, government restrictions play a role in delivery delays of materials to oil fields in Rivers State.
3. The Covid-19 Protocol is associated with material delivery delays to oil fields in Rivers State, showing that the two variables have a significant and positive linear relationship.
4. Weather Condition is also associated with material delivery delay to oil fields in Rivers State, as the two variables have a significant positive linear relationship.
5. Logistics and material delivery delay to oil fields in Rivers State exhibit a strong and positive relationship. The direction of association is the same, namely as one increases, so does the other.

## 5.2 Contributions to the body knowledge

Most of the reviewed literature discussed the factors that foster material delivery delays in the construction industry. However, proportional contributions of these elements to oil firms have not been quantified in extant studies. This study has therefore established that poor planning/scheduling had a significant effect on material supply delays to oil fields in Rivers State. Furthermore, government restrictions, Covid-19 Protocol, and weather Condition were also linked to material supply delays, indicating that the two respective variables had a significant positive linear relationship.

## 5.3 Scope for future research

The study investigated the factors that contribute to material delivery delays to oil and gas companies' oil fields in Rivers State, other researchers should conduct study in the entire country.

## 6. Conclusions

The project management team's major goal is to complete a project on schedule, within budget, and according to specifications and quality. As a result, recognizing and evaluating the reasons that may cause schedule delays is critical to helping the project management team meet the above-mentioned goals and avoid delays. The study suggests, however, that:

1. Poor planning and administration of Oil Company's oil field project can have detrimental effects on the project's duration and completion. Delays in material supply and project timeframe can change a prospective profitable venture into a fruitless one.

2. Proper planning of projects and effective management are two main key success factors for project completion, can reduce or prevent these delays.

3. Restrictions imposed by the government may cause delays in the delivery of materials to oil companies' fields. Covid-19 measures such as the social distance rule, total lockdown, and frequent hand washing, among others, have a considerable impact on the delivery of goods to oil fields.

4. The weather has a significant impact on the delivery of materials to oil firm fields. The transportation of commodities to oil company oil fields in Rivers State is influenced by logistics.

From the foregoing, the following recommendations are worth pondering:

The Nigerian government should implement a national policy on material delivery, and if required, take legislative actions to solve the problem of material delivery delays in the country. Material supply delays can be reduced or avoided through effective project planning and scheduling, as well as good project management, which are two of the most important success factors for project implementation and completion.

To ensure effective project delivery, oil field locations should employ an efficient project management team with professional logistics officers who are well-versed in timely and efficient project delivery.

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## THE IMPACT OF PORT OPERATIONS ON FREIGHT FORWARDERS IN NIGERIA

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**Abstract** *The study examines the impact of port operations on freight forwarders in Nigeria. The study's objective is to examine the effect of automation of port operations on freight forwarders' efficiency in Nigerian ports and the impact of port infrastructure on the efficiency of freight forwarders in Nigeria. The study was conducted in the Lagos Port Complex located in the Apapa Area of Lagos and consisted of Apapa Port and a container terminal now called APM Terminal. A survey research design was used for the study, and a stratified sampling technique was used. The study population is 5400 people, and the sample size is 372. A structured questionnaire was used to gather responses from the respondents, and the information was analyzed through simple descriptive statistics. The hypotheses were analyzed using correlation analysis in SPSS, and the result showed that automation of port operations enhances freight forwarders' functions. It was concluded that port infrastructure is paramount for the further development of port operations and will immensely benefit the freight forwarders. It was recommended that the Safety and security of lives and properties at the Nigerian seaports must be seen as everybody's business needs to grow and be compared with other countries of the world. Stakeholders in the maritime*



*industry must be willing to adopt security preventive measures to avert what could lead to disaster or loss of lives and properties at the seaport in Nigeria.*

**Keywords:** *port operations, freight, automation, port infrastructure*

**JEL Classification:** *R40*

### 1.1. Introduction

Most experts expect the global business environment to undergo greater change over the next ten years than it did over the last one hundred years (Mark, 2018). These changes will precipitate a radical shift in the business operations of global firms, especially with regard to the role of logistics. As global firms strive to attain a competitive advantage in the marketplace, new distribution systems will emerge (Max, 2019). Trade liberalization and information technology are continually advancing, national borders are increasingly disappearing and barriers to global trade are falling. As a result, global manufacturing and marketing are becoming increasingly organized (King, 2019). To cope with this operational environment, global firms have been searching for new production and logistics architectures as a way of gaining the advantages that come with standardized global production (Giggs, 2017).

Trade between nations has always made a significant contribution in terms of increasing wealth among the world population (Smith, 2016). Today, over 80% of all trade is seaborne (Stopford, 2019; UNCTAD, 2019). World merchandise trade volumes have grown at a modest rate of 2.3% in 2014 following the global gross domestic product (GDP) growth rate of 2.5%, indicating a strong correlation between trade and GDP (UNCTAD, 2019). The history of urban development also reveals that economic advancement is especially apparent in cities with seaports (Shan et al., 2019). Globalization of complex industrial production processes has increased the importance of seaports in the global supply chain. Port activity is no longer limited to just cargo handling; logistics service provision in an international context has become a core part of the business (Wang & Cullinane, 2020).

A Survey conducted by the East African Logistics Performance reveals significant improvement in port and corridor efficiency. Ongoing reforms and infrastructure improvements at the Nigeria ports have yielded significant results as cargo dwell time has dropped from an average 6.5 days in 2017 to 5 days in 2018 (Shadare, 2018). Despite these improvements, the efficiency at the Nigeria ports is

still below the internationally acceptable standards of a maximum 3 days dwell time (African Logistics Performance Survey, 2019).

Port reforms are policy measures by government aimed at enhancing efficiency and productivity of ports by revitalizing and strengthening the operational and functional modalities at the ports (Dumelo, 2018). Within the Nigerian context, ports reforms were with a view to making Nigerian ports both user and investor friendly, thus enhancing smooth operations at the ports. The reform model chosen by the Nigerian government was port concession, whereby the government retains ownership of the infrastructure, and contracts out the management and operation of the facilities to the private sector on competitive basis for a specified period of time. Bousquet and Fayard (2019) note that a concession arrangement is one in which the government (or her agency) grants the right to fund, build, own, improve, upgrade, maintain or operate a public infrastructure, and charge users for the cost of services, for a limited period of time to a private sector operator (Felix, 2019)

Port operations are very vital to Nigerian economy. Data obtained from port operations data can indicate if a port is efficient or not. The number of vessels that called at the port in 2016 had a decline of 2.72% when compared to the previous year (Amid, 2017). Also comparing the operations data to that of the neighbouring ports shows that the performances of the neighbouring ports are more robust. Hence, Nigerian port operations need to be reviewed to enable the ports to improve their competitive position in the regional and global market. Port congestions, high container dwell time, high turnaround time of vessels and trucks, inadequate of port facilities such as berths, etc have tremendously negated the operational performance of Apapa port of Lagos (Tunde, 2016). These drawbacks in port activities have made Apapa port operationally inefficient leading to increases in demurrage charges and operating cost of vessels. The implied economic implication of the aforementioned inefficiencies is that most shippers will prefer to call at other ports with less congestion, better port facilities and sophisticated cargo handling equipment. The economy is also experiencing increases in the prices of consumable goods, cut-off-flow during operations by the production companies, decrease in per capital income of port employees and general decreases in the revenue accruable to the port. Nigeria is a major force in international trade, with 70% of goods coming to the West, and Central Africa destined to Nigeria. Out of which 80% of the traded goods are transported by sea (UNCTAD, 2019). Therefore, the study of port operations is crucial to the sub-region. The World

Bank African infrastructure country diagnostics assessment of ports in SubSaharan Africa ranked Nigeria as the top reformer (Vagliasindi, 2009).

### **1.2. Statement of the Problem**

For many years, the Nigerian government has worked to promote the export of several commodities that the country produces in large quantities. Although the country's main export is crude oil, which accounts for 86% of foreign exchange earnings and 65% of total government revenue. The country exports other commodities such as cashew, cocoa, leather, ginger, among others (Kazeem, 2018). Unfortunately, Nigeria's performance in freight forwarding, as well as other components of the shipping and logistics business, has not been very attractive. This is reflected in its low ranking in the World Bank's Logistics Performance Index. This reality is connected to the several challenges confronting the freight forwarding industry.

Self-serving agents who pose as freight forwarders is one of the significant challenges confronting freight forwarding in Nigeria. This is mostly responsible for how the Nigerian freight forwarding industry is perceived globally. But the problem in Nigeria is that most of the processes are still manual (Wins, 2019). Customs, as well as other government agencies such as the Nigerian Ports Authority (NPA), Nigerian Drug Law Enforcement Agency (NDLEA), Standards Organization of Nigeria (SON), and sometimes, the police, want to see you before you are cleared. Eni (2018) explained that the issue of safety and security in the maritime industry is a serious and complex one. The economic losses that could arise from security lapses can be far-reaching and can severely affect the freight forwarding reputation. This study intends to suggest solutions to port operation issues and its effect on freight forwarders efficiency. The gap the study intends to cover is to examine the impact of port operations on freight forwarders in Nigeria and also the effect of automation of port operations on freight forwarders efficiency in Nigeria ports.

### **1.3. Objectives of the study**

The aim of the study is to examine impact of port operations on freight forwarders in Nigeria.

The specific objectives are to:

- i. Examine the effect of automation of port operations on freight forwarders efficiency in Nigeria ports.

- ii. Examine the effect of port infrastructure on the efficiency freight forwarders in Nigeria.

#### 1.4. Research Questions

- i. What are the effects of automation of port operations on freight forwarders efficiency?
- ii. To what extent does port infrastructure affects freight forwarders operation in the Nigeria ports?

#### 1.5. Research Hypotheses

The research hypothesis will be addressed in line with the research question in order to achieve the objective of the study

H<sub>01</sub>: There is no significant effect of port operations automation on freight forwarders efficiency in Nigeria port

H<sub>02</sub>: Port infrastructure does not have significant effect on freight forwarders operations in Nigeria ports.

land area of about 120 hectares. Apapa port has conventional berths that service all cargo types. These include 24 berths for handling dry cargo and two berths for loading and discharging petroleum products. Six of the 24 berths are designated as container berths. The total quay length of the port is 1km and the average draught of the berths is 11.5m. It has 13 transit sheds with a total storage space of 78,869 square metres and 8 warehouses with a total space of 58,042 square metres. It also has support facilities for cargo on transit to ECOWAS countries (NPAR, 2019).

## 2.0 Literature Review

### 2.1 Conceptual Review

#### 2.2.1 Ports and port operations

A port is a place at which the transfer of cargo and passengers to and from waterways and shores occurs. The transfers are made to and from vessels. The port may be a cargo port (handling only the transfer of cargo), a passenger port (handling only the transfer of passengers), or a combination cargo/passenger port (handling the transfer of both cargo and passengers). Ports are typically cargo ports. Cargoes include general and bulk cargoes. General (dry non-bulk) cargoes are either goods of various sizes and weights shipped as packaged cargo or goods of uniform sizes and weights shipped as loose (non-packaged) cargo. The former is

either container or breakbulk cargo, while the latter is neobulk cargo. Container cargo is general cargo stored in standardized containers, generally 20 or 40 feet in length without wheels (Omolola, 2012).

A public port's objectives may include promoting regional employment, economic development, and the export of commodities for which the region has a comparative advantage. Public ports are typically managed by public port authorities. A public authority is an independent (or quasi-independent) agency that has been given the authority by the government owner of the port to manage the port. In most places in the world, ports are located on the shore lands of cities. These lands are highly valued with many alternative uses. Not only may the land be used for marine terminals, but also for tourism and recreation industries, residential and office buildings, nature parks, and commercial fishing industries. Consequently, port land expansions are often entrusted to governments and regulatory authorities to reconcile the interests of all parties competing for the land (Rein, 2011)

### 2.2.2 Freight forwarding in Nigeria

Despite the fact that freight forwarding in Nigeria has been in place since the days of the export of groundnut as cash crop in early 1914, the profession became recognized as a distinct union by the Association of Nigerian licensed Customs Agents (ANLCA) through the Act of Parliament in 1954 (Sinks, 2017). This body became the mother of the various maritime associations in Nigeria today. Its relevance and prestige was unquestionable until the 1990 when its fortune started to decline. The breakup of Association of Nigerian Licensed Custom Agent resulted in multiplicity of trade associations that led to the deterioration of standards of freight forwarding practice. The practice became like the proverbial blind the blind. There was no regulation and control. They were seen as the weakest link in the global transportation chain (Ahmid, 2016)

As it is well known, the rate of cargo loss, theft, pilferage and damages has been a continuous nagging problem to port managers, operators and users. So also are increased insurance claims occasioned by loss of cargo or pilferage. The overall effect of these problems is undermining the future prospect of the Nigerian maritime industry. It is making the industry unable to compete adequately within the West African sub-region (Raimi, 2012). Perhaps, the greatest of these negative effects is the making of the nation's operating costs, delays in cargo handling and delivery. The greatest impact of these negative effects is the making of the nation's seaports to operate bellow installed capacity which, from the economic point of

view, is misallocation of resources given the combined huge investment made on port development in the government and other port users such as Haulage firms, clearing and forwarding companies and warehouse operators (Akintude, 2016). Ordinarily, cargo is the lifeblood of the maritime transport and the essence of all operations in the industry must be to ensure proper management of freight and cargo in such a way as to guide against damages of freight, guide against loss/pilferage, ensure safe delivery/arrival; and curtailing indirectly the multiplier effect of cargo damage/loss on the economic space of the country. However, there exist a good number of indigenous freight forwarding companies with an excellent record of compliance, expertise, and capacity (Kaka, 2018). To help traders, the Nigerian Export Promotion Council (NEPC) facilitates the identification of reliable freight forwarders through its online database of freight forwarders, customs brokers, and cargo agents in Nigeria. Therefore, clients must consult and compare two or more freight forwarders before making a deal (Mintz, 2019). An increase in automation and communication technology has made online clearing possible around the world. This means you can communicate with authorities, complete forms online, and clear goods irrespective of where you are.

### **2.2.3 Port operations and freight forwarding in Nigeria**

Developing countries are the drivers of maritime trade: 61.2% of all goods loaded and 55% of all goods unloaded are in relation to the developing countries, showing their resilience to the economic setbacks (UNCTAD, 2019). The share of the developed economies in global goods loaded and unloaded were 32.4% and 44.3% respectively. Transition economies accounted for 6.4% of goods loaded, and only 0.8% of goods unloaded. This discrepancy underlines the role many transition economies play in bulk exports of raw materials and energy products. Asia continues to dominate, with a share of 41% of total goods loaded, followed in decreasing order by the Americas, Europe, Oceania and Africa. Noticeable is the surpassing of Africa by Oceania as the fourth biggest export region, showing the growing impact of Australian commodity trade, mainly in iron ore, coal and minerals (Ali, 2017)

No doubt, over the years, various procedures have been evolved and perfected in the maritime transport industry on how best to manage and handle the effect freight generate. Devoting a lengthy time to discussing the various well known method in maritime freight/cargo handling will be an unnecessary adventure. What is pertinent is to highlight the basic fundamental issues to be taken into consideration before formulating any management strategy for handling cargo.

More importantly, these cargo/freight management strategies cannot be static; rather, they should be dynamic because they have to develop in tune with change taking place both locally and internationally in port and shipping operations (Sewes, 2016).

## 2.1 Theoretical framework

There are many different types of theories of motivation and each brings in different types of conclusion which makes the understanding of the concepts rather confusing, (Aahaji & Yusoff, 2018). Following are discussion of theories which are related to this research.

### 2.1.1 Modified neoclassical growth model

Modified neoclassical growth theory is referred to as the theory of endogenous development (Grossman & Helpman, 2017). Sjafrizal (2018) considers that the amount of output (goods and services) which is produced by an economic activity is determined by the availability and quantity of production factors used. In addition, he found a positive correlation between marine transportation infrastructure and economic growth of archipelagic regions. Hence, the causative relationship between the development of the seaport and economic growth was established. The coherence of the physical structure of transportation and the physical structure of economy is needed, and the parameters should be in synergy

### 2.1.2 Analytical Demand Model

The model examines cost minimization strategies and profit maximization strategies. Coupled with various market structures, it seeks to explain why behaviors that are perceived as irrational, such as leaving cargo in the port are the best option for an importer. It describes the economic foundations of rational decisions with regard to container storage in port terminals and off-dock container yards (ODCYs). Storage operations can be defined as a subcomponent of an international logistics pathway that starts with loading containers in the supplier's facilities and ends with unloading them in the customer's facilities. We define the logistics pathway as —a sequential set of logistics operations, warehousing, depot operations, port operations, trucking, and freight forwarding, which deal with the end-to-end movement of freight (Magala and Sammons, 2018). In addition, we focus on containerized trade only, specifically containerized trade through international ports. When deciding to import a certain quantity of containerized cargo, shippers have to choose either directly or indirectly (through contracted

shipping and freight forwarding agents or logistics providers) what logistics pathway to use. This is an informed supply chain decision that is generally based on a combination of rational criteria such as cost, delivery time, frequency, and risk as well as some behavioral patterns (for example, repeat-buyer behaviors).

## 2.4 Empirical Review

Moon and Woo (2014) analyzed the impact of port operations on efficient ship operations. The study conceptualized port management with ship operation, equipment infrastructure planning and cargo handling equipment. It employed the questionnaire and personal interview to generate its data. The study used Pearson's product moment correlation to measure the level of impact of port operations on efficient ship operations; it found that there is a strong relationship between of ship operation dimension of the study and efficient ship operations.

Clark et al (2001) carried out a study on maritime transport costs and port efficiency. The study employed the questionnaire and personal interview to generate its data. The study used Pearson's product moment correlation to measure the level of relationship between maritime transport costs and port efficiency; it found that there is a moderate and significant relationship between ship operation costs and port efficiency. The study concluded that ability of a ship to function economically depends among other factors, the availability of a good functional port.

Valentine and Gray (2001) applied the DEA-CCR model to 31 container ports out of the world's top 100 container ports for 1998 to determine if there exists any relationship between ship management and organizational structure. The authors conclude that clusters and synergies analysis is a viable tool for identifying organizational structures and that the ports sector exhibits three structural forms that seem to have a relationship to estimated levels of efficiency.

Lam and Notteboom (2014) investigated the port management tools that are used by leading ports in Asia and Europe. The study divided port management into ship operation, port dredging and cargo handling. Questionnaire was used to generate the study data and regression analysis was employed in testing the study hypotheses. The study found that ship operation dimension has a very strong and positive relationship with performance of leading ports in Asia and Europe.

Some significant studies on port operations include the earliest work of (Taaffe, 2017) on Nigerian and Ghanaian ports and Rimmer (2017) followed by that of Hayuth (2018). These studies have shown the significance of market port operations at emerging some few port locations as hub or load centres. However,

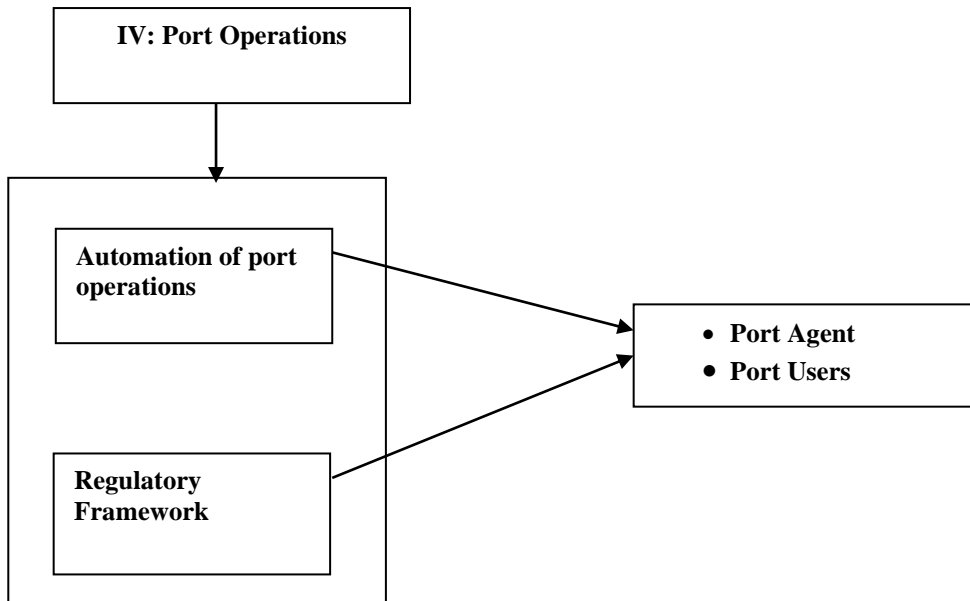


based on methodologies, Marti (2018) and Hayuth (2018) have examined container traffic port operations in the North America market using Shift-Share Analysis (S-SA) and the Gini coefficient.

In another study, Notteboom (2017) has investigated the port operations and deport operations tendencies of port traffic to reveal the emergence process of load centre in European port system. In addition, Wang and Cullinane (2014) adopted Hirshman Herfindahl Index (HHI), the Gini coefficient and Shift-Share Analysis to examine port traffic port operations at Hamburg, US and China ports between 1992 and 2002. Most of the studies on market port operations were carried out in ports of the developed economies and developed ports of emerging economies, in order to reveal current market status of ports in such regions.

## 2.5 . Conceptual Model

### CONCEPTUAL MODEL



*Source: Authors Conception*

## Research Methodology

### 3.2 Research Design

Survey research design was used for this study. The choice of survey research design is due to the fact that surveys are useful in describing the characteristics of a large population. No other research method can provide this broad capability, which ensures a more accurate sample to gather targeted results in which to draw conclusions and make important decisions.

### 3.3 Population of the Study

The population of the study comprises of persons involved in the operations of container terminal in the Lagos port, stakeholders who make use of the facility in port operation activities as well as freight forwarders/shippers, shipping agents and Nigeria Port Authority (NPA). The target population included the number of these officials when put together gave a total of approximately 5400 people (NPAR).

#### Population

Port agent -----	1380
Port users -----	1510
Port operators-----	1760
NPA-----	<u>750</u>
	5400

### 3.4 Sampling technique and Sampling Size

The study adopted stratified random sampling technique. Samples were drawn from amongst the port agents, port users (importers and exporters), port operators and the Nigerian Port Authority (NPA), all operating in the Lagos port. The justification for this technique stems from the fact that the choice of who to participate in the survey is independent of the research outcome since all port operators experience similar port conditions and responses only constitute averages for the entire survey. To be able to draw the right sample for the purpose of this study, Yaro Yamani formular is used to determine the sample size. The formular is given below as :

$$n = \frac{N}{1 + N(e)^2}$$

Where n = sample size, N = population size e = error limit  
 N = 5400 e = 0.05

Therefore  $n = 372$  approximately.

**Sample Size**

Port agent ----- 98  
 Port users ----- 107  
 Port operators-----113  
 NPA-----54

372

The total sample size for the study is 372

**3.6 Data Analysis Method**

Data collected will be analyzed using descriptive statistics of tables and percentages of data classification, correlation and regression analysis will be used to test the hypotheses formulated in order to examine impact of port operations on freight forwarders in Nigeria.

**3.7 Reliability and Validity test**

The researcher used the Cronbach Alpha method to test the reliability of the response from (30) people from Lagos port consisting of port Agents, Port users and port operators. The findings were reliable, this allow the research to be tested again and obtained the same results. Results are expressed between 0-1, however to test a good reliability, this result should test above 0.7 which will show 70% reliability.

**Reliability Statistics for the Constructs**

Construct	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Automation of Port Operations	0.831	0.864	5
Port Infrastructure	0.816	0.807	4
Regulatory framework	0.801	0.828	4
Freight Forwarders Efficiency	0.704	0.785	8

The table above shows the reliability test for the instrument. All the measurement scales for this instrument produce a Cronbach alpha of 0.831, 0.816, 0.8301, and 0.704 for the four major construct. The study met the above criteria with  $\alpha$  figures above 0.7 which suggest an excellent internal consistency of these constructs and their individual observed variables.

### Data Presentation and Analysis

The Analysis of the bio- data of the respondents, the analysis was done with respect to gender, age, Work experience, educational qualification and position at work. The results are presented in tables 4.1, 4.2, 4.3 and 4.4.

**Table 4.1 Demographics of the respondents**

VARIABLES		FREQUENCY	PERCENTAGE (%)
<b>SEX</b>	Male	191	51.3
	Female	181	48.7
	<b>Total</b>	<b>372</b>	<b>100</b>
<b>AGE (YEARS)</b>	25 – 30	86	23.1
	31 – 40	92	24.7
	41 – 45	101	27.2
	46 – 50	93	25
	<b>Total</b>	<b>372</b>	<b>100</b>
<b>WORKING EXPERIENCE</b>	1-5	73	19.6
	6-10	85	22.9
	11-15	61	16.4
	16-20	95	25.5
	21-25	58	15.6
	<b>Total</b>	<b>372</b>	<b>100</b>
<b>EDUCATIONAL QUALIFICATION</b>	SSCE	55	14.8
	OND	87	23.4
	B.Sc/HND	56	15.1
	M.Sc/MBA	85	22.8
	OTHERS	89	23.9
	<b>Total</b>	<b>372</b>	<b>100</b>
<b>POSITION AT WORK</b>	Senior Staff	69	18.6
	Junior Staff	98	26.3
	Management	97	26.1
	Staff	108	29
	Contract	<b>372</b>	<b>100</b>
	<b>Total</b>		

*Source: Field survey 2023*

Table 4.1 above shows that 51.3% of the respondents’ were male while 48.7% of the respondents were female.

It can also be seen that 23.1 % of the respondents were between the ages of 25 and 30 years, 24.7% were between the ages of 31 and 40 years old, while 27.2% respondents were between the ages of 41 and 45 years and 25% of the respondents are between the ages of 46 and 50.

It can also be seen that 19.6% of the respondents have worked between 1-5 years, 22.9% of the respondents had worked between 6 to 10 years, while 16.4% and 25.5% had worked between 11 to 15 years and 16 to 20 years respectively.15.6% of the respondents had worked between 21 to 25 years.

Table 4.1 above shows that 32.6% represent SSCE 24.2% of the respondents were OND, 9.6% of the respondents were holders of B.Sc/HND while 5.9% of the respondents were M.Sc/MBA holders while 27.6% represent other qualifications.

The table above also showed the position at work of the respondents.18.6% of the respondents is senior staff while 26.3% are junior staff and 26.1% are management staff while 29% are contract staff.

### 4.3 Analysis of Research Objectives

Section B of the questionnaire will be analyzed using frequency tables and simple percentages and the test of hypotheses will be done using chi square.

**Table 4.2: To examine the effect of automation of port operations on freight forwarders efficiency in Nigeria ports.**

S/N	Statement	SA (%) 5	A(%) 4	U(%) 3	D(%) 2	SD(%) 1	Total (%)
1	Automation of port operations improved efficiency of freight forwarders	102 (27.4)	74 (19.9)	64 (17.2)	76 (20.4)	56 (15.1)	372 (100)
2.	Automation of port operations has reduced wastage of resources	100 (26.9)	102 (27.4)	54 (14.5)	65 (17.5)	51 (13.7)	372 (100)
3	Automation of port operations has improved port productivity	108 (29.0)	77 (20.7)	53 (14.2)	88 (23.7)	46 (12.4)	372 (100)

S/N	Statement	SA (%) 5	A(%) 4	U(%) 3	D(%) 2	SD(%) 1	Total (%)
4	Most port operations are automated for better performance of all relevant activities in the port	95 (25.5)	68 (18.3)	87 (23.4)	77 (20.7)	45 (12.1)	384 (100)

Source: Field survey 2023

In the table 4.2 above is to examine the effect of automation of port operations on freight forwarders efficiency in Nigeria ports. It shows that 27.4% of the respondents strongly agreed that automation of port operations improved efficiency of freight forwarders while 19.9% of the respondents agreed, 17.2% are undecided, 20.4% disagreed while 15.1% of the respondents strongly disagreed to this fact.26.9% of the respondents strongly agreed that automation of port operations has reduced wastage of resources although 27.4% of the respondents agreed while 14.5%, 17.5% and 13.7% are undecided, disagreed and strongly disagreed respectively.29% and 20.7% strongly agreed and agreed that automation of port operations has improved port productivity while 14.2%, 23.7% and 12.4% are undecided, disagreed and strongly disagreed respectively.25.5%, 18.3% and 23.4% strongly agreed, agreed and undecided respectively that most port operations are automated for better performance of all relevant activities in the port while 20.7% and 21.1% of the respondents respectively strongly disagreed and disagreed that most port operations are automated for better performance of all relevant activities in the port.

**Table 4.3 To examine the effect of port infrastructure on the efficiency of freight forwarders in Nigeria.**

5	Port infrastructure has improved freight forwarders' performance	99 (26.6)	97 (26.1)	31 (8.3)	66 (17.8)	79 (21.2)	372 (100)
6	Poor infrastructure has reduced operational capacity at the port	101 (27.2)	98 (26.3)	47 (12.6)	97 (26.1)	29 (7.8)	372 (100)

7	There is no relationship between port infrastructure and port operations efficiency	41 (33.8)	48 (14.7)	91 (21)	99 (18.5)	93 (12.1)	372 (100)
8	Freight forwarders are underutilized due to port infrastructure	83 (21.6)	93 (24.2)	73 (19.1)	89 (23.2)	46 (11.9)	384 (100)

Source: Field survey 2023

In the table 4.3 above is to examine the effect of port operations on the efficiency of freight forwarders in Nigeria. It shows that 26.6% of the respondents strongly agreed that port infrastructure has improved freight forwarders' performance while 26.1% of the respondents agreed, 8.3% are undecided, and 17.8% disagreed while 21.2% of the respondents strongly disagreed to this fact. 27.2% of the respondents strongly agreed that poor infrastructure has reduced operational capacity at the port although 26.3% of the respondents agreed while 12.6%, 26.1% and 7.8% are undecided, disagreed and strongly disagreed respectively. 33.8% and 14.7% strongly agreed and agreed that There is no relationship between port infrastructure and port operations efficiency while 21%, 18.5% and 12.1% are undecided, disagreed and strongly disagreed respectively. 21.6%, 24.2% and 19.1% strongly agreed, agreed and undecided respectively that freight forwarders are underutilized due to port infrastructure while 23.2% and 11.9% of the respondents respectively strongly disagreed and disagreed that freight forwarders are underutilized due to port infrastructure

**Table 4.5 To examine the efficiency of the freight forwarders in Nigeria ports**

9	Freight forwarders are more productive with the use of automation in port operations	41 (33.8)	48 (14.7)	91 (21)	99 (18.5)	93 (12.1)	372 (100)
10	Freight forwarders can use automation to reduce wastage	99 (26.6)	97 (26.1)	31 (8.3)	66 (17.8)	79 (21.2)	372 (100)
11	Freight forwarders workload is reduce through automation of port operations	108 (29.0)	77 (20.7)	53 (14.2)	88 (23.7)	46 (12.4)	372 (100)

12	Efficiency and effectiveness is achieved by freight forwarders when all processes are automated	108 (29.0)	77 (20.7)	53 (14.2)	88 (23.7)	46 (12.4)	372 (100)
	Freight forwarders efficiency is directly proportional to the degree of adoption of automation in port operations	99 (26.6)	97 (26.1)	31 (8.3)	66 (17.8)	79 (21.2)	372 (100)

In the table 4.5 above is to examine the efficiency of the freight forwarders in Nigeria ports. It shows that 33.8% of the respondents strongly agreed that freight forwarders are more productive with the use of automation in port operations while 14.7% of the respondents agreed, 21% are undecided, 18.5% disagreed while 12.1% of the respondents strongly disagreed to this fact. 26.6% of the respondents strongly agreed that freight forwarders can use automation to reduce wastage although 26.1% of the respondents agreed while 8.3%, 17.8% and 21.2% are undecided, disagreed and strongly disagreed respectively. 29% and 20.7% strongly agreed and agreed that freight forwarders workload is reduce through automation of port operations while 14.2%, 23.7% and 12.4% are undecided, disagreed and strongly disagreed respectively. 29.0%, 20.7% and 14.2% strongly agreed, agreed and undecided respectively that efficiency and effectiveness is achieved by freight forwarders when all processes are automated while 23.7% and 12.4% of the respondents respectively strongly disagreed and disagreed that efficiency and effectiveness is achieved by freight forwarders when all processes are automated. 26.6%, 26.1% and 8.3% strongly agreed, agreed and undecided respectively that freight forwarders efficiency is directly proportional to the degree of adoption of automation in port operations while 17.8% and 21.2% of the respondents respectively strongly disagreed and disagreed that Freight forwarders efficiency is directly proportional to the degree of adoption of automation in port operations.

#### 4.4 Analysis of Research Hypothesis

##### Hypothesis One

$H_{01}$ : There is no significant effect of port operations automation on freight forwarders efficiency



**Table 4.4.3: Regression Analysis of Port operations Automation vs. Freight Forwarders Efficiency**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.725 <sup>a</sup>	.525	.524	.43942		
a. Predictors: (Constant), Port operations						
ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.751	1	67.751	350.868	.000 <sup>b</sup>
	Residual	61.211	317	.193		
	Total	128.962	318			
a. Dependent Variable: Freight Forwarders Efficiency						
b. Predictors: (Constant), Port Operations						
Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.747	.169		4.410	.000
	Port Operations Automation	.757	.040	.725	18.731	.000
a. Dependent Variable: Freight Forwarders efficiency						

The correlation coefficient equals 0.725 indicates a moderate relationship between Port operations Automation vs. Freight Forwarders Efficiency. The R-Squared statistic indicates that the model as fitted explains 52.5% of the variability in freight Forwarders efficiency. This simply implies that about 52.5% of the total variation in measure of the freight Forwarders efficiency is explained by the variations in Port operations automation. The regression coefficient ( $\beta=0.757$ ) of the above equation for the model implies that unit change in port operations automation will exert a positive effect on freight Forwarders efficiency. Also the p-value of (0.000) which is less than the level of significant at the 0.05 level (2-tailed) indicate that the result is statistically significant; therefore the null hypothesis is rejected and it can be concluded that there is significant effect of port operations automation on freight forwarders efficiency.

**Hypothesis II**

H<sub>02</sub>: Port infrastructure does not have significant effect on freight forwarders operations in Nigeria ports.

**Regression Analysis**

**Table 4.4.2: Regression Analysis Port Infrastructure vs. Freight Forwarders operations**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.701 <sup>a</sup>	.491	.021	1.439		
a. Predictors: (Constant), port infrastructure						
ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	65.923	1	65.923	207.300	.000 <sup>b</sup>
	Residual	100.809	317	.318		
	Total	166.732	318			
a. Dependent Variable: freight Forwarders operations in Nigeria						
b. Predictors: (Constant), port infrastructure						
Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.799	.217		3.674	.000
	Port Infrastructure	.747	.052	.701	14.398	.000
a. Dependent Variable: freight Forwarders operations in Nigeria						

The table above tagged model summary shows the correlation analysis between the predictor and the dependent variable which. The R value of 0.701 shows a strong positive relationship between the two variables which are port infrastructure (independent variable) and freight forwarders operations (dependent variable).the R squared which is 0.491 shows that 49.1% of freight forwarders operations in Nigeria is as a result of port infrastructure while the remaining 49.6% is as a result of other factors.

The F test which shows a value of 207.300 is greater than F statistic which shows the rejection of H<sub>0</sub> which means port infrastructure has significant effect on freight forwarders operations in Nigeria ports.

#### 4.4 DISCUSSION OF FINDINGS

The results show that improvement in quality of port infrastructure and logistics performance would bring the greatest benefits to the economy of a country. The study revealed that the quality of port infrastructure has a significant positive effect on freight forwarders in Nigeria. Our findings are also similar to those of Deng (2019) as we found no association between seaborne trade (i.e. port demand) and efficiency of port users. However, quality of port infrastructure significantly affects the logistics performance of a country. Similar to Hausman et (2013), we also found that logistics performance affects the port trade of a country.

Infrastructure for the purposes of this study refers to both physical (hard Infrastructure) and soft (Management of Port operations) which inversely influence container terminals. 60% of the respondents assess infrastructure to be very important. 63.3% of the respondents assess the congestion of container operations at the port to be on average, due to certain number of factors. Apart from the fact that the findings of this study could guide the policy and decision making of government particularly in ports operations and generally in shipping, it has revealed that effective port operations is important in boosting Nigerian economy because about 90% of Nigerian bound imports pass through the seaport. It has equally established the fact that Cargo throughput, ship traffic volume and gross registered tonnage are port operations indicators influenced Nigerian GDP. Vessel gross registered tonnage was found to have a positive significant impact on Nigerian economy while the influences of cargo throughput and ship traffic volume were not significant.

### Summary, Recommendations and Conclusions

#### 5.1 Summary

If a port and city create a shared spatial system, the transport system of the urbanized area must include the present and future traffic flows generated in the port area. The factors, which influence their volume and nature, include the port traffic volume, the level of development of its objective functions and, as a result, the fields of its activity. The development of the industrial and logistics distribution function and, consequently, the functioning of the port as an Inland Logistics Center (ILC) and Industrial Park (IP) leads to the big movement of goods transported by road, including the ones delivered to the port conurbation system. An efficient and modern port is an important component that determines ship accommodation and increased port throughput. Terminal container operations in modernized ports are also important to avoid delays and uncertainties, which is

also helpful in improving sea transport connectivity. Although some key economic reforms in Nigeria have been delayed, the national government has shown vision and determination in implementing far-reaching reforms in the port sector. Improving the capacity and efficiency of port operations is a critical element of larger government plans to improve the country's transport network, often cited as a key factor in limiting business activity and overall economic development.

## **5.2 Conclusion**

From the foregoing, if Nigeria wants to grow economically, the security and safety of our ports must be taken seriously. The seaport manager in Nigeria must employ security standard which the advanced or world class economy have undertaken to grow their maritime business. Adequate security agencies must be provided to bring sea pirate to check. Kidnapping and other forms of terrorism must be curtailed in most of the Nigerian seaports, this is because if security of lives, goods and services are not well guaranteed in ports, no investor will like to waste both money and lives in the course of transporting his or her goods from loading countries to Nigeria or other country. Theft of goods are in most occasions being responsible for by freight forwarding companies workers who have undertaken to either load or off-load the cargoes, at times, they remove part or high volume of numbers of goods destined for importation or exportation. Adequate measures must be employed to check this unlawful habit of ad-hoc staff of freight forwarding companies, otherwise it will affect volume of trade with Nigerian sea port negatively.

To curtail this, well trained police officers or other security agencies must be stationed in all the Nigerian seaports to avert what it could be described as seaport economic loss disaster. The port operations indicators that were assessed include cargo throughput, ship traffic volume and gross registered tonnage. Apart from the fact that the findings of this study could guide the policy and decision making of government particularly in ports operations and generally in shipping, it has revealed that effective port operations is important in boosting Nigerian economy because about 90% of Nigerian bound imports pass through the seaport. It has equally established the fact that Cargo throughput, ship traffic volume and gross registered tonnage are port operations indicators influenced Nigerian GDP. Vessel gross registered tonnage was found to have a positive significant impact on Nigerian economy while the influences of cargo throughput and ship traffic volume were not significant.

#### 5.4 Recommendations

On the basis of the findings of this study, the researcher has drawn the following recommendations:

1. Enlarged space must be created at most of the Nigerian seaports so as to accommodate security agencies who will like to provide security for safety measures, for goods and services at the seaports.

2. Safety and security of lives and properties at the Nigerian seaports must be seen as everybody's business needs to grow and be compared with other countries of the world, stake holders in maritime business must be willing to adopt security preventive measure to avert what could lead to disaster or loss of lives and properties at the seaport in Nigeria.

3. Corruption must and should be promptly checked among the managers of the Nigerian seaports. Often times, Nigerian government do provide funds to cater for things like building of security posts and providing equipment in most of our national ports, but the funds allocated in most occasions are being diverted to personal use. This is not good and at times create bad impression about the government at the central.

4. Construction of good and motorable road leading to all seaports need to be taken serious and urgent. This is because if there is the case of emergency at seaports, if good road is in place, the level of loss will be minimized if an expert or trained securities are put in place

5. There should be improvement in the number and capacity of cargo handling equipment to enhance port operations vessel turnaround time and berth occupancy; and the Nigerian government should develop the country's inland infrastructure of rail and water ways. This will not only facilitate swift transfer of cargo from the ports to the hinterland but will also greatly improve ports operations by reducing congestion both in the ports and on roads.

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# SCIENCE VERSUS CONSCIENCE IN CRISIS MANAGEMENT. TECHNOLOGY VERSUS FUTURE WITHOUT PEOPLE. INTERDISCIPLINARY APPROACH

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## **Abstract:**

*In the current context, but especially the future one, in which a series of crises is taking shape more and more clearly, which specialists from different fields, theorists or practitioners, researchers and the academic environment have warned that they will be established with certainty in the coming years, it becomes a priority for Romania to reposition itself in the single European market, but also in the global economy.*

*In the conditions where the environment changes dramatically from day to day, in which economies become vulnerable, after years in a row the solution to success was considered to be the interconnection of economies (especially in Europe), and the stimulation of competition at any cost, under the pressure of the digital age that imposes new technologies and the transformation of the life and work of each of us, we are obliged to reposition ourselves this time not to perform but ONLY to resist the various forms of crisis that are foreshadowing: the energy crisis, the food crisis, the climate crisis, environmental crises, resource crises, etc.*

*This study, presented in an interdisciplinary, sociological, philosophical, psychological, legal and economic approach presents, in current realities, a point of view corroborated with the current stage of technological*



*development of the Romanian economy, a scenario that can be considered regarding recovery options economy of Romania, drawing attention to the human component, without which nothing can be built.*

**Keywords:** *economic crisis, digitization, technology, consciousness, science, fundamental human rights, single market*

**JEL Classification:** *K20, Y8, F630, F69, F550, F 230*

**Introductory remarks:** Why science versus conscience in crisis management. It is a delicate subject, if we consider that the geniuses of science were misunderstood and judged in the contemporaneity in which they lived, which is why some of the results of their research are still trying to be deciphered today. Why technology in the service of man or replacing him with artificial intelligence?... because this is the future, provided that man continues to drive the machine and AI does not subordinate him and violate all his freedoms and rights won by his ancestors ours, generating dictatorial, discretionary, discriminatory societies, etc. specialized literature begins to develop this topic, finding that those who have something to say on this topic are from different fields of science, which generates an urgent and acute need for there to be as close a collaboration as possible without competition between them, which seems paradoxical in the globalized world in which we live. Sociologists, psychologists, psychiatrists, medical therapists, and the list is long, are beginning to write about the effects of the sudden changes that have engulfed all of humanity, especially after the global pandemic period (2019-2022) and that have forced the peoples of the world to use AI on a large scale and changed their individual and collective behavior. The Chinese model of the social score is an example that most do not consider to be generalizable, although as time goes on more and more specialists notice that some Chinese models/patterns can be found in the governance style of some European states . For example, the guaranteed minimum income experienced during the pandemic in Spain and Portugal looks like and is inspired by the Chinese model. In this study, a continuation of the themes presented annually in recent years at the CEN conference, it also analyzes interdisciplinary aspects related to the need to awaken human consciousness, at this turning point in the history of human civilization. The future of the planet depends on how humanity as a whole reacts. Even if it may seem pompous, perhaps extravagant and unrealistic, the speed with which new technologies are implemented in everyday life shocks and creates a

mirage mimicking the help and good intentions of those who have already experienced on population groups, during the pandemic, the way people reacts to various stressful situations, fear, etc. The problem of willingly renouncing fundamental rights and freedoms, out of convenience, out of fear, indifference, remains a delicate aspect from the perspective of humanity's future. The interdisciplinary approach becomes a necessity to understand the mechanisms of manipulation, the speed with which all this is being implemented is suspect. "Improvisations are better when they are prepared", said Shakespeare. That's why when all the signs point to an upcoming crisis period, it's time to prepare thoroughly, like for an exam. However, what is Romania doing, in the current global context? And this time she seems unprepared, as if waiting for "instructions" from somewhere....where? Everyone knows, those who say it are ostracized, vilified, considered conspiratorial, and yet what do you do if it turns out they were right?

The current system of governing states by elites uses many of the methods that seem to have been forgotten, such as those expounded by the Italian diplomat, philosopher, politician and writer Niccolò Machiavelli, a prominent representative of the Italian Renaissance, who "inspired" many statesmen through the principles of governance recorded in his work "Il principe", considered by the way, the first modern political treatise.

Why do we find that many of the ideas of this Italian diplomat and politician from his book "The Princes" (1532), given to the Florentine governor at the time, Lorenzo de' Medici, are still applied today by the statesmen who rule the world, as an "organization"? (The book was printed in 1532 and contains a series of advice for Lorenzo de' Medici, the Florentine governor of those times. The book has significantly influenced over the centuries the thinking of statesmen such as Oliver Cromwell, Henry VIII, Louis XIV, Napoleon I, Otto von Bismarck, John F. Kennedy. But also of underlings like John Gotti, who frequently quoted from Principe and considered it a reference book of his "organization"-<https://florinrosoga.ro/book/principele-niccolo-machiavelli/>) One reason Machiavelli wrote The Prince was to curry favor with Lorenzo de' Medici, the governor of Florence, to whom the book is dedicated. Machiavelli hoped to obtain an administrative position within the government. Unfortunately his strategy didn't work.

According to the recommendations, the leader of the state (principles), makes decisions on behalf of the subjects, without being liked and loved by the people, but on the contrary, through the difficult decisions taken, he must be respected and

feared, ensuring the subjects stability and the certainty that they are governed. Machiavelli even advises the prince to make sure he kills anyone who might oppose his rule before anything else. (Synthesis according to <https://florinrosoga.ro/book/principele-niccolo-machiavelli/>)

### **Why science versus consciousness?**

At the moment when, on a collective level, there is an increase in the level of consciousness, activating the soul that each of us has from birth, we return to the feelings of empathy, care for those close to you, respect for the one next to you, which obliges the respect of the rights and freedoms of each of us, to the revival of the traditional Romanian spirit of help, which kept us as a nation in the "Danubian-Pontic space" as it is called by historians.

If we also remember how our ancestors revolted and regained their lands and territories stolen by the invading foreigners throughout the history of this nation, we will notice that the solution was the union of all forces, and the renunciation of individualism modern became a trend, fueled by a competitive spirit, most often destructive, but a proof of modernism, for the last generations.

### **The factual and legal situation**

Beyond the philosophical and sociological aspects, we must note that the delegation of powers to the European institutions with the adoption of the Lisbon Treaty in 2009, after Romania's accession to the European bloc in 2007, generated, in the early years, the Romanian presence with equal rights in the great European family", a series of positive developments from the perspective of the transition from a totalitarian communist economy to the European market economy, on a competitive single market. In the years of economic progress of Europe and implicitly of Romania, through the adoption of European legislation, involving the transposition of the community acquis into Romanian legislation, positive effects appeared on the national economy.

However, as William Shakespeare said: "It is not enough to raise the weak, you must support them later"! and this would be confirmed later, when Europe began to face the pressure of Great Britain's exit from the EU and the global pandemic of 2019-2022.

This was the test of the truth regarding the degree of European solidarity, the fundamental principle since the establishment of the European Union, as the successor of the European Communities, which later became the European Community and currently the European Union. Thus, shock after shock, the

European Union closed ranks among the old members of the community bloc, rebuilding spheres of influence and "isolating" the new members (the states from the former communist bloc), confirming that "the old tempers are never lost", even if an attempt is made, in a conjunctural and temporary way, to hide them under the slogan "Unity in diversity".

Real life confirms to us that in crisis situations you remain on your own and that each state "literally closes its borders", for example during the global pandemic, and figuratively through the protectionist policies practiced, through the method of the double standard of products in the retail area food, and the examples can go on.

Although European legislation apparently tries to create the feeling of equity and good governance, in reality, after years in which Romania knowingly gave away the country's wealth, as if forgetting the words of Stephen the Great: "Remember the words of Stephen, who it was good-bye to you until old age... that Moldova did not belong to my ancestors, it was not mine and it is not yours, but to your descendants and the descendants of your descendants forever and ever...".

Paraphrasing, Romania, in the current borders, which have also been modified, according to the geopolitical interests of the neighbors, "it was not of our ancestors", it was not of those who lead us and it is not ours, (the contemporaries of these troubled times), "but of our descendants, and of the descendants, our descendants forever and ever...!"

But even this way of thinking is currently criticized and cataloged, condemned as non-European....since it is about nationalism. However, all member states defend with all their might their national wealth, and even their national interests in our country.

A concrete example is the way multinationals are taxed and especially the way profit is repatriated both in their case and in the case of foreign banks that have taken over the Romanian banking system. With domestic political support, through successive legislative amendments, domestic capital was gradually eliminated from the Romanian banking system through the classic methods, according to the textbook, of bankruptcy, mergers, buying them at ridiculous prices for their purchasing power, more so for their assets.

Moreover, this policy of closing all state and private enterprises, small, medium and large, was carried out in the 33 years (1990-2023) with the concurrence of politicians regardless of their orientation and beliefs.

At this moment, when it seems that the country no longer belongs to us, when foreign capital is constantly withdrawing from the country, by repatriating revenues and profits, when contributors to the state budget are the few Romanian

legal structures that stubbornly resist and do it with hard, especially after the blows received post-pandemic, when many businesses were forcibly closed (through laws later proven abusive and useless from the point of view of the reason invoked to stop the spread of the pandemic), which subsequently never opened again; a question is emerging, rightly so, to which an answer is still being sought: what role does Romania play in the new geostrategic repositioning of forces in Europe and in the world?

Machiavelli's advice is still relevant today. "Be friends with the neighbors of the kingdom. Don't let people hate you, but don't worry too much if they don't really like you" The war in Ukraine, also predicted and announced by Putin himself at meetings of world leaders, was in turn ignored and considered a political discussion which cannot become reality, only because the rest of the world has generated a series of sanctions against Russia. Reality has shown that in this case too Europe was not prepared, as it was not prepared in the case of the pandemic either. (For details, see the published studies and indicated in the bibliography at the end of the paper.)

### **Technology versus the future without humans.**

Coming back to the risks of misappropriating the use of artificial intelligence (AI) for human benefit the new technological era we have entered for some time now is a reality that cannot be disputed and constitutes the future whether we like it or not! The benefits of using (AI) is undeniable, but given the experiences of history, increased attention is needed, so that this man-made intelligence does not get out of control, or be used to human detriment. (Păun Roxana-Daniela, 2023)

Despite the difficulties that can still be encountered in perceiving such an essential evolution, humanity has entered, even if only partially, the era in which intelligence transforms and in turn transforms the world. The IT and technological revolution and the explosion of new media systems inexorably involve us in these processes.

Informatics introduces a new way of thinking, extending intelligence, through artificial intelligence, which it puts in direct relation with the other intelligences within the global system, thus creating a spatially unlimited synergy that allows the understanding of situations, turning information into wealth and an influence factor. Due to the role played by information and communication in preventing or preventing conflicts or crises, or for the resolution of other critical situations arising in peacetime, during their development, at the general and operational level, the informational confrontation acquires an unsuspected importance.

### **The influence of 5G on contemporary human life**

Knowledge is power, which means data is power. Collecting data about us has an attractive twist in part by disguising it as convenience. We are told that this information is a byproduct of all the applications designed to make our lives simpler and more comfortable, relieving us of some of our work and making our lives safer. Cameras are already ubiquitous especially in the biggest city and more sensors will be introduced with 5G that detect or measure temperature humidity light movement pressures and so on these are the sensory organs of smart cars and the networked world. No aspect of our lives will remain unmonitored by biosensors that transmit such data to another location for further processing, in many cases we will have no control over who has access to certain data, or even who they can access them whenever they want, not to mention the data we voluntarily publish on social media platforms and through digital assistants or mobile phone applications.

*If it is technically possible, they will do it, and this type of surveillance will no longer be used only by military secret services or state agencies, in the area of national security, but will be used by companies with commercial interests, organizations whose only true God is the value for the shareholding.* (said Edward Snowden, quoted by [https://ro.wikipedia.org/wiki/Edward\\_Snowden](https://ro.wikipedia.org/wiki/Edward_Snowden))

But what data are you constantly revealing through your internet shopping habits that you voluntarily hand over to social media platforms through your Smart Home apps - your electric heating and digital water meters, your wearable technology or smartphone apps are being collected connected and analyzed?

Finally, it can create an image of you that is not to the liking of the bank or your employer, your health insurance provider. Your blood pressure is too high, you don't get enough sleep and you don't exercise enough, according to electronic data collected through the wrist device, which has become mandatory. If you want to get health insurance, it reminds you that if you don't change your lifestyle, your health insurance premium will unfortunately increase by 50% next month. What you don't know right now is that your employer also has access to all the latest available data about your lifestyle, and in the next round of downsizing they'll be putting you on the list of people they'll soon be offering, a dismissal contract. *A bit over the top?* Writes Barbara Newerla, in a volume that apparently has nothing to do with a future control of world populations, volume originally published in German in 2009 and later edited in English in 2010, second edition in 2020 and reprinted in 2021. In the section "Consequences of BIG Data in the future", of the volume "Crystal protection from 5G and EMF pollution", describes the entire

"social score" system already introduced in China and considered a "gigantic social engineering experiment".

"Everything is connected to the facial recognition system and intersects with financial, medical and legal documents. The entire apparatus is interpreted and regulated by advanced artificial intelligence networks, which looks like something out of a dystopian sci-fi movie, but China is going even further." writes the author of the post, citing reactions from some Chinese citizens." (see also the 27's minute film - Exposing China's Digital Dystopian Dictatorship - [https://www.youtube.com/watch?v=eViswN602\\_k](https://www.youtube.com/watch?v=eViswN602_k) published by the Australian Broadcasting Corporation - the Australian public radio broadcasting service). The essence of this system is to award merit or demerit points based on the degree of obedience, "if you have few points, your child will not be allowed to attend the chosen school, you will not get a new apartment, and your friends will avoid you, because association with someone who falls behind in the points system is at the expense of their own points."

Is this the new form of competition for the new era? With certainty the future will confirm or deny what now seems like a "science fiction" story, because it depends on access to real information, and not manipulated information, because it depends on the level of consciousness of each person, beyond professional training and ability to understand messages and information, but also to distinguish between real and "fake" or distorted information, in order to be accepted by the mass of the world's population. Last but not least, it depends on how attracted world leaders will be to take over and/or apply/modify this system in their own state.

***"The sleep of reason breeds monsters"*** is a famous expression, used today in various contexts. However, the lack of reaction of nations bewildered by the information bombardment gives those who are tempted and even use artificial intelligence for purposes that distort human life on earth, only out of a desire to optimize their profits and gain by all means and methods money and power, it is that which affects the evolution of life on earth in a peaceful way, without wars and without violent states of competition, where it is not the case. Paradoxically, from the Second World War to the present, wars, armed conflicts, states of aggression have continued in various parts of the globe that have changed the fate of the oppressed, aggressed nations and where rich states have continued to establish local, regional institutional structures and global that seem to want world peace, to organize peace conferences, but in reality they have continued to arm themselves and even in some situations to sell arms to both parties involved in the conflict!

There is room for everyone under the sun on this planet, and human laws become ineffective for the advancement of humanity when they are manipulated by interest groups hostile to evolution. Societies evolve when there is a harmony between economic and natural laws, structured in effective legal regulations. The lack of collaboration between the economic and the legal, doubled by the political interference in the economy and justice, generates bad laws, with procedural loopholes, with successive sometimes aberrant changes, ignoring the mandatory requirements of a legal norm. All of which bring disastrous effects to the economy and the standard of living of the citizens. Including in Romania in recent years, it was governed by the Constitutional Court, which saw itself obliged to correct the mistakes made at the level of the law and which brought serious damage to the rule of law, the Constitution and created inequities for the citizens! Bad laws or laws not adapted to the economic requirements of the current stage of development of Romania, a member of the European Union, have brought and still bring damage to our country.

### **The effects of the digitalization of society through 5G technology**

"The driving force behind 5G even in the US and Europe is politics, yes, you read that right. it's not big business, but the political world pushing for the rapid introduction of 5G, although as a technology standard it is in some ways still in its infancy.", declared Barbara Newerla in 2021 in the section of her book entitled: "The consequences of BIG Data in the future ".

However, the prospect of comprehensive surveillance is too tempting, even if it seems unrealistic, at least for the time being in the Western European world.

The same authors list other possible consequences of the digitization of our world using 5G including:

- large-scale job losses and widening chasms in society
- the increasing involvement of each individual in virtual realities
- alienation from the Natural World and natural resources
- complete dependence on digital devices and applications
- atrophy of cognitive abilities called digital dementia

Many of these effects are beginning to make themselves felt and are confirmed by sociologists, psychologists, psychiatrists, etc.

### **The science of manipulating information through modern technology for economic purposes**

The Internet has become the technical support of networks of influence that have far exceeded the stratification of traditional society by states, nations,



cultures, religion, etc. At the same time, these new divisions have multiplied by establishing new networks to support particularist opinions. The knowledge of these networks and the ability to influence them becomes an important means of action in the solution of both the multifaceted conflicts that the world knows at the present time, as well as other situations that would be appreciated at first glance as "of peace" (Georgeta Stefania Ungureanu, 2021)

Today, media support for political decisions and military actions has become indispensable. The war in Yugoslavia, for example, caused the media, especially television, to have an important influence on them, its channels, its information, continuously operating and with the possibility of broadcasting instantly around the world, helping to raise awareness of opinions about broadcast events and shaping, little by little, international opinion.

But information is not only produced by television. In Rwanda, the radio station "O mie de coline" played an important role in uncovering the massacres of 1996. It was the same in Bosnia, and in Iran it played a special role in starting the revolution that led Iran to withdraw the cassettes had it.

In 1955, President D. Eisenhower declared that, "the day when the people of the communist countries will be as well informed as those of the free countries, discontent, agitation and revolt will encompass millions of people in these countries and will probably cause , reforms in government structures or the brutal fall of communist dictatorships."

The conflicts of the future tend to revolve more and more seriously around the manipulation of information and the modification of even human behavior in the last resort, without much recourse to weapons, because the use of brute force is cruel, often ineffective, and more reluctant to re-solve conflicts. Even in the armed confrontation, instead of victims and material destruction, they rely more and more on the use of new technologies for conducting radio-electronic warfare, destroying the enemy's information and communication networks, drone attacks, etc. In future armed conflicts, information will be able to be transmitted or intercepted, it will be impossible to determine if it has been stolen, and it will also be difficult to tell who carries it, what they know, and especially how much the adversary knows. This information, but especially the way it is used, changes the fate of the economies of the states that become vulnerable, from prosperity to poverty being just one step! To satisfy his thirst for information, modern man uses modern vectors for their transmission. The evolution from newspapers, magazines, landline phone, fax, TV, is felt in the information society using modern technologies, the Internet, social networks, vlogs, blogs, podcasts, etc., becoming, in a way unconsciously,

increasingly dependent on them and giving them a large dose of trust, dependence, which represents an extraordinary opportunity for information manipulators.

**Conclusions:** Shakespeare also said: "*In our mad attempts, we give up who we are for what we hope to be.*" That is precisely why, "The wise man does not sit down to mourn, but cheerfully attends to his task of repairing the damage done." There are generations that went through world wars, years of famine and infectious diseases, natural cataclysms that led to the disappearance of some cities by fire, sinking caused by earthquakes of great magnitude or atomic weapons.

The disappearance of the city of Pompeii, the sinking of Atlantis - the lost city, the legendary Atlantis, described by the ancient Greek philosopher Plato in two of his works, as a rich island, which was swallowed by the sea, following earthquakes, the atomic bombings of Hiroshima and Nagasaki, other sunken cities, etc.) are just a few examples, which despite the tragedies of those generations did not lead to the extinction of the human species. Survivors, where they existed, adapted, rebuilt, and generated current progress.

For this reason, it can be assumed that the end of the world is not coming, as some try to induce through the mass media, generalizing a state of fear and helplessness... but with all our strength we must be aware of what is happening and act together, without wait for someone else to come and restore your prosperity and well-being!

No stranger will accept a prosperous nation other than himself near his borders! Imperialism, which some believed to be dead, is gradually being reinstated through modern and updated methods, precisely to deceive the vigilance of historians and to keep the collective consciousness asleep, so that until the awakening of the nations, the new forms of colonialism are already established, without the possibility of small states to react. The new forms of subjugation in all areas of human life are achieved by seizing natural resources, by ceding the sovereignty of the states in the hands of those who peacefully, "for the good and development of the country", entrust the leadership of the country to foreigners, through the migration phenomenon that we went through and which aimed at "replacing the old, aging populations of the European continent with an amorphous mass of uneducated immigrants, (See the 2000 UN report)

A quick solution would be to return to education, tradition in respecting the generations that created added value, adopting and adapting to the new according to the local economic specifics. The import of technologies at any price, without adapting it to Romania's market realities and not to excessively pessimistic or

optimistic statistics and forecasts, is, in my opinion, a mistake that, at present, is not aware of the real danger for the future of the country.

A few brief arguments: excessive robotization and absolutized computerization generate irreparable ruptures between man and the device, the software used (phone, tablet, computer, drone, location software, etc.). The obvious rift between people is perhaps not yet realized to its true extent. Paradoxically, man is interconnected non-stop using these technologies, which certainly represent the future, but in reality alienated, alienated, robotic, without empathy, without a spirit of helping, a reality confirmed by psychologists, psychiatrists, sociologists, ethics specialists, And so on Exaggerated stimulation of competition between people, firms, etc. by eliminating cooperation, it also breeds soul loss in favor of a generalized state of indifference to one's fellow man.

After the destruction of socialist/communist associative forms, and their replacement with nothing, for a long period of time, generated chaos and lack of collaboration, toxic for any successful business, the return to European associative models was realized after everything was already destroyed. According to the models used in wars, the aggressor attacks you, destroys your country, infrastructure, material goods, and then he also offers to rebuild, this time with your money, forcing you to take out loans, which you pay back in decades . What happens to those who have no debt??? They are removed from the leadership of the states. The surprising statement of the former president of Princeton Economics International Ltd. (Which by the way is the symbol of an offshore jurisdiction-Limited Liability Companies/ LTD is not actually an acronym; it is a shortened term for the word "limited". LTDs, Limited Liability Companies, and Limited Companies are all exactly the same. Limited Liability Companies, as per <https://www.mintformations.co.uk/blog/what-does-ltd-mean-complete-guide-limited-companies/>) Martin Armstrong, taken during a conference held in Philadelphia, USA., confirms what was said above. (<https://www.youtube.com/watch?v=bT9I48dnIJA>- Romania - the only country in the history of humanity that paid its debt to the banks, in 1980, starting from the year 6000 ÎHR. "Romania no longer pays tribute to anyone", Ceaușescu said then, on April 12, 1989, the date of the liquidation of Romania's debt, 25 Dec 1989, the date of the liquidation of President Nicolae Ceaușescu), On April 12, 1989, according to the statements made by Nicolae Ceaușescu, Romania had got rid of its debt which amounts to 21 billion dollars. Moreover, our country still had to recover 2.5 billion dollars. They were never recovered. <https://evz.ro/aprilie-romania-sua.html>)

The consumer society that leads to progress, if not absolutized, generates new habits, stimulates modified behaviors, but also changes in consciousness. Governing by fear alters the state of consciousness. (<https://trezireainterioara.com/post-title-5/>)

David Hawkins, author of the "Scale of Consciousness" or "Pyramid of Consciousness", using applied kinesiology, the science that uses the body's muscle response, which acts as a kind of antenna, to test the truth or falsity of certain statements (whether or not they exist in the information field that surrounds us) or how beneficial certain treatments are. Our body reacts by being stronger, when we tell the truth, and by being weaker, when we say something that is not true. Determinations and measurements can be made individually or with the help of another person. The accuracy of the responses appears to be influenced by the level of consciousness of the person taking the measurements. The more evolved the person, because fundamentally the motivation behind the calibrations would be beneficial to life, the more valid the results. Those who calibrate below 200 on the Scale of Consciousness, i.e. below the level of Integrity, cannot make accurate measurements because their motivation for seeking information is most likely not beneficial to themselves or others, or the way they would use the results would be disingenuous." (<https://andreafilep.com/kinesiology-aplicata/>)

David Hawkins, uses applied kinesiology to measure the vibrational level of human beings, has actually developed a map of the levels of human consciousness. Dr. David R. Hawkins, one of the contemporary luminaries, doctor of medicine and philosophy, expert in mental processes, has studied and experimented with levels of consciousness for decades and discovered a logarithmic scale that equates to different corresponding energy levels. Each level of consciousness development determines your degree of happiness, the emotions you usually feel, the processes that take place inside you and the general outlook on life.

*"Each level of consciousness has its own view of life, of God, its own view of self, emotions and the process of evolution. You can see the whole world in one graph. It shows you a way out of the pit of despair all the way up into state of Enlightenment."* (<https://www.libris.ro/harta-constiintei-david-r-hawkins-DAA978-606-8597-23-2--p28663005.html#descriptionHead>)

In fact, the book offers solutions regarding enlightened leadership (or how people's lives could be if the leaders evolved spiritually), business success, understanding addiction and the steps needed to recover from addiction would be just some of the topics developed in the volume.

In times when things can no longer always work according to the book, a different approach is needed, an interdisciplinary and close collaboration between specialists of all fields involved in finding causes and solutions, in order to counteract the effects on human communities and they are structured on different levels.

I conclude with William Shakespeare: "The gravest sin against our fellows is not to hate them, but to treat them with indifference; this is the essence of humanity" especially if: "we know what we are, but not what we can become!" "Don't trust someone who has lost his faith!". It is also important to understand one of the re-education methods from the totalitarian communist system which sounded something like this: "In the beginning we ask you to talk like us; in the end, you will think like us" Notice to amateurs who risk becoming robots and forget to remain human, as they were born!

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## MATHEMATICAL ANALYSIS OF AN INDUSTRY WHEN COST OF PRINCIPAL RAW MATERIALS INCREASE: A NONLINEAR BUDGET CONSTRAINT ATTEMPT

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### **Abstract:**

*During profit maximization procedure an industry faces various difficulties; and increase of cost of principal raw material is one of them that happen frequently. In this study an attempt is taken to discuss economic effects on various inputs when the cost of principal raw material is increased. The economic sensitivity analysis of various inputs on the basis of principal raw material is an essential step for an industry when the industry is on the profit maximization track. This article deals with four variable inputs, such as capital, labor, principal raw materials, and irregular inputs of an industry, where nonlinear budget constraint is considered. This study stresses on mathematical formalities to show the economic predictions scientifically.*

**Keywords:** *Profit maximization, nonlinear budget constraint, principal raw material*

**JEL Codes:** *C61, C67, D21, D24, H32, I31*



## 1. Introduction

Once global economy was very poor and did not depend on mathematics. But the situation is changed from the 19<sup>th</sup> century and at present mathematical modeling becomes an essential tool in economics [Samuelson, 1947]. Mathematics not only covers economics, but also covers many fields of social sciences, such as psychology, sociology, political science, etc. [Carter, 2001]. We do not demand confidently that the global economy is sustainable always. But every industry can proceed very carefully for the economic development and sustainability [Ferdous & Mohajan, 2022]. The aim of every firm is to achieve maximum profit with minimum cost [Eaton & Lipsey, 1975]. Scientific economic predictions help the industry to develop economic structure for future production [Mohajan & Mohajan, 2022b].

Actually the method of Lagrange multiplier is a valuable and dominant technique in multivariable calculus [Baxley & Moorhouse, 1984; Islam et al., 2010]. We have applied it to obtain higher dimensional unconstrained problem from the lower dimensional constrained one. Cobb-Douglas production function is used here to operate the determinant of  $6 \times 6$  bordered Hessian matrix, and  $6 \times 6$  Jacobian properly. We have also applied Implicit Function Theorem of multivariable calculus [Cobb & Douglas, 1928].

## 2. Literature Review

Literature review is considered as an introductory section that shows the works of previous researchers [Polit & Hungler, 2013]. Two US professors Charles W. Cobb (1875-1949) and Paul H. Douglas (1892-1976) have introduced concept of production functions, which is known as Cobb-Douglas production function [Cobb & Douglas, 1928]. Another two US scholars John V. Baxley and John C. Moorhouse have developed the optimization problems in mathematical economics [Baxley & Moorhouse, 1984].

Professor Jamal Nazrul Islam (1939-2013) and his coworkers have studied profit maximization for social welfare [Islam et al., 2010, 2011]. Pahlaj Moolio and his coauthors have used the Cobb-Douglas production functions in the optimization problems [Moolio et al., 2009]. Lia Roy and her coworkers have discussed cost minimization policy for the sustainable development of an industry [Roy et al., 2021]. Jannatul Ferdous and Haradhan Kumar Mohajan have discussed on a profit maximization problem [Ferdous & Mohajan, 2022]. In a series of papers Devajit Mohajan and Haradhan Kumar Mohajan have studied on optimization analysis [Mohajan & Mohajan, 2022a-f, 2023a-g].

### 3. Research Methodology of the Study

Research is a systematic inquiry where researchers collect data and information; later analyze and interpret them efficiently to give a rational and sensible conclusion [Groh, 2018]. It searches for truth and tries to advance the stock of human knowledge [Pandey & Pandey, 2015]. It is the careful consideration of a problem that uses scientific methods to explain, predict, and control the observed phenomenon [Babbie, 2017]. Methodology is a guideline for the accomplishment of a good research [Kothari, 2008]. It consents the reader to critically evaluate overall validity and reliability of a study [Howell, 2012]. Therefore, research methodology is the specific procedures that are used to identify, select, process, and analyze materials related to the research matters [Somekh & Lewin, 2005; Schwandt, 2014].

We have used Cobb-Douglas production function to discuss economic predictions. To obtain the results we have stressed on two matrix algebras: determinant of  $5 \times 5$  bordered Hessian and Jacobian matrices [Mohajan, 2017b, 2018a]. To prepare this paper we have depended on the secondary data sources. We have unsparingly consulted valuable articles and books of famous authors. We have also collected some materials from the internet and websites [Islam et al., 2009a,b; Mohajan, 2017a, 2018b, 2020].

### 4. Objective of the Study

The main objective of this article is to discuss the economic effects of various inputs when the cost of principal raw material is increased. Other minor objectives of the study are as follows:

- to explain the mathematical terms more clearly and elaborately, and
- to show the optimum results smoothly.

### 5. Lagrangian Function

Let us consider that an industrial firm is willing to make a maximum profit from its products. Let the firm uses  $E_1$  amount of capital,  $E_2$  quantity of labor,  $E_3$  quantity of principal raw materials, and  $E_4$  quantity of irregular input for its annual production. Let us consider the Cobb-Douglas production function  $f(E_1, E_2, E_3, E_4)$  as a profit function for our model [Cobb & Douglas, 1928; Islam et al., 2011; Mohajan & Mohajan, 2022a],

$$P(E_1, E_2, E_3, E_4) = f(E_1, E_2, E_3, E_4) = AE_1^\alpha E_2^\beta E_3^\gamma E_4^\delta, \quad (1)$$

where  $A$  is the efficiency parameter that reflects the level of technology, i.e., technical process, economic system, etc., which represents total factor productivity. Moreover,  $A$  reflects the skill and efficient level of the workforce. Here  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  are parameters;  $\alpha$  indicates the output of elasticity of capital measures the percentage change in  $P(E_1, E_2, E_3, E_4)$  for 1% change in  $E_1$ , while  $E_2$ ,  $E_3$ , and  $E_4$  are held constants. Similarly,  $\beta$  indicates the output of elasticity of labor,  $\gamma$  indicates the output of elasticity of principal raw materials, and  $\delta$  indicates the output of elasticity of irregular input. Now these four parameters  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  must satisfy the following four inequalities [Islam et al., 2010; Mohajan, 2022]:

$$0 < \alpha < 1, 0 < \beta < 1, 0 < \gamma < 1, \text{ and } 0 < \delta < 1. \quad (2)$$

A strict Cobb-Douglas production function, in which  $\forall = \alpha + \beta + \gamma + \delta < 1$  indicates decreasing returns to scale,  $\forall = 1$  indicates constant returns to scale, and  $\forall > 1$  indicates increasing returns to scale. Now we consider that the profit function is subject to a nonlinear budget constraint as [Mohajan & Mohajan, 2022a, 2023b],

$$B(E_1, E_2, E_3, E_4) = kE_1 + lE_2 + mE_3 + n(E_4)E_4, \quad (3)$$

where  $k$  is rate of interest or services of capital per unit of capital  $E_1$ ;  $l$  is the wage rate per unit of labor  $E_2$ ;  $m$  is the cost per unit of principal raw material  $E_3$ ; and  $n$  is the cost per unit of irregular input  $E_4$ . In nonlinear budget equation (3) we consider [Mohajan & Mohajan, 2023c],

$$n(E_4) = n_0 E_4 - n_0, \quad (4)$$

where  $n_0$  being the discounted price of the irregular input  $E_4$ . Therefore, the nonlinear budget constraint (3) takes the form [Mohajan, 2021a; Mohajan & Mohajan, 2023d];

$$B(E_1, E_2, E_3, E_4) = kE_1 + lE_2 + mE_3 + n_0 E_4^2 - n_0 E_4. \quad (5)$$

We now formulate the maximization problem for the profit function (1) in terms of single Lagrange multiplier  $\lambda$  by defining the Lagrangian function  $R(E_1, E_2, E_3, E_4, \lambda)$  as [Moolio et al., 2009; Mohajan & Mohajan, 2023e],

$$R(E_1, E_2, E_3, E_4, \lambda) = AE_1^\alpha E_2^\beta E_3^\gamma E_4^\delta + \lambda \{ B(E_1, E_2, E_3, E_4) - kE_1 - lE_2 - mE_3 - n_0 E_4^2 + n_0 E_4 \}. \quad (6)$$

Relation (6) is a 5-dimensional unconstrained problem that is obtained from (1) and 4-dimensional constrained problem (3), where Lagrange multiplier  $\lambda$ , is considered as a device in our profit maximization model.

## 6. Analysis on Four Inputs

For maximization, first order differentiation equals to zero; then from (6) we can write [Mohajan, 2021b; Mohajan & Mohajan, 2022e],

$$R_\lambda = B - kE_1 - lE_2 - mE_3 - n_0E_4^2 + n_0E_4 = 0, \quad (7a)$$

$$R_1 = \alpha AE_1^{\alpha-1} E_2^\beta E_3^\gamma E_4^\delta - \lambda k = 0, \quad (7b)$$

$$R_2 = \beta AE_1^\alpha E_2^{\beta-1} E_3^\gamma E_4^\delta - \lambda l = 0, \quad (7c)$$

$$R_3 = \gamma AE_1^\alpha E_2^\beta E_3^{\gamma-1} E_4^\delta - \lambda m = 0, \quad (7d)$$

$$R_4 = \delta AE_1^\alpha E_2^\beta E_3^\gamma E_4^{\delta-1} - \lambda n_0(2E_4 - 1) = 0, \quad (7e)$$

where,  $\frac{\partial R}{\partial \lambda} = R_\lambda$ ,  $\frac{\partial R}{\partial E_1} = R_1$ ,  $\frac{\partial R}{\partial E_2} = R_2$ , etc. indicate first-order partial differentiations of multivariate Lagrangian function.

Using equations (2) to (7) we can decide the values of  $E_1$ ,  $E_2$ ,  $E_3$ , and  $E_4$  as follows [Ferdous & Mohajan 2022; Mohajan & Mohajan, 2022f]:

$$E_1 = \frac{\alpha B}{k \nabla}, \quad (8a)$$

$$E_2 = \frac{\beta B}{l \nabla}, \quad (8b)$$

$$E_3 = \frac{\gamma B}{m \nabla}, \quad (8c)$$

$$E_4 = \frac{\delta B}{n \nabla}. \quad (8d)$$

## 7. Bordered Hessian Matrix Analysis

Let us consider the determinant of the 5×5 bordered Hessian matrix as [Islam et al. 2011; Mohajan & Mohajan, 2022g],

$$|H| = \begin{vmatrix} 0 & -B_1 & -B_2 & -B_3 & -B_4 \\ -B_1 & R_{11} & R_{12} & R_{13} & R_{14} \\ -B_2 & R_{21} & R_{22} & R_{23} & R_{24} \\ -B_3 & R_{31} & R_{32} & R_{33} & R_{34} \\ -B_4 & R_{41} & R_{42} & R_{43} & R_{44} \end{vmatrix}. \quad (9)$$

Taking first-order partial differentiations of (5) we get,

$$B_1 = k, B_2 = l, B_3 = m, \text{ and } B_4 = 2n_0E_4 - n_0. \quad (10)$$

Taking second-order and cross-partial derivatives of (6) we get [Roy et al., 2021; Mohajan & Mohajan, 2023a],

$$\begin{aligned} R_{11} &= \alpha(\alpha - 1)AE_1^{\alpha-2}E_2^\beta E_3^\gamma E_4^\delta, \\ R_{22} &= \beta(\beta - 1)AE_1^\alpha E_2^{\beta-2}E_3^\gamma E_4^\delta, \\ R_{33} &= \gamma(\gamma - 1)AE_1^\alpha E_2^\beta E_3^{\gamma-2}E_4^\delta, \\ R_{44} &= \delta(\delta - 1)AE_1^\alpha E_2^\beta E_3^\gamma E_4^{\delta-2}, \\ R_{12} &= R_{21} = \alpha\beta AE_1^{\alpha-1}E_2^{\beta-1}E_3^\gamma E_4^\delta, \\ R_{13} &= R_{31} = \alpha\gamma AE_1^{\alpha-1}E_2^\beta E_3^{\gamma-1}E_4^\delta, \\ R_{14} &= R_{41} = \alpha\delta AE_1^{\alpha-1}E_2^\beta E_3^\gamma E_4^{\delta-1}, \\ R_{23} &= R_{32} = \beta\gamma AE_1^\alpha E_2^{\beta-1}E_3^{\gamma-1}E_4^\delta, \\ R_{24} &= R_{42} = \beta\delta AE_1^\alpha E_2^{\beta-1}E_3^\gamma E_4^{\delta-1}, \\ R_{34} &= R_{43} = \gamma\delta AE_1^\alpha E_2^\beta E_3^{\gamma-1}E_4^{\delta-1}. \end{aligned} \quad (11)$$

where  $\frac{\partial^2 R}{\partial E_1 \partial E_2} = R_{12} = R_{21}$ ,  $\frac{\partial^2 R}{\partial E_2^2} = R_{22}$ , etc. indicate cross-partial, second order differentiations of multivariate Lagrangian function, respectively, etc.

Now we expand the Hessian (9) as  $|H| > 0$  [Islam et al., 2010; Mohajan et al., 2013; Mohajan & Mohajan, 2022d],

$$|H| = \frac{A^3 \alpha \beta \gamma \delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B^2}{E_1^2 E_2^2 E_3^2 E_4^2 \nabla^2} (\alpha + \beta + \gamma + \delta)(\delta + 3) > 0, \quad (12)$$

where efficiency parameter,  $A > 0$ , and budget of the firm,  $B > 0$ ;  $E_1, E_2, E_3$ , and  $E_4$  are four different types of inputs; and consequently,  $E_1, E_2, E_3, E_4 > 0$ . Parameters,  $\alpha, \beta, \gamma, \delta > 0$ ; also in the model either  $0 < \nabla = \alpha + \beta + \gamma + \delta < 1$ ,  $\nabla = 1$  or  $\nabla > 1$ . Hence, equation (12) gives;  $|H| > 0$  [Islam et al., 2011; Mohajan & Mohajan, 2022c].

### 8. Determination of Lagrange Multiplier $\lambda$

Now using the necessary values from (8) in (7a) we get [Moolio et al., 2009; Islam et al., 2011; Mohajan & Mohajan, 2022c],

$$B = \frac{\alpha A E_1^\alpha E_1^\beta E_1^\gamma E_1^\delta}{\lambda} + \frac{\beta A E_1^\alpha E_1^\beta E_1^\gamma E_1^\delta}{\lambda} + \frac{\gamma A E_1^\alpha E_1^\beta E_1^\gamma E_1^\delta}{\lambda} + \frac{\delta A E_1^\alpha E_1^\beta E_1^\gamma E_1^\delta}{\lambda}$$

$$\lambda = \frac{A E_1^\alpha E_1^\beta E_1^\gamma E_1^\delta \nabla}{B}. \quad (13)$$

We have observed that the second-order condition is satisfied, so that the determinant of (5) survives at the optimum, i.e.,  $|J| = |H|$ ; and hence, we can apply the implicit function theorem. Now we compute twenty-five partial derivatives, such as  $\frac{\partial \lambda}{\partial k}, \frac{\partial E_1}{\partial k}, \frac{\partial E_3}{\partial l}, \frac{\partial E_4}{\partial B}$ , etc. that are referred to as the comparative statics of the model [Chiang, 1984; Mohajan & Mohajan, 2023f].

Let  $\mathbf{G}$  be the vector-valued function of ten variables  $\lambda^*, E_1^*, E_2^*, E_3^*, E_4^*, k, l, m, n$ , and  $B$ , and we define the function  $\mathbf{G}$  for the point  $(\lambda^*, E_1^*, E_2^*, E_3^*, E_4^*, k, l, m, n, B) \in R^{10}$ , and take the values in  $R^5$ . By the Implicit Function Theorem of multivariable calculus, the equation [Mohajan & Mohajan, 2022e, 2023a],

$$F(\lambda^*, E_1^*, E_2^*, E_3^*, E_4^*, k, l, m, n, B) = 0, \quad (14)$$

may be solved in the form of

$$\begin{bmatrix} \lambda \\ E_1 \\ E_2 \\ E_3 \\ E_4 \end{bmatrix} = \mathbf{G}(k, l, m, n, B). \quad (15)$$

Now the  $5 \times 5$  Jacobian matrix for  $\mathbf{G}(k, l, m, n, B)$ ; regarded as  $J_G = \frac{\partial(\lambda, E_1, E_2, E_3, E_4)}{\partial(k, l, m, n_0, B)}$ , and is represented by;

$$J_G = \begin{bmatrix} \frac{\partial \lambda}{\partial k} & \frac{\partial \lambda}{\partial l} & \frac{\partial \lambda}{\partial m} & \frac{\partial \lambda}{\partial n_0} & \frac{\partial \lambda}{\partial B} \\ \frac{\partial E_1}{\partial k} & \frac{\partial E_1}{\partial l} & \frac{\partial E_1}{\partial m} & \frac{\partial E_1}{\partial n_0} & \frac{\partial E_1}{\partial B} \\ \frac{\partial E_2}{\partial k} & \frac{\partial E_2}{\partial l} & \frac{\partial E_2}{\partial m} & \frac{\partial E_2}{\partial n_0} & \frac{\partial E_2}{\partial B} \\ \frac{\partial E_3}{\partial k} & \frac{\partial E_3}{\partial l} & \frac{\partial E_3}{\partial m} & \frac{\partial E_3}{\partial n_0} & \frac{\partial E_3}{\partial B} \\ \frac{\partial E_4}{\partial k} & \frac{\partial E_4}{\partial l} & \frac{\partial E_4}{\partial m} & \frac{\partial E_4}{\partial n_0} & \frac{\partial E_4}{\partial B} \end{bmatrix}. \quad (16)$$

$$= -J^{-1} \begin{bmatrix} -E_1 & -E_2 & -E_3 & -E_4^2 + E_4 & 1 \\ -\lambda & 0 & 0 & 0 & 0 \\ 0 & -\lambda & 0 & 0 & 0 \\ 0 & 0 & -\lambda & 0 & 0 \\ 0 & 0 & 0 & -2\lambda E_4 + \lambda & 0 \end{bmatrix}.$$

The inverse of Jacobian matrix is,  $J^{-1} = \frac{1}{|J|} C^T$ , where  $C = (C_{ij})$ , the matrix of cofactors of  $J$ , where  $T$  for transpose, then (16) becomes [Moolio et al., 2009; Mohajan, 2021b],

$$= -\frac{1}{|J|} \begin{bmatrix} C_{11} & C_{21} & C_{31} & C_{41} & C_{51} \\ C_{12} & C_{22} & C_{32} & C_{42} & C_{52} \\ C_{13} & C_{23} & C_{33} & C_{43} & C_{53} \\ C_{14} & C_{24} & C_{34} & C_{44} & C_{54} \\ C_{15} & C_{25} & C_{35} & C_{45} & C_{55} \end{bmatrix} \begin{bmatrix} -E_1 & -E_2 & -E_3 & -E_4^2 + E_4 & 1 \\ -\lambda & 0 & 0 & 0 & 0 \\ 0 & -\lambda & 0 & 0 & 0 \\ 0 & 0 & -\lambda & 0 & 0 \\ 0 & 0 & 0 & -2\lambda E_4 + \lambda & 0 \end{bmatrix}$$

$$J_G = -\frac{1}{|J|} \begin{bmatrix} -E_1 C_{11} - \lambda C_{21} & -E_2 C_{11} - \lambda C_{31} & -E_3 C_{11} - \lambda C_{41} & -E_4^2 C_{11} + E_4 C_{11} - 2\lambda E_4 C_{51} + \lambda C_{51} & C_{11} \\ -E_1 C_{12} - \lambda C_{22} & -E_2 C_{12} - \lambda C_{32} & -E_3 C_{12} - \lambda C_{42} & -E_4^2 C_{12} + E_4 C_{12} - 2\lambda E_4 C_{52} + \lambda C_{52} & C_{12} \\ -E_1 C_{13} - \lambda C_{23} & -E_2 C_{13} - \lambda C_{33} & -E_3 C_{13} - \lambda C_{43} & -E_4^2 C_{13} + E_4 C_{13} - 2\lambda E_4 C_{53} + \lambda C_{53} & C_{13} \\ -E_1 C_{14} - \lambda C_{24} & -E_2 C_{14} - \lambda C_{34} & -E_3 C_{14} - \lambda C_{44} & -E_4^2 C_{14} + E_4 C_{14} - 2\lambda E_4 C_{54} + \lambda C_{54} & C_{14} \\ -E_1 C_{15} - \lambda C_{25} & -E_2 C_{15} - \lambda C_{35} & -E_3 C_{15} - \lambda C_{45} & -E_4^2 C_{15} + E_4 C_{15} - 2\lambda E_4 C_{55} + \lambda C_{55} & C_{15} \end{bmatrix} \quad (17)$$

In (17) total 25 comparative statics are available, and in this study we deal only with four of them when wage rate is increased. The firm always attempts for the profit maximization production [Baxley & Moorhouse, 1984; Islam et al., 2010].

Now we analyze the effect on capital  $E_1$  when per unit cost of principal raw material,  $m$  increases. Taking  $T_{23}$  (i.e., term of 2<sup>nd</sup> row and 3<sup>rd</sup> column) from both sides of (17) we get [Moolio et al., 2009; Islam et al., 2011; Roy et al., 2021],

$$\frac{\partial E_1}{\partial m} = \frac{E_3}{|J|} [C_{12}] + \frac{\lambda}{|J|} [C_{42}]$$

$$= \frac{E_3}{|J|} \text{Cofactor of } C_{12} + \frac{\lambda}{|J|} \text{Cofactor of } C_{42}$$



$$\begin{aligned}
 &= -\frac{E_3}{|J|} \begin{vmatrix} -B_1 & R_{12} & R_{13} & R_{14} \\ -B_2 & R_{22} & R_{23} & R_{24} \\ -B_3 & R_{32} & R_{33} & R_{34} \\ -B_4 & R_{42} & R_{43} & R_{44} \end{vmatrix} + \frac{\lambda}{|J|} \begin{vmatrix} 0 & -B_2 & -B_3 & -B_4 \\ -B_1 & R_{12} & R_{13} & R_{14} \\ -B_2 & R_{22} & R_{23} & R_{24} \\ -B_4 & R_{42} & R_{43} & R_{44} \end{vmatrix} \\
 &= -\frac{E_3}{|J|} \left\{ -B_1 \begin{vmatrix} R_{22} & R_{23} & R_{24} \\ R_{32} & R_{33} & R_{34} \\ R_{42} & R_{43} & R_{44} \end{vmatrix} - R_{12} \begin{vmatrix} -B_2 & R_{23} & R_{24} \\ -B_3 & R_{33} & R_{34} \\ -B_4 & R_{43} & R_{44} \end{vmatrix} + R_{13} \begin{vmatrix} -B_2 & R_{22} & R_{24} \\ -B_3 & R_{32} & R_{34} \\ -B_4 & R_{42} & R_{44} \end{vmatrix} \right. \\
 &\quad \left. - R_{14} \begin{vmatrix} -B_2 & R_{22} & R_{23} \\ -B_3 & R_{32} & R_{33} \\ -B_4 & R_{42} & R_{43} \end{vmatrix} \right\} \\
 &+ \frac{\lambda}{|J|} \left\{ B_2 \begin{vmatrix} -B_1 & R_{13} & R_{14} \\ -B_2 & R_{23} & R_{24} \\ -B_4 & R_{43} & R_{44} \end{vmatrix} - B_3 \begin{vmatrix} -B_1 & R_{12} & R_{14} \\ -B_2 & R_{22} & R_{24} \\ -B_4 & R_{42} & R_{44} \end{vmatrix} + B_4 \begin{vmatrix} -B_1 & R_{12} & R_{13} \\ -B_2 & R_{22} & R_{23} \\ -B_4 & R_{42} & R_{43} \end{vmatrix} \right\} \\
 &= -\frac{E_3}{|J|} \left[ -B_1 \{ R_{22}(R_{33}R_{44} - R_{43}R_{34}) + R_{23}(R_{42}R_{34} - R_{32}R_{44}) + R_{24}(R_{32}R_{43} - R_{42}R_{33}) \} \right. \\
 &\quad - R_{12} \{ -B_2(R_{33}R_{44} - R_{43}R_{34}) + R_{23}(-B_4R_{34} + B_3R_{44}) + R_{24}(-B_3R_{43} + B_4R_{33}) \} \\
 &\quad + R_{13} \{ -B_2(R_{32}R_{44} - R_{42}R_{34}) + R_{22}(-B_4R_{34} + B_3R_{44}) + R_{24}(-B_3R_{42} + B_4R_{32}) \} \\
 &\quad \left. - R_{14} \{ -B_2(R_{32}R_{43} - R_{42}R_{33}) + R_{22}(-B_4R_{33} + B_3R_{43}) + R_{23}(-B_3R_{42} + B_4R_{32}) \} \right] \\
 &+ \frac{\lambda}{|J|} \left[ B_2 \{ -B_1(R_{23}R_{44} - R_{43}R_{24}) - R_{13}(-B_2R_{44} + B_4R_{24}) + R_{14}(-B_2R_{43} + B_4R_{23}) \} \right. \\
 &\quad - B_3 \{ -B_1(R_{22}R_{44} - R_{42}R_{24}) - R_{12}(-B_2R_{44} + B_4R_{24}) + R_{14}(-B_2R_{42} + B_4R_{22}) \} \\
 &\quad \left. + B_4 \{ -B_1(R_{22}R_{43} - R_{42}R_{23}) - R_{12}(-B_2R_{43} + B_4R_{23}) + R_{13}(-B_2R_{42} + B_4R_{22}) \} \right] \\
 &= -\frac{E_3}{|J|} \{ -B_1R_{22}R_{33}R_{44} \quad + B_1R_{22}R_{43}R_{34} \quad - B_1R_{23}R_{42}R_{34} \quad + B_1R_{23}R_{32}R_{44} \\
 &\quad - B_1R_{24}R_{32}R_{43} + B_1R_{24}R_{42}R_{33}
 \end{aligned}$$

$$\begin{aligned}
 & + B_2 R_{12} R_{33} R_{44} - B_2 R_{12} R_{43} R_{34} + B_4 R_{12} R_{23} R_{34} - B_3 R_{12} R_{23} R_{44} + B_3 R_{12} R_{24} R_{43} \\
 & - B_4 R_{12} R_{24} R_{33} \\
 & - B_2 R_{13} R_{32} R_{44} + B_2 R_{13} R_{42} R_{34} - B_2 R_{13} R_{22} R_{34} + B_3 R_{13} R_{22} R_{44} - B_3 R_{13} R_{24} R_{42} \\
 & + B_4 R_{13} R_{24} R_{32} \\
 & + B_2 R_{14} R_{32} R_{43} - B_2 R_{14} R_{42} R_{33} + B_4 R_{14} R_{22} R_{33} - B_3 R_{14} R_{22} R_{43} + B_3 R_{14} R_{23} R_{42} \\
 & - B_4 R_{14} R_{23} R_{32} \} \\
 & + \frac{\lambda}{|J|} \{ -B_1 B_2 R_{23} R_{44} + B_1 B_2 R_{24} R_{34} + B_2^2 R_{13} R_{44} - B_2 B_4 R_{13} R_{24} - B_2^2 R_{14} R_{34} \\
 & + B_2 B_4 R_{14} R_{23} + B_1 B_3 R_{22} R_{44} - B_1 B_3 R_{24}^2 - B_2 B_3 R_{12} R_{44} + B_3 B_4 R_{12} R_{24} + B_2 B_3 R_{14} R_{24} \\
 & - B_3 B_4 R_{14} R_{22} - B_1 B_4 R_{22} R_{34} + B_1 B_4 R_{23} R_{24} + B_2 B_4 R_{12} R_{34} - B_4^2 R_{12} R_{23} \\
 & - B_2 B_4 R_{13} R_{24} + B_4^2 R_{13} R_{22} \} \\
 & = - \frac{E_3}{|J|} \frac{A^3 E_1^{3p} E_2^{3q} E_3^{3r} E_4^{3s}}{E_1^2 E_2^2 E_3^2 E_4^2} \{ -k E_1^2 \beta (\beta - 1) \gamma (\gamma - 1) \delta (\delta - 1) + k E_1^2 \beta (\beta - 1) \gamma^2 \delta^2 \\
 & - k E_1^2 \beta^2 \gamma^2 \delta^2 + k E_1^2 \beta^2 \gamma^2 \delta (\delta - 1) - k E_1^2 \beta^2 \gamma^2 \delta^2 + k E_1^2 \beta^2 \gamma (\gamma - 1) \delta^2 \\
 & + l E_1 E_2 \alpha \beta \gamma (\gamma - 1) \delta (\delta - 1) - l E_1 E_2 \alpha \beta \gamma^2 \delta^2 + n E_1 E_4 \alpha \beta^2 \gamma^2 \delta \\
 & - m E_1 E_3 \alpha \beta^2 \gamma \delta (\delta - 1) - n E_1 E_4 \alpha \beta^2 \gamma (\gamma - 1) \delta - l E_1 E_2 \alpha \beta \gamma^2 \delta (\delta - 1) \\
 & + l E_1 E_2 \alpha \beta \gamma^2 \delta^2 - n E_1 E_4 \alpha \beta (\beta - 1) \gamma^2 \delta + m E_1 E_3 \alpha \beta (\beta - 1) \gamma \delta (\delta - 1) \\
 & - m E_1 E_3 \alpha \beta^2 \gamma \delta^2 + n E_1 E_4 \alpha \beta^2 \gamma^2 \delta + l E_1 E_2 \alpha \beta \gamma^2 \delta^2 - l E_1 E_2 \alpha \beta \gamma (\gamma - 1) \delta^2 \\
 & + n E_1 E_4 \alpha \beta (\beta - 1) \gamma (\gamma - 1) \delta - m E_1 E_3 \alpha \beta (\beta - 1) \gamma \delta^2 + m E_1 E_3 \alpha \beta^2 \gamma \delta^2 \\
 & - n E_1 E_4 \alpha \beta^2 \gamma^2 \delta \} + \frac{\lambda}{|J|} \frac{A^2 E_1^{2p} E_2^{2q} E_3^{2r} E_4^{2s}}{E_1^2 E_2^2 E_3^2 E_4^2} \{ -k l E_1^2 E_2 E_3 \beta \gamma \delta (\delta - 1) \\
 & + k l E_1^2 E_2 E_3 \beta \gamma \delta^2 + l^2 E_1 E_2^2 E_3 \alpha \gamma \delta (\delta - 1) - n l E_1 E_2 E_3 E_4 \alpha \beta \gamma \delta - l^2 E_1 E_2^2 E_3 \alpha \gamma \delta^2 \\
 & + n l E_1 E_2 E_3 E_4 \alpha \beta \gamma \delta + k m E_1^2 E_3^2 \beta (\beta - 1) \delta (\delta - 1) - k m E_1^2 E_3^2 \beta^2 \delta^2 \\
 & - l m E_1 E_2 E_3^2 \alpha \beta \delta (\delta - 1) + m n E_1 E_3^2 E_4 \alpha \beta^2 \delta + l m E_1 E_2 E_3^2 \alpha \beta \delta^2 \\
 & - m n E_1 E_3^2 E_4 \alpha \beta (\beta - 1) \delta - k n E_1^2 E_3 E_4 \beta (\beta - 1) \gamma \delta + k n E_1^2 E_3 E_4 \beta^2 \gamma \delta
 \end{aligned}$$

$$\begin{aligned}
 & +nlE_1E_2E_3E_4\alpha\beta\gamma\delta \quad -n^2E_1E_3E_4^2\alpha\beta^2\gamma \quad -nlE_1E_2E_3E_4\alpha\beta\gamma\delta \\
 & +n^2E_1E_3E_4^2\alpha\beta(\beta-1)\gamma\} \\
 & = -\frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}B}{E_1E_2E_3E_4^2\forall} \{-(\beta-1)(\gamma-1)(\delta-1) + \beta(\gamma-1)(\delta-1) \\
 & -\beta\gamma(\delta-1) + (\beta-1)\gamma(\delta-1) - (2E_4-1)\beta(\gamma-1)\delta - (2E_4-1)(\beta-1)\gamma\delta \\
 & + 2(2E_4-1)\beta\gamma\delta + (2E_4-1)(\beta-1)(\gamma-1)\delta\} + \frac{1}{|J|} \frac{A^2\alpha\beta\gamma\delta E_1^{2\alpha}E_2^{2\beta}E_3^{2\gamma}E_4^{2\delta}}{E_1E_2E_3E_4^2} \\
 & \frac{AE_1^{2\alpha}E_2^{2\beta}E_3^{2\gamma}E_4^{2\delta}\forall}{B} \{(\beta-1)(\delta-1) - \beta(\delta-1) - 2(2E_4-1)(\beta-1)\delta \\
 & + 2(2E_4-1)\beta\delta - (2E_4-1)^2\beta\delta + (2E_4-1)^2(\beta-1)\delta\} \\
 & \frac{\partial E_1}{\partial m} = \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}B}{E_1E_2E_3E_4^2\forall} \{-4E_4^2\delta + E_4(10\delta - 2\beta\gamma\delta) + \beta\gamma\delta - 4\delta\}. \quad (18)
 \end{aligned}$$

Now using  $\alpha = \beta = \gamma = \delta = \frac{1}{4}$  then we get,  $\forall = 1$ , i.e., for constant returns to scale, in (18) we get,

$$\frac{\partial E_1}{\partial m} \approx -\frac{1}{|J|} \frac{A^3E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}B}{2^{13}E_1E_2^2E_3E_4^2\forall} (4E_4 - 5)^2 < 0. \quad (19)$$

From the relation (19) we see that when per unit cost of principal raw material increases, the level of capital is decreased. It seems that principal raw material is essential for the firm and more capital is used for buying the principal raw material. Consequently, the firm may think to reduce the level of capital, which is reasonable. In this situation the firm may face difficulties to move profit maximization.

Now using  $\alpha = \beta = \gamma = \delta = \frac{1}{2}$  then we get,  $\forall = 2$ , i.e., for increasing returns to scale, in (18) we get,

$$\frac{\partial E_1}{\partial m} = \frac{1}{|J|} \frac{A^3E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}B}{2^7E_1E_2^2E_3E_4^2\forall} (8E_4 - 15)(1 - 2E_4). \quad (20)$$

From (19) we see that if  $E_4 > \frac{1}{2}$  and  $E_4 < \frac{15}{8}$  we get,

$$\frac{\partial E_1}{\partial m} > 0. \tag{21}$$

From the inequality (21) we see that when per unit cost of principal raw material increases, the level of capital also increases. It seems that although cost of principal raw material increases, the demand of the products of the firm is also increased in the society, and the industry increases its capital structure. We believe that for increasing returns to scale the industry is in sustainable environment and also is in profit maximization.

From (19) we see that if  $E_4 < \frac{1}{2}$  or  $E_4 > \frac{15}{8}$  we get,

$$\frac{\partial E_1}{\partial m} < 0. \tag{22}$$

From the inequality (22) we see that when per unit cost of principal raw material increases, the level of capital decreases, which is reasonable. In this situation the industry may not achieve profit maximization policy.

Now we analyze the effect on worker  $E_2$  when per unit cost of principal raw material,  $m$  increases. Taking  $T_{33}$  (i.e., term of 3<sup>rd</sup> row and 3<sup>rd</sup> column) from both sides of (17) we get [Mohajan, 2021c; Wiese, 2021],

$$\begin{aligned} \frac{\partial E_2}{\partial m} &= \frac{E_3}{|J|} [C_{13}] + \frac{\lambda}{|J|} [C_{43}] \\ &= \frac{E_3}{|J|} \text{Cofactor of } C_{13} + \frac{\lambda}{|J|} \text{Cofactor of } C_{43} \\ &= \frac{E_3}{|J|} \begin{vmatrix} -B_1 & R_{11} & R_{13} & R_{14} \\ -B_2 & R_{21} & R_{23} & R_{24} \\ -B_3 & R_{31} & R_{33} & R_{34} \\ -B_4 & R_{41} & R_{43} & R_{44} \end{vmatrix} - \frac{\lambda}{|J|} \begin{vmatrix} 0 & -B_1 & -B_3 & -B_4 \\ -B_1 & R_{11} & R_{13} & R_{14} \\ -B_2 & R_{21} & R_{23} & R_{24} \\ -B_4 & R_{41} & R_{43} & R_{44} \end{vmatrix} \end{aligned}$$

$$\begin{aligned}
 &= \frac{E_3}{|J|} \left\{ -B_1 \begin{vmatrix} R_{21} & R_{23} & R_{24} \\ R_{31} & R_{33} & R_{34} \\ R_{41} & R_{43} & R_{44} \end{vmatrix} - R_{11} \begin{vmatrix} -B_2 & R_{23} & R_{24} \\ -B_3 & R_{33} & R_{34} \\ -B_4 & R_{43} & R_{44} \end{vmatrix} + R_{13} \begin{vmatrix} -B_2 & R_{21} & R_{24} \\ -B_3 & R_{31} & R_{34} \\ -B_4 & R_{41} & R_{44} \end{vmatrix} \right. \\
 &\quad \left. - R_{14} \begin{vmatrix} -B_2 & R_{21} & R_{23} \\ -B_3 & R_{31} & R_{33} \\ -B_4 & R_{41} & R_{43} \end{vmatrix} \right\} \\
 &\quad - \frac{\lambda}{|J|} \left\{ B_1 \begin{vmatrix} -B_1 & R_{13} & R_{14} \\ -B_2 & R_{23} & R_{24} \\ -B_4 & R_{43} & R_{44} \end{vmatrix} - B_3 \begin{vmatrix} -B_1 & R_{11} & R_{14} \\ -B_2 & R_{21} & R_{24} \\ -B_4 & R_{41} & R_{44} \end{vmatrix} + B_4 \begin{vmatrix} -B_1 & R_{11} & R_{13} \\ -B_2 & R_{21} & R_{23} \\ -B_4 & R_{41} & R_{43} \end{vmatrix} \right\} \\
 &= \frac{E_3}{|J|} \left[ -B_1 \{R_{21}(R_{33}R_{44} - R_{43}R_{34}) + R_{23}(R_{41}R_{34} - R_{31}R_{44}) + R_{24}(R_{31}R_{43} - R_{41}R_{33})\} \right. \\
 &\quad - R_{11} \{-B_2(R_{33}R_{44} - R_{43}R_{34}) + R_{23}(-B_4R_{34} + B_3R_{44}) + R_{24}(-B_3R_{43} + B_4R_{33})\} \\
 &\quad + R_{13} \{-B_2(R_{31}R_{44} - R_{41}R_{34}) + R_{21}(-B_4R_{34} + B_3R_{44}) + R_{24}(-B_3R_{41} + B_4R_{31})\} \\
 &\quad \left. - R_{14} \{-B_2(R_{31}R_{43} - R_{41}R_{33}) + R_{21}(-B_4R_{33} + B_3R_{43}) + R_{23}(-B_3R_{41} + B_4R_{31})\} \right] \\
 &\quad - \frac{\lambda}{|J|} \left[ B_1 \{-B_1(R_{23}R_{44} - R_{43}R_{24}) + R_{13}(-B_4R_{24} + B_2R_{44}) + R_{14}(-B_2R_{43} + B_4R_{23})\} \right. \\
 &\quad - B_3 \{-B_1(R_{21}R_{44} - R_{41}R_{24}) + R_{11}(-B_4R_{24} + B_2R_{44}) + R_{14}(-B_2R_{41} + B_4R_{21})\} \\
 &\quad \left. + B_4 \{-B_1(R_{21}R_{43} - R_{41}R_{23}) + R_{11}(-B_4R_{23} + B_2R_{43}) + R_{13}(-B_2R_{41} + B_4R_{21})\} \right] \\
 &= -\frac{E_3}{|J|} \{B_1R_{21}R_{33}R_{44} - B_1R_{21}R_{43}R_{34} + B_1R_{23}R_{41}R_{24} - B_1R_{23}R_{31}R_{44} + B_1R_{24}R_{31}R_{43} \\
 &\quad - B_1R_{24}R_{41}R_{33} - B_2R_{11}R_{33}R_{44} + B_2R_{11}R_{43}R_{34} - B_4R_{11}R_{23}R_{34} + B_3R_{11}R_{23}R_{44} \\
 &\quad - B_3R_{11}R_{24}R_{43} + B_4R_{11}R_{24}R_{33} + B_2R_{13}R_{31}R_{44} - B_2R_{13}R_{41}R_{34} + B_4R_{13}R_{21}R_{34} \\
 &\quad - B_3R_{13}R_{21}R_{44} + B_3R_{13}R_{24}R_{41} - B_4R_{13}R_{24}R_{31} - B_2R_{14}R_{31}R_{43} + B_2R_{14}R_{41}R_{33} \\
 &\quad \left. - B_4R_{14}R_{21}R_{33} + B_3R_{14}R_{21}R_{43} - B_3R_{14}R_{23}R_{41} + B_4R_{14}R_{23}R_{31}\}
 \end{aligned}$$

$$\begin{aligned}
 & -\frac{\lambda}{|J|} \left\{ -B_1^2 R_{23} R_{44} + B_1^2 R_{24} R_{43} - B_1 B_4 R_{13} R_{24} + B_1 B_2 R_{13} R_{44} - B_1 B_2 R_{14} R_{43} \right. \\
 & + B_1 B_4 R_{14} R_{23} + B_1 B_3 R_{21} R_{44} - B_1 B_3 R_{41} R_{24} + B_3 B_4 R_{11} R_{24} - B_2 B_3 R_{11} R_{44} \\
 & + B_2 B_3 R_{14} R_{41} - B_3 B_4 R_{14} R_{21} - B_1 B_4 R_{21} R_{43} + B_1 B_4 R_{41} R_{23} - B_4^2 R_{11} R_{23} + B_2 B_4 R_{11} R_{43} \\
 & \left. - B_2 B_4 R_{13} R_{41} + B_4^2 R_{13} R_{21} \right\} \\
 & = -\frac{E_3}{|J|} \frac{A^3 E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \left\{ k E_1 E_2 \alpha \beta \gamma (\gamma - 1) \delta (\delta - 1) - k E_1 E_2 \alpha \beta \gamma^2 \delta^2 \right. \\
 & + k E_1 E_2 \alpha \beta \gamma^2 \delta^2 - k E_1 E_2 \alpha \beta \gamma^2 \delta (\delta - 1) + k E_1 E_2 \alpha \beta \gamma^2 \delta^2 - k E_1 E_2 \alpha \beta \gamma (\gamma - 1) \delta^2 \\
 & - l E_2^2 \alpha (\alpha - 1) \gamma (\gamma - 1) \delta (\delta - 1) + l E_2^2 \alpha (\alpha - 1) \gamma^2 \delta^2 - n E_2 E_4 \alpha (\alpha - 1) \beta \gamma^2 \delta \\
 & + m E_2 E_3 \alpha (\alpha - 1) \beta \gamma \delta (\delta - 1) - m E_2 E_3 \alpha (\alpha - 1) \beta \gamma \delta^2 + n E_2 E_4 \alpha (\alpha - 1) \beta \gamma (\gamma - 1) \delta \\
 & + l E_2^2 \alpha^2 \gamma^2 \delta (\delta - 1) - l E_2^2 \alpha^2 \gamma^2 \delta^2 + n E_2 E_4 \alpha^2 \beta \gamma^2 \delta - m E_2 E_3 \alpha^2 \beta \gamma \delta (\delta - 1) \\
 & + m E_2 E_3 \alpha^2 \beta \gamma \delta^2 - n E_2 E_4 \alpha^2 \beta \gamma^2 \delta - l E_2^2 \alpha^2 \gamma^2 \delta^2 + l E_2^2 \alpha^2 \gamma (\gamma - 1) \delta^2 \\
 & \left. - n E_2 E_4 \alpha^2 \beta \gamma (\gamma - 1) \delta + m E_2 E_3 \alpha^2 \beta \gamma \delta^2 - m E_2 E_3 \alpha^2 \beta \gamma \delta^2 + n E_2 E_4 \alpha^2 \beta \gamma^2 \delta \right\} \\
 & - \frac{1}{|J|} \frac{A^2 E_1^{2\alpha} E_2^{2\beta} E_3^{2\gamma} E_4^{2\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \frac{A \beta \gamma E_1^\alpha E_2^\beta E_3^\gamma E_4^\delta \nabla}{B} \left\{ -k^2 E_1^2 E_2 E_3 \beta \gamma \delta (\delta - 1) \right. \\
 & + k^2 E_1^2 E_2 E_3 \beta \gamma \delta^2 - k n E_1 E_2 E_3 E_4 \alpha \beta \gamma \delta + k l E_1 E_2^2 E_3 \alpha \gamma \delta (\delta - 1) + k l E_1 E_2^2 E_3 \alpha \gamma \delta^2 \\
 & + k n E_1 E_2 E_3 E_4 \alpha \beta \gamma \delta + k m E_1 E_2 E_3^2 \alpha \beta \delta (\delta - 1) - k m E_1 E_2 E_3^2 \alpha \beta \delta^2 \\
 & + m n E_2 E_3 E_4 \alpha (\alpha - 1) \beta \delta - l m E_2^2 E_3^2 \alpha (\alpha - 1) \delta (\delta - 1) + l m E_2^2 E_3^2 \alpha^2 \delta^2 \\
 & - m n E_2 E_3^2 E_4 \alpha^2 \beta \delta - k n E_1 E_2 E_3 E_4 \alpha \beta \gamma \delta + k n E_1 E_2 E_3 E_4 \alpha \beta \gamma \delta \\
 & - n^2 E_2 E_3 E_4 \alpha (\alpha - 1) \beta \gamma + n l E_2^2 E_3 E_4 \alpha (\alpha - 1) \gamma \delta - n l E_2^2 E_3 E_4 \alpha^2 \gamma \delta \\
 & \left. + n^2 E_2 E_3 E_4 \alpha^2 \beta \gamma \right\} \\
 & = -\frac{1}{|J|} \frac{A^3 \alpha \beta \gamma \delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \left\{ k E_1 (\gamma - 1) (\delta - 1) - k E_1 \gamma (\delta - 1) + k E_1 \gamma \delta \right. \\
 & - k E_1 (\gamma - 1) \delta + l E_2 \alpha \beta^{-1} \gamma (\delta - 1) - l E_2 \alpha \beta^{-1} \gamma \delta + l E_2 \alpha \beta^{-1} (\gamma - 1) \delta - l E_2 \alpha \beta^{-1} \gamma \delta \\
 & \left. - l E_2 (\alpha - 1) \beta^{-1} (\gamma - 1) (\delta - 1) \right\}
 \end{aligned}$$

$$\begin{aligned}
 & +lE_2\alpha\beta^{-1}\gamma\delta - mE_3(\alpha-1)\delta + mE_3(\alpha-1)(\delta-1) - mE_3\alpha(\delta-1) + mE_3\alpha\delta \\
 & + nE_4(\alpha-1)(\gamma-1) - nE_4(\alpha-1)\gamma + nE_4\alpha\gamma - nE_4\alpha(\gamma-1)\} \\
 & - \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} \forall}{E_1^2 E_2 E_3 E_4^2 B} \{-k^2 E_1^2 \beta\gamma\delta(\delta-1) + k^2 E_1^2 \beta\gamma\delta^2 \\
 & + klE_1 E_2 \alpha\gamma\delta(\delta-1) + klE_1 E_2 \alpha\gamma\delta^2 + kmE_1 E_3 \alpha\beta\delta(\delta-1) - kmE_1 E_3 \alpha\beta\delta^2 \\
 & + mnE_3 E_4 \alpha(\alpha-1)\beta\delta - mnE_3 E_4 \alpha^2 \beta\delta - lmE_2 E_3 \alpha(\alpha-1)\delta(\delta-1) \\
 & + lmE_2 E_3 \alpha^2 \delta^2 + nlE_2 E_4 \alpha(\alpha-1)\gamma\delta - nlE_2 E_4 \alpha^2 \gamma\delta - n^2 E_4^2 \alpha(\alpha-1)\beta\gamma \\
 & + n^2 E_4^2 \alpha^2 \beta\gamma\} \\
 & = - \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B}{E_1^2 E_2 E_3 E_4^2 \forall} \{\alpha(\gamma-1)(\delta-1) - (\alpha-1)(\gamma-1)(\delta-1) \\
 & + (\alpha-1)\gamma(\delta-1) - \alpha\gamma(\delta-1) \\
 & - (\alpha-1)\gamma\delta + \alpha\gamma\delta + (2E_4-1)(\alpha-1)(\gamma-1)\delta - (2E_4-1)(\alpha-1)\gamma\delta \\
 & + (2E_4-1)\alpha\gamma\delta - (2E_4-1)\alpha(\gamma-1)\delta\} \\
 & - \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B}{E_1^2 E_2 E_3 E_4^2 \forall} \{\alpha(\delta-1) - (\alpha-1)(\delta-1) \\
 & - 2(2E_4-1)\alpha\delta + 2(2E_4-1)(\alpha-1)\delta - (2E_4-1)^2(\alpha-1)\delta + (2E_4-1)^2\alpha\delta\}. \\
 & \frac{\partial E_2}{\partial m} = - \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B}{E_1^2 E_2 E_3 E_4^2 \forall} (4E_4^2 - 6E_4\delta + 2\delta + \gamma\delta). \tag{23}
 \end{aligned}$$

Now using  $\alpha = \beta = \gamma = \delta = \frac{1}{4}$  then we get,  $\forall = 1$ , i.e., for constant returns to scale, in (23) we get,

$$\frac{\partial E_2}{\partial m} = - \frac{1}{|J|} \frac{A^3 E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B}{2^{12} E_1 E_2 E_3 E_4^2 \forall} (8E_4 - 3)^2 < 0. \tag{24}$$

From the equation (24) we have realized that when per unit cost of principal raw material increases, wage of laborers decreases. It seems that less principal raw material is purchased after increase price of it and more labors become unemployed, and they agree to work with lower wage.

Now we test the effect on principal raw material  $E_3$  when per unit cost of it increases. Taking  $T_{43}$  (i.e., term of 4<sup>th</sup> row and 3<sup>rd</sup> column) from both sides of (17) we get [Roy et al., 2021; Mohajan & Mohajan, 2023f],

$$\begin{aligned} \frac{\partial E_3}{\partial m} &= \frac{E_3}{|J|} [C_{14}] + \frac{\lambda}{|J|} [C_{44}] \\ &= \frac{E_3}{|J|} \text{Cofactor of } C_{14} + \frac{\lambda}{|J|} \text{Cofactor of } C_{44} \\ &= -\frac{E_3}{|J|} \begin{vmatrix} -B_1 & R_{11} & R_{12} & R_{14} \\ -B_2 & R_{21} & R_{22} & R_{24} \\ -B_3 & R_{31} & R_{32} & R_{34} \\ -B_4 & R_{41} & R_{42} & R_{44} \end{vmatrix} + \frac{\lambda}{|J|} \begin{vmatrix} 0 & -B_1 & -B_2 & -B_4 \\ -B_1 & R_{11} & R_{12} & R_{14} \\ -B_2 & R_{21} & R_{22} & R_{24} \\ -B_4 & R_{41} & R_{42} & R_{44} \end{vmatrix} \\ &= -\frac{E_3}{|J|} \left\{ -B_1 \begin{vmatrix} R_{21} & R_{22} & R_{24} \\ R_{31} & R_{32} & R_{34} \\ R_{41} & R_{42} & R_{44} \end{vmatrix} - R_{11} \begin{vmatrix} -B_2 & R_{22} & R_{24} \\ -B_3 & R_{32} & R_{34} \\ -B_4 & R_{42} & R_{44} \end{vmatrix} + R_{12} \begin{vmatrix} -B_2 & R_{21} & R_{24} \\ -B_3 & R_{31} & R_{34} \\ -B_4 & R_{41} & R_{44} \end{vmatrix} \right. \\ &\quad \left. - R_{14} \begin{vmatrix} -B_2 & R_{21} & R_{22} \\ -B_3 & R_{31} & R_{32} \\ -B_4 & R_{41} & R_{42} \end{vmatrix} \right\} \\ &\quad + \frac{\lambda}{|J|} \left\{ B_1 \begin{vmatrix} -B_1 & R_{12} & R_{14} \\ -B_2 & R_{22} & R_{24} \\ -B_4 & R_{42} & R_{44} \end{vmatrix} - B_2 \begin{vmatrix} -B_1 & R_{11} & R_{14} \\ -B_2 & R_{21} & R_{24} \\ -B_4 & R_{41} & R_{44} \end{vmatrix} + B_4 \begin{vmatrix} -B_1 & R_{11} & R_{12} \\ -B_2 & R_{21} & R_{22} \\ -B_4 & R_{41} & R_{42} \end{vmatrix} \right\} \\ &= -\frac{E_3}{|J|} \left[ -B_1 \{ R_{21} (R_{32} R_{44} - R_{42} R_{34}) + R_{22} (R_{41} R_{34} - R_{31} R_{44}) + R_{24} (R_{31} R_{42} - R_{41} R_{32}) \} \right. \\ &\quad \left. - R_{11} \{ -B_2 (R_{32} R_{44} - R_{42} R_{34}) + R_{22} (-B_4 R_{34} + B_3 R_{44}) + R_{24} (-B_3 R_{42} + B_4 R_{32}) \} \right. \\ &\quad \left. + R_{12} \{ -B_2 (R_{31} R_{44} - R_{41} R_{34}) + R_{21} (-B_4 R_{34} + B_3 R_{44}) + R_{24} (-B_3 R_{41} + B_4 R_{31}) \} \right. \\ &\quad \left. - R_{14} \{ -B_2 (R_{31} R_{42} - R_{41} R_{32}) + R_{21} (-B_4 R_{32} + B_3 R_{42}) + R_{22} (-B_3 R_{41} + B_4 R_{31}) \} \right] \end{aligned}$$



$$\begin{aligned}
 & + \frac{\lambda}{|J|} \left[ B_1 \left\{ -B_1 (R_{22}R_{44} - R_{42}R_{24}) + R_{12} (-B_4R_{24} + B_2R_{44}) + R_{14} (-B_2R_{42} + B_4R_{22}) \right\} \right. \\
 & - B_2 \left\{ -B_1 (R_{21}R_{44} - R_{41}R_{24}) + R_{11} (-B_4R_{24} + B_2R_{44}) + R_{14} (-B_2R_{41} + B_4R_{21}) \right\} \\
 & \left. + B_4 \left\{ -B_1 (R_{21}R_{42} - R_{41}R_{22}) + R_{11} (-B_4R_{22} + B_2R_{42}) + R_{12} (-B_2R_{41} + B_4R_{21}) \right\} \right] \\
 & = - \frac{E_3}{|J|} \left\{ -B_1R_{21}R_{32}R_{44} \quad + B_1R_{21}R_{42}R_{34} \quad - B_1R_{22}R_{41}R_{34} \quad + B_1R_{22}R_{31}R_{44} \right. \\
 & - B_1R_{24}R_{31}R_{42} \quad + B_1R_{24}R_{41}R_{32} \quad + B_2R_{11}R_{32}R_{44} \quad - B_2R_{11}R_{42}R_{34} \quad + B_4R_{11}R_{22}R_{34} \\
 & - B_3R_{11}R_{22}R_{44} \quad + B_3R_{11}R_{24}R_{42} \quad - B_4R_{11}R_{24}R_{32} \quad - B_2R_{12}R_{31}R_{44} \quad + B_2R_{12}R_{41}R_{34} \\
 & - B_4R_{12}R_{21}R_{34} \quad + B_3R_{12}R_{21}R_{44} \quad - B_3R_{12}R_{24}R_{41} \quad + B_4R_{12}R_{24}R_{31} \quad + B_2R_{14}R_{31}R_{42} \\
 & \left. - B_2R_{14}R_{41}R_{32} \quad + B_4R_{14}R_{21}R_{32} \quad - B_3R_{14}R_{21}R_{42} \quad + B_3R_{14}R_{22}R_{41} \quad - B_4R_{14}R_{22}R_{31} \right\} \\
 & + \frac{\lambda}{|J|} \left\{ -B_1^2R_{22}R_{44} \quad + B_1^2R_{42}R_{24} \quad - B_1B_4R_{12}R_{24} \quad + B_1B_2R_{12}R_{44} \quad - B_1B_2R_{14}R_{42} \right. \\
 & + B_1B_4R_{14}R_{22} \quad + B_1B_2R_{21}R_{44} \quad - B_1B_2R_{41}R_{24} \quad + B_2B_4R_{11}R_{24} \quad - B_2^2R_{11}R_{44} \quad + B_2^2R_{14}R_{41} \\
 & - B_2B_4R_{14}R_{21} \quad - B_1B_4R_{21}R_{42} \quad + B_1B_4R_{41}R_{22} \quad - B_4^2R_{11}R_{22} \quad + B_2B_4R_{11}R_{42} \\
 & \left. - B_2B_4R_{12}R_{41} \quad + B_4^2R_{12}R_{21} \right\} \\
 & = - \frac{E_3}{|J|} \frac{A^3 E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \left\{ -kE_1E_3\alpha\beta^2\gamma\delta(\delta-1) \quad + kE_1E_3\alpha\beta^2\gamma\delta^2 \right. \\
 & - kE_1E_3\alpha\beta(\beta-1)\gamma\delta^2 \quad + kE_1E_3\alpha\beta(\beta-1)\gamma\delta(\delta-1) \quad - kE_1E_3\alpha\beta^2\gamma\delta^2 \\
 & + kE_1E_3\alpha\beta^2\gamma\delta^2 \quad + lE_2E_3\alpha(\alpha-1)\beta\gamma\delta(\delta-1) \quad - lE_2E_3\alpha(\alpha-1)\beta\gamma\delta^2 \\
 & + nE_3E_4\alpha(\alpha-1)\beta(\delta-1)\gamma\delta \quad - mE_3^2\alpha(\alpha-1)\beta(\beta-1)\delta(\delta-1) \\
 & + mE_3^2\alpha(\alpha-1)\beta^2\delta^2 \quad + nE_3E_4\alpha(\alpha-1)\beta(\beta-1)\gamma\delta \quad - nE_3E_4\alpha(\alpha-1)\beta^2\gamma\delta \\
 & - lE_2E_3\alpha\beta\gamma\delta(\delta-1) \quad + lE_2E_3\alpha\beta\gamma\delta^2 \quad - nE_3E_4\alpha^2\beta^2\gamma\delta \quad + mE_3^2\alpha^2\beta^2\delta(\delta-1) \\
 & - mE_3^2\alpha^2\beta^2\delta^2 \quad + nE_3E_4\alpha^2\beta^2\gamma\delta \quad + lE_2E_3\alpha\beta\gamma\delta^2 \quad - lE_2E_3\alpha\beta\gamma\delta^2 \\
 & \left. + nE_3E_4\alpha^2\beta^2\gamma\delta \quad - mE_3^2\alpha^2\beta^2\delta^2 \quad + mE_3^2\alpha^2\beta(\beta-1)\delta^2 \quad - nE_3E_4\alpha^2\beta(\beta-1)\gamma\delta \right\} \\
 & + \frac{1}{|J|} \frac{A^2 E_1^{2\alpha} E_2^{2\beta} E_3^{2\gamma} E_4^{2\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \frac{AE_1^\alpha E_2^\beta E_3^\gamma E_4^\delta \nabla}{B} \left\{ -k^2 E_1^2 E_3^2 \beta(\beta-1)\delta(\delta-1) \right\}
 \end{aligned}$$

$$\begin{aligned}
 & +k^2 E_1^2 E_3^2 \beta^2 \delta^2 - knE_1 E_3^2 E_4 \alpha \beta^2 \delta + klE_1 E_2 E_3^2 \alpha \beta \delta (\delta - 1) - klE_1 E_2 E_3^2 \alpha \beta \delta^2 \\
 & + knE_1 E_3^2 E_4 \alpha \beta (\beta - 1) \delta + klE_1 E_2 E_3^2 \alpha \beta \delta (\delta - 1) - klE_1 E_2 E_3^2 \alpha \beta \delta^2 \\
 & + nlE_2 E_3^2 E_4 \alpha (\alpha - 1) \beta \delta - l^2 E_2^2 E_3^2 \alpha (\alpha - 1) \delta (\delta - 1) + l^2 E_2^2 E_3^2 \alpha^2 \delta^2 \\
 & - nlE_2 E_3^2 E_4 \alpha^2 \beta \delta - knE_1 E_3^2 E_4 \alpha \beta^2 \delta + knE_1 E_3^2 E_4 \alpha \beta (\beta - 1) \delta \\
 & - n^2 E_3^2 E_4^2 \alpha (\alpha - 1) \beta (\beta - 1) + nlE_2 E_3^2 E_4 \alpha (\alpha - 1) \beta \delta - nlE_2 E_3^2 E_4 \alpha^2 \beta \delta \\
 & + n^2 E_3^2 E_4^2 \alpha^2 \beta^2 \} \\
 & = -\frac{1}{|J|} \frac{A^3 \alpha \beta \gamma \delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_4^2} \{ -kE_1 \beta (\delta - 1) - kE_1 (\beta - 1) \delta + kE_1 (\beta - 1) (\delta - 1) \\
 & + kE_1 \beta \delta + lE_2 (\alpha - 1) (\delta - 1) - lE_2 \alpha (\delta - 1) + lE_2 \alpha \delta - lE_2 (\alpha - 1) \delta \\
 & - 2mE_3 \alpha \beta \gamma^{-1} \delta + mE_3 \alpha (\beta - 1) \gamma^{-1} \delta - mE_3 (\alpha - 1) (\beta - 1) \gamma^{-1} (\delta - 1) \\
 & + mE_3 \alpha \beta \gamma^{-1} (\delta - 1) + mE_3 (\alpha - 1) \beta \gamma^{-1} \delta + nE_4 (\alpha - 1) (\beta - 1) - nE_4 (\alpha - 1) \beta \\
 & + nE_4 \alpha \beta - nE_4 \alpha (\beta - 1) \} + \frac{1}{|J|} \frac{A^3 E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B}{E_1^2 E_2^2 E_4^2 \nabla} \{ -k^2 E_1^2 \beta (\beta - 1) \delta (\delta - 1) \\
 & + k^2 E_1^2 \beta^2 \delta^2 - 2knE_1 E_4 \alpha \beta^2 \delta + 2knE_1 E_4 \alpha \beta (\beta - 1) \delta + 2klE_1 E_2 \alpha \beta \delta (\delta - 1) \\
 & - 2klE_1 E_2 \alpha \beta \delta^2 + nlE_2 E_4 \alpha (\alpha - 1) \beta \delta - l^2 E_2^2 \alpha (\alpha - 1) \delta (\delta - 1) + l^2 E_2^2 \alpha^2 \delta^2 \\
 & - nlE_2 E_4 \alpha^2 \beta \delta + nlE_2 E_4 \alpha (\alpha - 1) \beta \delta - nlE_2 E_3^2 E_4 \alpha^2 \beta \delta \\
 & - n^2 E_4^2 \alpha (\alpha - 1) \beta (\beta - 1) + n^2 E_4^2 \alpha^2 \beta^2 \} \\
 & = -\frac{1}{|J|} \frac{A^3 \alpha \beta \gamma \delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_4^2} \{ -\alpha \beta (\delta - 1) + \alpha (\beta - 1) (\delta - 1) + (\alpha - 1) \beta (\delta - 1) \\
 & - (\alpha - 1) (\beta - 1) (\delta - 1) + (2E_4 - 1) (\alpha - 1) (\beta - 1) \delta - (2E_4 - 1) (\alpha - 1) \beta \delta \\
 & + (2E_4 - 1) \alpha \beta \delta - (2E_4 - 1) \alpha (\beta - 1) \delta \} + \frac{1}{|J|} \frac{A^3 \alpha \beta \delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta} B}{E_1^2 E_2^2 E_4^2 \nabla} \\
 & \{ -\alpha (\beta - 1) (\delta - 1) + 2\alpha \beta (\delta - 1) - (\alpha - 1) \beta (\delta - 1) - 4(2E_4 - 1) \alpha \beta \delta \\
 & + 2(2E_4 - 1) \alpha (\beta - 1) \delta + 2(2E_4 - 1) (\alpha - 1) \beta \delta - (2E_4 - 1)^2 (\alpha - 1) (\beta - 1) \delta \\
 & + (2E_4 - 1)^2 \alpha \beta \delta \}
 \end{aligned}$$

$$\frac{\partial E_3}{\partial m} = \frac{1}{|J|} \frac{A^3 \alpha \beta \gamma \delta E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_4^2} \left\{ E_4^2 (4\alpha\delta + 4\beta\delta - 4\delta) - E_4 (8\alpha\delta + 8\beta\delta + 2\gamma\delta - 4\delta) + 4\alpha\delta + 4\beta\delta + 2\gamma\delta - \alpha - \beta - \gamma - \delta \right\}. \quad (25)$$

Now using  $\alpha = \beta = \gamma = \delta = \frac{1}{4}$  then we get,  $\forall = 1$ , i.e., for constant returns to scale, in (25) we get,

$$\frac{\partial E_3}{\partial m} = -\frac{1}{|J|} \frac{A^3 E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{2^9 E_1^2 E_2^2 E_4^2} \left\{ \left( 2E_4 - \frac{3}{4} \right)^2 + \frac{39}{16} \right\}. \quad (26)$$

In (26) if  $\left( 2E_4 - \frac{3}{4} \right)^2 > \frac{39}{16}$ , i.e.,  $E_4 > (3 \pm \sqrt{39})/8$ , then we get,

$$\frac{\partial E_3}{\partial m} < 0. \quad (27)$$

The relation (27) indicates that per unit cost of principal raw material,  $m$  increases; the tendency of purchasing principal raw material  $E_3$  decreases, which is reasonable. In this situation, the industry may face difficulties in its production for profit maximization [Islam et al., 2011; Mohajan; 2021b, Mohajan & Mohajan, 2022c].

In (26) if  $\left( 2E_4 - \frac{3}{4} \right)^2 < \frac{39}{16}$ , i.e.,  $E_4 < (3 + \sqrt{39})/8$ , then we get,

$$\frac{\partial E_3}{\partial m} > 0. \quad (28)$$

The inequality (28) indicates that if per unit cost of principal raw material increases, the tendency of purchasing principal raw material  $E_3$  also increases, which is not reasonable. From this study we observe that the revenue of the industry have increased and tends to profit maximization [Mohajan; 2022, Mohajan & Mohajan, 2022b].

Now we study the effects on irregular inputs  $E_4$  when per unit cost of principal raw material,  $m$  increases. Taking  $T_{53}$  (i.e., term of 5<sup>th</sup> row and 3<sup>rd</sup> column) from both sides of (12) we get [Islam et al., 2010; Roy et al., 2021],

$$\begin{aligned}
 \frac{\partial E_4}{\partial m} &= \frac{E_3}{|J|} [C_{15}] + \frac{\lambda}{|J|} [C_{45}] \\
 &= \frac{E_3}{|J|} \text{Cofactor of } C_{15} + \frac{\lambda}{|J|} \text{Cofactor of } C_{45} \\
 &= \frac{E_3}{|J|} \begin{vmatrix} -B_1 & R_{11} & R_{12} & R_{13} \\ -B_2 & R_{21} & R_{22} & R_{23} \\ -B_3 & R_{31} & R_{32} & R_{33} \\ -B_4 & R_{41} & R_{42} & R_{43} \end{vmatrix} + \frac{\lambda}{|J|} \begin{vmatrix} 0 & -B_1 & -B_2 & -B_3 \\ -B_1 & R_{11} & R_{12} & R_{13} \\ -B_2 & R_{21} & R_{22} & R_{23} \\ -B_4 & R_{41} & R_{42} & R_{43} \end{vmatrix} \\
 &= \frac{E_3}{|J|} \left\{ -B_1 \begin{vmatrix} R_{21} & R_{22} & R_{23} \\ R_{31} & R_{32} & R_{33} \\ R_{41} & R_{42} & R_{43} \end{vmatrix} - R_{11} \begin{vmatrix} -B_2 & R_{22} & R_{23} \\ -B_3 & R_{32} & R_{33} \\ -B_4 & R_{42} & R_{43} \end{vmatrix} + R_{12} \begin{vmatrix} -B_2 & R_{21} & R_{23} \\ -B_3 & R_{31} & R_{33} \\ -B_4 & R_{41} & R_{43} \end{vmatrix} \right. \\
 &\quad \left. - R_{13} \begin{vmatrix} -B_2 & R_{21} & R_{22} \\ -B_3 & R_{31} & R_{32} \\ -B_4 & R_{41} & R_{42} \end{vmatrix} \right\} \\
 &\quad + \frac{\lambda}{|J|} \left\{ B_1 \begin{vmatrix} -B_1 & R_{12} & R_{13} \\ -B_2 & R_{22} & R_{23} \\ -B_4 & R_{42} & R_{43} \end{vmatrix} - B_2 \begin{vmatrix} -B_1 & R_{11} & R_{13} \\ -B_2 & R_{21} & R_{23} \\ -B_4 & R_{41} & R_{43} \end{vmatrix} + B_3 \begin{vmatrix} -B_1 & R_{11} & R_{12} \\ -B_2 & R_{21} & R_{22} \\ -B_4 & R_{41} & R_{42} \end{vmatrix} \right\} \\
 &= \frac{E_3}{|J|} \left[ -B_1 \{ R_{21} (R_{32} R_{43} - R_{42} R_{33}) + R_{22} (R_{41} R_{33} - R_{31} R_{43}) + R_{23} (R_{31} R_{42} - R_{41} R_{32}) \} \right. \\
 &\quad - R_{11} \{ -B_2 (R_{32} R_{43} - R_{42} R_{33}) + R_{22} (-B_4 R_{33} + B_3 R_{43}) + R_{23} (-B_3 R_{42} + B_4 R_{32}) \} \\
 &\quad + R_{12} \{ -B_2 (R_{31} R_{43} - R_{41} R_{33}) + R_{21} (-B_4 R_{33} + B_3 R_{43}) + R_{23} (-B_3 R_{41} + B_4 R_{31}) \} \\
 &\quad - R_{13} \{ -B_2 (R_{31} R_{42} - R_{41} R_{32}) + R_{21} (-B_4 R_{32} + B_3 R_{42}) + R_{22} (-B_3 R_{41} + B_4 R_{31}) \} \Big] \\
 &\quad + \frac{\lambda}{|J|} \left[ B_1 \{ -B_1 (R_{22} R_{43} - R_{42} R_{23}) + R_{12} (-B_4 R_{23} + B_2 R_{43}) + R_{13} (-B_2 R_{42} + B_4 R_{22}) \} \right. \\
 &\quad \left. - B_2 \{ -B_1 (R_{21} R_{43} - R_{41} R_{23}) + R_{11} (-B_4 R_{23} + B_2 R_{43}) + R_{13} (-B_2 R_{41} + B_4 R_{21}) \} \right]
 \end{aligned}$$

$$\begin{aligned}
 & + B_3 \{ -B_1(R_{21}R_{42} - R_{41}R_{22}) + R_{11}(-B_4R_{22} + B_2R_{42}) + R_{12}(-B_2R_{41} + B_4R_{21}) \} \\
 & - R_{13} \{ -B_2(R_{31}R_{42} - R_{41}R_{32}) + R_{21}(-B_4R_{32} + B_3R_{42}) + R_{22}(-B_3R_{41} + B_4R_{31}) \} \\
 & = \frac{E_3}{|J|} \{ -B_1R_{21}R_{32}R_{43} + B_1R_{21}R_{42}R_{33} - B_1R_{22}R_{41}R_{33} + B_1R_{22}R_{31}R_{43} - B_1R_{23}R_{31}R_{42} \\
 & + B_1R_{23}R_{41}R_{32} + B_2R_{11}R_{32}R_{43} - B_2R_{11}R_{42}R_{33} + B_4R_{11}R_{22}R_{33} - B_3R_{11}R_{22}R_{43} \\
 & + B_3R_{11}R_{23}R_{42} - B_4R_{11}R_{23}R_{32} - B_2R_{12}R_{31}R_{43} + B_2R_{12}R_{41}R_{33} - B_4R_{12}R_{21}R_{33} \\
 & + B_3R_{12}R_{21}R_{43} - B_3R_{12}R_{23}R_{41} + B_4R_{12}R_{23}R_{31} + B_2R_{13}R_{31}R_{42} - B_2R_{13}R_{41}R_{32} \\
 & + B_4R_{13}R_{21}R_{32} - B_3R_{13}R_{21}R_{42} + B_3R_{13}R_{22}R_{41} - B_4R_{13}R_{22}R_{31} \} + \frac{\lambda}{|J|} \{ -B_1^2R_{22}R_{43} \\
 & + B_1^2R_{42}R_{23} - B_1B_4R_{12}R_{23} + B_1B_2R_{12}R_{43} - B_1B_2R_{13}R_{42} + B_1B_4R_{13}R_{22} + B_1B_2R_{21}R_{43} \\
 & - B_1B_2R_{41}R_{23} + B_2B_4R_{11}R_{23} - B_2^2R_{11}R_{43} + B_2^2R_{13}R_{41} - B_2B_4R_{13}R_{21} - B_1B_3R_{21}R_{42} \\
 & + B_1B_3R_{41}R_{22} - B_3B_4R_{11}R_{22} + B_2B_3R_{11}R_{42} - B_2B_3R_{12}R_{41} + B_3B_4R_{12}R_{21} \} \\
 & = \frac{E_3}{|J|} \frac{A^3 E_1^{3\alpha} E_2^{3\beta} E_3^{3\gamma} E_4^{3\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \{ -kE_1E_4\alpha\beta^2\gamma^2\delta + kE_1E_4\alpha\beta^2\gamma(\gamma-1)\delta \\
 & - kE_1E_4\alpha\beta(\beta-1)\gamma(\gamma-1)\delta + kE_1E_4\alpha\beta(\beta-1)\gamma^2\delta - kE_1E_4\alpha\beta^2\gamma^2\delta \\
 & + kE_1E_4\alpha\beta^2\gamma^2\delta + lE_2E_4\alpha(\alpha-1)\beta\gamma^2\delta - lE_2E_4\alpha(\alpha-1)\beta\gamma(\gamma-1)\delta \\
 & + nE_4^2\alpha(\alpha-1)\beta(\beta-1)\gamma(\gamma-1) - mE_3E_4\alpha(\alpha-1)\beta(\beta-1)\gamma\delta \\
 & + mE_3E_4\alpha(\alpha-1)\beta^2\gamma\delta - nE_4^2\alpha(\alpha-1)\beta^2\gamma^2 - lE_2E_4\alpha^2\beta\gamma^2\delta \\
 & + lE_2E_4\alpha^2\beta\gamma(\gamma-1)\delta - nE_4^2\alpha^2\beta^2\gamma(\gamma-1) + mE_3E_4\alpha^2\beta^2\gamma\delta - mE_3E_4\alpha^2\beta^2\gamma\delta \\
 & + nE_4^2\alpha^2\beta^2\gamma^2 + lE_2E_4\alpha^2\beta\gamma^2\delta - lE_2E_4\alpha^2\beta\gamma^2\delta + nE_4^2\alpha^2\beta^2\gamma^2 \\
 & - mE_3E_4\alpha^2\beta^2\gamma\delta + mE_3E_4\alpha^2\beta(\beta-1)\gamma\delta - nE_4^2\alpha^2\beta(\beta-1)\gamma^2 \} \\
 & + \frac{1}{|J|} \frac{A^2 E_1^{2\alpha} E_2^{2\beta} E_3^{2\gamma} E_4^{2\delta}}{E_1^2 E_2^2 E_3^2 E_4^2} \frac{AE_1^\alpha E_2^\beta E_3^\gamma E_4^\delta \nabla}{B} \{ -k^2 E_1^2 E_3 E_4 \beta(\beta-1)\gamma\delta \\
 & + k^2 E_1^2 E_3 E_4 \beta^2 \gamma\delta - knE_1E_3E_4\alpha\beta^2\gamma + klE_1E_2E_3E_4\alpha\beta\gamma\delta - klE_1E_2E_3E_4\alpha\beta\gamma\delta \\
 & + knE_1E_3E_4\alpha\beta(\beta-1)\gamma + klE_1E_2E_3E_4\alpha\beta\gamma\delta - klE_1E_2E_3E_4\alpha\beta\gamma\delta \}
 \end{aligned}$$

$$\begin{aligned}
 & +nlE_2E_3E_4^2\alpha(\alpha-1)\beta\gamma \quad -l^2E_2^2E_3E_4\alpha(\alpha-1)\gamma\delta \quad +l^2E_2^2E_3E_4\alpha^2\gamma\delta \\
 & -nlE_2E_3E_4^2\alpha^2\beta\gamma \quad -mE_1E_3^2E_4\alpha\beta^2\delta \quad +kmE_1E_3^2E_4\alpha\beta(\beta-1)\delta \\
 & -mnE_3^2E_4^2\alpha(\alpha-1)\beta(\beta-1) \quad +lmE_2E_3^2E_4\alpha(\alpha-1)\beta\delta \quad -lmE_2E_3^2E_4\alpha^2\beta\delta \\
 & +mnE_3^2E_4^2\alpha^2\beta^2\} \\
 & = \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}}{E_1^2E_2^2E_3E_4} \{-2\alpha\beta\gamma \quad +2(\alpha-1)\beta\gamma \quad +2\alpha(\beta-1)\gamma \\
 & -(\alpha-1)(\beta-1)\gamma \quad +2\alpha\beta(\gamma-1) \quad -\alpha(\beta-1)(\gamma-1) \quad -(\alpha-1)\beta(\gamma-1) \\
 & +(2E_4-1)(\alpha-1)(\beta-1)(\gamma-1) \quad -(2E_4-1)\alpha\beta(\gamma-1) \quad +(2E_4-1)\alpha\beta\gamma \\
 & -(2E_4-1)\alpha(\beta-1)\gamma\} + \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}}{E_1^2E_2^2E_3E_4} \{-(2E_4-1)\alpha\beta \\
 & +(2E_4-1)\alpha(\beta-1) + (2E_4-1)(\alpha-1)\beta \quad -(2E_4-1)(\alpha-1)(\beta-1)\} \\
 & = \frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}}{E_1^2E_2^2E_3E_4} \{E_4(-2\beta\gamma+2\alpha+2\beta+2\gamma-4) \\
 & +\alpha\beta\gamma-\beta\gamma-2\alpha-2\beta-2\gamma+2\} \\
 & \frac{\partial E_4}{\partial m} = -\frac{1}{|J|} \frac{A^3\alpha\beta\gamma\delta E_1^{3\alpha}E_2^{3\beta}E_3^{3\gamma}E_4^{3\delta}}{E_1^2E_2^2E_3E_4} (168E_4-29). \tag{29}
 \end{aligned}$$

If  $E_4 > 29/168$  in (29) we get,

$$\frac{\partial E_4}{\partial m} < 0. \tag{30}$$

From the equation (30) we see that if per unit cost of principal raw material increases, the tendency of purchasing irregular inputs  $E_4$  decreases. It seems that irregular input is complementary to principal raw material. Therefore, the price of  $E_3$  goes up, citizens of the country buy less of it, and consequently level of consumption of  $E_4$  also decreases [Islam et al., 2010; Mohajan, 2021a; Ferdous & Mohajan, 2022].

## 8. Conclusions

In this study we have discussed the economic effects of various inputs of an industry if the cost of principal raw material is increased. In this paper we have considered nonlinear budget constraint to provide economic predictions though the profit maximization. In the study we have included Cobb-Douglas productions function as our profit function. We have used  $5 \times 5$  bordered Hessian matrix and  $5 \times 5$  Jacobian to operate the mathematical formulations.

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# PERFORMANCE ENHANCEMENT OF OCCUPATIONAL SAFETY AND HEALTH IN NIGERIA'S MANUFACTURING SECTOR THROUGH EFFECTIVE GOVERNMENT SAFETY LEADERSHIP

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## **Abstract**

*The manufacturing sectors in Nigeria may have benefited from a symbiotic relationship with governmental regulatory bodies due to their profit-driven intentions as well as their crucial contributions towards job creation, poverty eradication, and social and fiscal obligations. Such a connection puts the workers at risk and may jeopardise the government's ability to fulfil its statutory supervisory obligations. To close this knowledge gap, the performance enhancement of OSH through effective government safety leadership is investigated. The present investigation utilised a mixed-methods research design, integrating both qualitative and quantitative research methodologies through a fixed explanatory sequential QUAN-dominant mixed-method strategy to examine perceptions of the three key major stakeholders*

*regarding existing safety measures in the manufacturing industry, their efficacy, and possible interventions to enhance their applicability to revitalize OHS practises. A cross-sectional research design was adopted in collecting data from both registered (196, with three participants drawn from each, representing about 56% of the total population of 353) and non-registered (15) workplaces located in the cities of three Nigerian states, totalling 633 required participants. This work employed a combination of simple random and convenience sampling methods to determine the desired sample size. A total of 800 semi-structured questionnaires were distributed to mitigate the possibility of non-response bias among the respondents. The blue-collar workers constituted the unit of analysis for this phase. Findings indicate that the influence of government safety leadership (SL) is not supported in the safety performance behaviours of both employees and employers in the Nigerian manufacturing industry. Thus, the appropriate utilisation of transformation safety leadership could be a viable means of enhancing OSH performance in the manufacturing sector.*

**Keywords:** *Occupational safety and health, performance, government safety transformational leadership, HR practices, safety climate, safety behaviour*

**JEL Classification:** *I13; I18*

## Introduction

Situational reports on occupational safety and health (OSH) issues remain a key concern, especially considering the prevalence of preventable workplace incidents (Haslam, Haefeli, & Haslam, 2010). Despite inconsistency or the absence of data to precisely assess losses or repercussions, research shows that the observed impacts are usually large and involve a wide spectrum of negative outcomes (ILO, 2016; Barbaranelli, Petitta, & Probst, 2015). The evidence reveals that managerial errors and safety negligence are responsible for most employee safety issues (Yorio & Wachter, 2014). The dilemma is compounded by employees' lackadaisical attitudes and workplace safety practises, which suggest that safety is impossible to achieve (Oyelohunnu, 2009). Evidence suggests that most of the industrial safety related incidents are preventable (Abubakar, 2015). However, in numerous incidents related to safety have been attributed to the widespread notion that achieving a zero-tolerance culture on safety related issues is difficult, which appears to have undermined the vital safety measures that employers and employees are obligated

to follow. Leaders, especially the national government, are expected to mediate workplace safety procedures to ensure that proper protocol prevails (Orazulike, 2016). However, several government efforts around safety have, incidentally been flawed till date (ILO, 2016). In addition to the insufficiency of resources required to achieve satisfactory safety performance, including necessary regulations and resources in terms of human, technical, and financial resources, there is also a noted reluctance among government establishments to adopt adequate OSH standards (Jilcha et al., 2016; Alfers et al., 2016; Idubor & Oisamoje, 2013).

The effectiveness of existing safety measures and other nationally implemented solutions, therefore, warrants strict scrutiny and procedural monitoring to ensure applicability and performance enhancement (Lewis-Beck & Alford, 1980). Seeing the critical roles of the manufacturing industries in sustaining the Nigerian economy in terms of fiscal and corporate social responsibility, modernization, employment generation, and poverty reduction, tendencies are that these industries often seek favour from the government that may invariably compromise the existing safety measures. This seemingly symbiotic relationship may sabotage existing OSH practices, and thereby exposing many workers to hazardous working conditions. Thus, inquiry into the relationship between government leadership and occupational safety is imperative for finding a viable resolution to OSH issues, given the features of OSH management in developing countries. This could also drive the design and execution of efficient safety-related human resource management (HRM) practices and employer alignment to activate the right safety operations in the nation, which are necessary countermeasures to unsafe behaviours in the workplace. This paper, therefore, aims to investigate the impact of effective government leadership on OSH in Nigeria. The purpose is to investigate the significance of safety leadership at the governmental level with regards to the adoption of conventional human resource management practices and the nurturing of safety commitment among employers (safety climate) to enhance safety-related conduct among employees.

### **Leadership intervention and safety performance outcomes**

Leaders create the operational workplace climate (Lewin et al., 1939). Studies have linked the persistence of workplace safety issues to deficiencies in safety leadership, emphasising the value of leaders in safety (Wu et al., 2016). Several studies have found that leaders and their leadership traits or activities are important determinants of employee well-being and contribute to the advancement and maintenance of a safe and healthy workplace (Martínez-Córcoles & Stephanou,

2017; Clarke, 2013). Leaders' behaviours, practices, actions, qualities, and styles (Martínez-Córcoles et al., 2011) are perceived to be significant for diverse organisational and national outcomes. Wang, Tsui, and Xin (2011) established a strong connection between the conduct of leaders and organisational performance. According to Pollitt (2011), the efficacy of safety interventions is especially impacted by the degree of dedication exhibited by leaders in prioritising safety as a fundamental value within the organisation. He posits that the readiness to pursue continuous improvement, whilst establishing suitable health and safety measures, as opposed to merely having what appears to be acceptable safety regulations, is correlated with increased safety performance. The enhancement of safety performance is observed to be substantial when leaders communicate safety concerns effectively to their subordinates and facilitate the cultivation of a prevention-oriented approach in the workplace (Zohar, 2010).

Studies (Martínez-Córcoles & Stephanou, 2017; Clarke, 2013) on leaders' behaviours found that members' work performance is highly affected by leaders' communication and leadership styles (Clarke, 2013). Previous studies examined leadership styles or behaviours through various facets such as transactional, transformational, or leader-member exchange (Clarke, 2013). The transformational leadership style is recognised for its capacity to motivate team members and offer a constructive outlook for expected outcomes (Martínez-Córcoles & Stephanou, 2017). In addition to these ascribed merits, the specific roles played in such a leadership style also establish the perceived climate in which subordinates respond in accordance with the created climates. Griffin and Hu's (2013) revealed that the display of safety-specific transformational leadership, specifically through actions that inspire, monitor, and promote safety learning, has a noteworthy influence on safety performance behaviours. The term safety inspiration pertains to the extent to which a leader effectively communicates a constructive and stimulating safety vision to their subordinates. Safety monitoring refers to the extent to which a leader actively observes and rectifies safety lapses and mistakes committed by team members. The concept of safety learning pertains to the extent to which a leader promotes and facilitates the acquisition of knowledge and skills pertaining to safety. Griffin and Hu's (2013) found that safety monitoring was positively correlated with safety compliance, while safety inspiration was significantly associated with safety participation. The results indicate that workers exhibit a greater propensity to allocate their time and effort towards safety-related tasks when they receive an inspiring safety vision from their leaders.

The growing concern about workplace safety issues has demonstrated that

achieving optimal safety performance is a complex job that necessitates numerous settings, institutions, and targets to create change (Haghighi et al., 2017). Hence, given that effective leadership and the extent of leadership involvement are critical to achieving the desired safety performance, it could be argued that active leadership from the top (state or government) should result in improved workplace safety. Also, given management's usual pressure to increase productivity, which could affect accident prevention, these situations could provide strong theoretical reasons to argue that the government should step in to prevent managers from engaging in risky activities. Another compelling argument to for government active engagement is the assumption that such leadership may have a stronger impact on the types of HRM practices that firms utilise, and the resources mobilised to address safety and health issues. Such involvement is equated with creating a positive safety climate or culture, which has been significantly linked to individual behaviour and the efficacy of HR practices (Bowen & Ostroff, 2004).

Compared to the top units of leadership, the accounts of the actions and procedures of leadership are less in-depth. Furthermore, safety climate indicators have not considered the influence of top government leadership positions (at the federal, state, or local levels) on safety performance. One would anticipate that top-level government's influence on employment relations (at the federal, state, or municipal levels) would have a significant impact on occupational safety (ILO, 2016). This claim has received special attention as research has shown that while organisational leadership is a significant determinant of safety performance, the ability of leaders at this level of management to influence safety is guided by an understanding of the safety-critical aspects of their work environments and the kind of leadership that is offered in their daily interactions with the work (Griffin & Hu, 2013). Further, it is emphasised that such behaviour may be subject to intervention by higher authorities, with the perceived safety climate of the higher authority requiring other stakeholders to be safety-conscious and motivated to take safety seriously.

Therefore, researchers (Umeokafor et al., 2014) assert that improvements to OSH in Nigeria should come from the top down. It has been noted that the absence of enforcement and compliance with OSH regulations in the past has contributed significantly to Nigeria's OSH failure. Hence, the situation in Nigeria calls for immediate attention to be paid to the upstream regulatory sector of OSH considering the fact that necessary improvements to follow OSH regulations cannot be separated from the actions of the upstream sectors and leadership. The current study makes a novel addition to the body of knowledge by including government

involvement in the hypothesised relationships under study. The current study considers that appropriate safety-related HRM practices, top management safety commitment, and the application of safety-specific transformational leadership strategies by top government officials could assist in promoting safety and reinforcing safety behaviour amongst individuals. Accordingly, the government's resilient safety leadership activities are incorporated in this study as a moderator of the relationship between HR practices effectiveness, safety climate (top management commitment), and employee safety behaviour. Hence, the following hypotheses have been formulated below:

H10: There is no positive significant moderating influence of the government's transformational safety leadership on the relationship between safety-related HR practices, safety climate (top management commitment), and employee safety behaviour (compliance & participation) in Nigeria's manufacturing industry.

H11: There is a positive and significant moderating influence of the government's transformational safety leadership activities on the relationship between safety-related HR practices, safety climate (top management commitment), and employee safety behaviour (compliance & participation) in Nigeria's manufacturing industry.

### **Theories underpinning government leadership intervention and safety performance outcomes**

The relationship examined in this study is viewed as an exchange of responses among parties involved in workplace relationships. The commonly adopted theoretical foundations for providing an understanding of this aspect have often exploited the tenets of theories such as the social exchange theory (SET), the Ability + Motivation + Opportunity to participate theory (AMO), and the expectancy-valence theory (Neal & Griffin, 2006; Vroom, 1964). While there are various theories that support workplace relationships, the SET and AMO theories serve as foundational conceptual frameworks to investigate work attitudes and behaviours in research (Gould-Williams, 2007), making them pertinent to this study.

The AMO theory holds that aptitude, motivation, and participation opportunities determine performance. This idea states that good employee performance is possible when workers are given the skills, competencies, motivation, and involvement opportunities they need. This shows that personnel management that supplies these important variables enhances corporate success since employees with them are more ready and confident to complete assignments (Jiang et al.,

2013). An increased sense of self-efficacy helps individuals contribute effectively, especially when these behaviours are sustained in an appropriate work setting (Jiang et al., 2013). Thus, well-designed HRM practices (particularly those that encourage, increase skills, and create opportunities) boost employee performance. Social Exchange Theory (SET) elaborates on AMO assumptions. Broadly speaking, SET holds significance due to its implications for employment and work relationships, and the strategies employed to effectively manage the human resources pool. This theory states that job relationships are typified by reciprocal exchanges, where one party is more likely to reciprocate based on their treatment. When this is incorporated into safety performance, the SET's underlying premise is that when an organisation shows genuine concern for its employees' wellbeing (seen as a positive safety environment), employees are more likely to develop implicit obligations to reciprocate by engaging in safety behaviours that benefit the organisation. Regarding SET's applicability to the HRM-safety performance relationship, it is presumed that employees' perceptions of the HRM practices that firms adopt to manage them, along with the satisfaction derived, usually underlie the exchange relationship (Oke et al., 2016; Armstrong, 2014; Kinnie et al., 2005).

Studies demonstrate that employees often interpret the HRM practises that they are exposed to at work, differently. Such practises have been viewed as a sign of organisational support (Reader et al., 2017), care or concern for their well-being, the value placed on them, or an indication of the personified long-term commitment of organisations to their employees, and so on (Alfes et al., 2013; Gavino et al., 2012). Thus, it has been established that when employees view such practises favourably, they may reciprocate the organisation's goodwill by showing greater dedication to the organisation and enthusiasm for achieving the organisational goals (Gavino et al., 2012; Bowen & Ostroff, 2004). This is consistent with empirical findings, which suggest that employee safety performance behaviours result from social exchanges. The perceived organisational exchanges (via HRM practices) allegedly lead to reciprocal employee behaviours such as willing obedience towards established standards and the voluntary performance of discretionary activities that contribute to the overall well-being of the organisation (Reader et al., 2017). According to SET, when employees perceive that they are treated fairly by their employer (because of their exposure to HRM practices), then they develop feelings of indebtedness and the intention to repay the organisation with positive work attitudes. These positive work attitudes may include appropriate safety performances, particularly if workers believe that safety is important to their organisations and that engaging in such behaviours is a noble



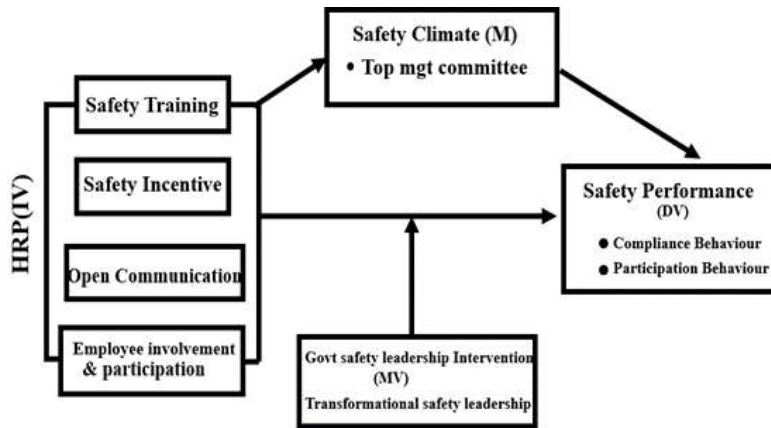
act (Kaufman, 2014). SET has been used in this context to explain why employees behave in a certain way, which is typically a reaction to perceived organisational relationships and practices.

Likewise, the active involvement of government safety leadership in the HRM-safety performance linkage is expected to build a similar foundation for SET. Adequate leader safety interventions represent the ultimate input for leveraging employee and employer safety behaviours through social exchanges (Hon et al., 2014). This is because as leaders demonstrate a high level of safety behaviour in their genuine concern and provision for safety, this is likely to inform employees of the importance of safety, whilst motivating them to utilise HR practices and act accordingly to discharge their exchange obligations or to reciprocate with expected safety behaviour (if terms of the exchange pertain to safety). Some studies (Hon et al., 2014; Neal & Griffin, 2006) declare that individuals are more likely to comply with established safety procedures if safety is truly emphasised by their leaders since this is indicative of the safety climate. An increasing body of research has shown a link between a well-established positive safety atmosphere and a range of organisational and individual outcomes. As stated in previous sub-sections, a positive environment affects performance and the effectiveness of organisational practises or policies (Wu et al., 2016; Hon et al., 2014).

It has also been widely documented that safety leadership predicts subordinates' safety behaviours (Wu et al., 2016). Positive climates established by leaders (in this case, management, and top government) motivate employees to act safely. Conversely, organizations are more likely to accept and strive for the position of top safety performers if, for example, they are motivated to create a supportive safety culture. Although top management team members are legally required to ensure that their organisation's safety management systems comply with nationally mandated standards (Pilbeam et al., 2016), their readiness and openness to work safety are likely to increase if they believe that the leaders support safety as a core value and are deeply committed to its success. With this, the organisation is inspired to increase their level of implementation of safety management procedures, allocate substantial resources for preventative actions, and adhere to required legal responsibilities (Tappura et al., 2017).

Considering the offered foundation for possible exchanges within the above theories, it is suggested that employees and their employers would behave safely when they perceive that such behaviour is valued and would be adequately rewarded. The reviewed literature and these existing theories offer a guiding

framework to propose the concepts examined in this study. The derived theoretical framework is presented Figure 1.



**Figure 1: Theoretical framework**

*Source: Author's fieldwork*

## Research Methodology

### *Research design*

Aiming at investigating relationships that could provide knowledge to advance existing theories and practices, a mixed-methods design that comprises the combination of both exploratory (via narrative means such as interviews) and explanatory research (using numerical procedures via a questionnaire) was considered appropriate to deepen the overall strength of a study than deploying the purist approaches. Specifically, to examine participant perceptions on the subject matter, a fixed explanatory sequential QUAN-dominant mixed-method strategy was used, in which the first phase of data collection and analysis is followed by a second phase of either method that builds on the results of the first phase. The datasets, however, are merged through triangulation to establish the possibility of convergence, confirmation, differences, or some combination (Creswell & Clark, 2017).

### *Data collection*

The quantitative phase of data collection adopted a cross-sectional research design, where data was collected from both registered (196, with three participants

drawn from each, representing about 56% of the total population of 353) and non-registered (15) workplaces located in the cities of three Nigerian states, totalling 633 required participants. The quantitative phase was conducted with a specific focus on the blue-collar workers from registered manufacturing industries in three state capitals, namely Ikeja (Lagos), Akure (Ondo), and Ibadan (Oyo state). This group constitutes the target population and the unit of analysis for this phase. Registered industries were considered, as they were more likely to have a documented list of their staff, which helped overcome the constraint of a lack of sampling frames coupled with the limited available resources. The blue-collar were considered, as they were the ones directly prone and, most often, first affected in major workplace incidents. As a result, they would be in a better position to provide the necessary information (Lewis, 2009). The predicted samples were chosen using a combination of basic random and convenience sampling approaches. The data for the survey phase of the study were gathered through a self-administered questionnaire instrument and the "drop-off and pick-up" strategy, where questionnaires were self-administered and collected in a similar manner. To collect answers from participants on concerns explored within the research constructs, a pre-existing questionnaire modified from previously validated surveys.

The appropriate sample size of participants is first determined by using Krejcie and Morgan's (1970) comprehensive scientific table for determining sample size. To increase sample size and response rate, 800 semi-structured questionnaire copies were distributed to account for participants' non-response bias. From the 800 copies that were distributed, 710 copies were retrieved, with 641 (90%) completed. SPSS software version 26 was used to analyse the 641 responses. A sample of 663 participants from 211 selected manufacturing workplaces including 196 registered and 15 non-registered manufacturing industries were employed to obtain the required data. The employees' anonymity was well-maintained throughout the inquiry process in line with research ethics. The blue-collar workers constituted the unit of analysis in this phase. Following that, 20 key informants were interviewed face-to-face including 10 top management staff, four government representatives, and six employee representatives, as well as labour union members. Key stakeholders were considered for the qualitative phase, as they could provide detailed information to guide an in-depth study of the topic. The group served as this phase's analytical unit. Thematic analysis (template analysis) and direct interpretation were utilised to analyse the qualitative data, which included 18 usable interview responses that were transcribed. The duration of the data collection phase spanned four months.

### *Research instrument*

A questionnaire that incorporated both open-ended and closed-ended questions, and was less rigidly structured, was employed to elicit the perspectives of participants on each of the variables evaluated for enhancing occupational safety. As aforementioned a combination of open-ended and closed-ended questions was utilised to establish a shared basis for contrasting the corresponding qualitative information. The utilisation of this approach is advantageous in improving the calibre of results derived from the explanatory sequential method, which is a mixed-methods design employed in the broader investigation. The survey utilised a five-section (A, B, C, D, and E) questionnaire, with Sections B through E employing a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). According to Leedy and Ormrod (2005), a greater score denotes an increased level of agreement, while a lesser score implies a decreased level. Section A contains demographic questions including respondents' gender, marital status, age, educational qualifications, work experience in months, type of job, workplace accident, and frequency of involvement. Sub-section B measured HRM practices with four determinants: safety training (6 items), safety incentives (9 items), open communication (5 items), and workers' involvement and participation (5 things). The study used items from Vinodkumar and Bhasi (2010) with Cronbach alpha coefficients above 0.6. This study offers the scale's reliability Cronbach's alpha coefficients: ST (0.89), SI (0.91), OC (0.89), and EIP (0.90). Section C evaluates perceptions about top management safety practises (Safety climate), using eight items. The items measuring safety climate were adapted from Zohar (2010) in Fugas, Silva, and Melia (2012). The scale's Cronbach's alpha coefficient was 0.92 in this study, demonstrating reliability. Section D uses five items from Bass and Avolio's MLQ-5X to assess safety leadership. The current study reports a 0.91 Cronbach's alpha coefficient for scale reliability. Safety performance behaviour (this study's dependent variable) is in Section E. It assessed employees' safety compliance (SCB) and participation (SPB) using 5 items. With sufficient alpha values, Vinodkumar and Bhasi (2010) were adopted. The scale was 0.76 for SCB and 0.86 for SPB reliability. This questionnaire contained 55 items before pilot testing reduced it to 48. All items have Cronbach alpha coefficients over 0.6, showing internal consistency ( $\alpha = 0.948$ ). Use of simple, easy-to-understand questions improved measurement quality and response rate. The study's official language, English, was used for the 20-minute questionnaire. Anonymity and voluntary participation were quality assurance measures.

### ***Research procedure***

The questionnaires were hand-delivered to factory management representatives (where possible) and collected using the "drop-off and pick-up" approach. This questionnaire administration method has been proven to provide proper dissemination and collection under the researcher's control. It managed Nigeria's data loss and delay in collection. Gatekeepers and personal ties improved workplace access and response rates, especially in the target country that has information limits. However, the Manufacturing Association of Nigeria (MAN) allowed research in the defined areas. The researcher received an introduction letter from the association's executive director to enter the companies. The researcher's institution's data-collecting approval letter explaining the study's purpose also secured participation. This researcher acquired management authorization and informed consent from targeted manufacturing organisations. The cover letter discussed the study's purpose and anonymity. Survey participants completed the main page of consent form to confirm their interests. The HR managers were notified three days before distribution and collection. Phone calls or visits encouraged questionnaire completion by the deadline. To ensure the representation of registered and non-registered manufacturing workplace participants, three employees from each industry were randomly selected using the lottery method and convenience sampling strategy. The present researcher also conducted a pilot study to assess the survey's efficacy and identify any issues. The content and accuracy of these questionnaires were reviewed by researchers. The testing method revalidated surveys and tested their suitability for the Nigerian sector. A 30-person pilot sample was randomly selected before sending out the questionnaires. This sample included factory workers from Gauteng manufacturing firms, various employees, and University of Johannesburg occupational safety office and maintenance department personnel. Some aspects were reworded and rephrased to fit Nigerian industrial culture and history. However, the scales' conceptual meaning was preserved as closely as possible to their original users' intent.

The qualitative interviews sought to comprehend the study's concerns from key industry personnel and safety custodians. Thus, 18 participants were interviewed at work using an interview guide for in-depth, semi-structured interviews. Nigerian manufacturing safety caretakers included three employee delegates, an organisational healthcare specialist, a linesman, two supervisors, and a production manager. Three safety officials, four upper-level managers, MAN delegate, and two government representatives attended, using mobile phones to record responses.

Also, field notes were taken during interviews to record observations regarding the visited firms' safety and other pertinent information to enhance the recorded data.

### *Analysis*

The obtained numerical information for the quantitative phase was subjected to various statistical analyses, using the Statistical Package for the Social Sciences (SPSS 26). The required preliminary statistical analysis including Factor analysis (CFA) was conducted to establish the reliability and validity of the constructs prior to further analysis, as well as to verify the one-dimensionality of the scale items (Podsakoff & Organ, 1986). CFA is the best way to analyse data when a researcher has a good idea of how latent variables are put together or when he or she uses measures that have been carefully made, tested, and approved (Hair et al., 2010). Other analysis procedure includes checking for any violations of statistical technique assumptions, appropriate data handling, and data quality to adequately address the specific research questions (Pallant, 2007). The appropriateness and adequacy of the dataset was confirmed using the Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Hair et al., 2018). The KMO measure of adequacy's requisite (Kaiser, 1974) was fulfilled with data showing an excellent KMO index of 0.965 confirming the fit of the data for FA analysis (Hair et al., 2018; Pallant, 2011). With reference to the Bartlett's test of sphericity criteria, which suggests that the data should possess a significant p-value level of less than 0.05, the reported Bartlett's test of sphericity index for this paper is significant with an index value of 0.000 ( $p < 0.05$ ). This confirmed that the observed correlation matrix was different from an identity matrix, implying that the variables relate to each other and were suitable for structure detection (Pallant, 2011). Moreover, this statistical position validates the suitability of data for FA (Pallant, 2011). Also, FA was performed on the raw data, using the principal component analysis procedure. Kaiser's criterion extraction techniques or the Eigenvalue principle was adopted using the varimax rotational technique with Kaiser normalisation (Pallant, 2005). In accordance with Kaiser's inclusion criteria for appropriate factor analyses procedure, the factors, or components with eigenvalues of 1 or more were considered acceptable principal components in this research. According to literature, any factor with an eigenvalue greater than or equal to 1 ( $\geq 1$ ) demonstrates that it explains more variance than a single observed variable, hence, such factors are justified to be retained and useful for further analyses (Pallant, 2011). Furthermore, the identified dimensions contributed significantly to explaining the common variance with the total variance score of

about 71%. According to Hair et al. (2012), for constructs to be valid in factor analysis, the total variance explained in the social sciences should be 60% or more. In line with this principle, the total variance score of about 71% for analysed data confirms the adequacy of the extracted components used in the analysis. This information also provided additional evidence to support the adequacy of the sample size (641) for analyses in this work. Correlation analysis and multiple regression analyses were run to test the relationships.

Also, the proposed regression models of Baron and Kenny (1986) were used to assess the possibility of this moderating influence on the established positive correlation among the independent, dependent, and mediating constructs, using the Hayes Process Macro computational tool (version 3.1). "PROCESS" is an observed variable ordinary least square (OLS) and logistic regression path analysis modelling tool widely used to estimate several categories of analytical procedures (individually and simultaneously) with easily identified paths and concise models (Hayes, 2012). It is an effective tool to analyse hypothesised mediation models given the fact that it offers ease with analysing relatively complex models using bootstrapping confidence intervals. However, the assumed conditions for running regression analysis were manually tested by reconstructing all the regression models run by Process in SPSS via a comprehensive test approach. This is because Hayes' Process Macro regression tool does not perform such required regression assumptions as checking for linearity (the assumption of a normal distribution of the residuals), normality (the assumption of equal variances among the residuals), uncorrelatedness of the residuals, the absence of strong multicollinearity, appropriate scale properties, and the absence of extreme outliers by default. These conditions were certified, enhancing the fit of the data for the regression analysis procedures. The moderated mediating relationships were assessed using the Process Macro Model 14 based on the second stage. This stage investigates whether the moderator influences the strength of the relationship between the mediator and dependent variable, which fits the nature of the investigation in this work.

The quantitative data analysis offered important demographic breakdowns of the participants, including gender, age groupings, years of work, the highest qualifications obtained by respondents, and descriptions of the incidence of injuries and accidents. While inferential statistics (correlation and regression) were used to examine the data, descriptive statistics and tailored tables were used to show the results. Accounts of the participant's assessment of the efficacy of HRM practices, as well as the safety atmosphere in relation to their safety behaviour as influenced by government safety leadership, were also offered. The investigated narratives

were examined with respect to the proposed hypothesis, which was also reviewed. The study's findings concentrate on presenting p-value values of less than 0.05. When the p-value is less than 0.05, it is safe to assume that the model for the state null hypothesis is rejected while the alternative hypothesis is established, indicating the presence of a substantial positive relationship between the variables under consideration. Thematic analysis was also employed to investigate and show their qualitative responses. The procedure for data analysis included manually translating the recorded interviews into written text immediately after each day's sessions. This ensures that the collected information was reviewed on a regular basis for an appropriate reflective process (Creswell & Creswell 2018), which helped the researcher to determine whether there is a continuous flow of relevant data from which they can gain additional insights into areas where efforts should be increased, or areas of focus in the upcoming rounds of interview sessions (Creswell & Creswell 2018). This reflective process was repeated until a saturation point was reached, where no new information was added by the subsequent interview sections. Also, the entire interview data set was manually transcribed using intelligent transcription, with all words except pauses, status, and filler words transcribed. Following this, the text was cleaned up and edited to improve readability and clarity in preparation for the main analysis. The participants were ascribed a pseudonym to keep their identity and ensure anonymity while presenting the findings. Furthermore, both deductive and inductive coding frameworks were used in the coding process from which themes or patterns were further developed. The responses were presented using the narrative format, where the resulting themes are reinforced with verbatim quotations from participants. Triangulation is equally employed so that gathered information from the open-ended sections of the questionnaire and the field notes are incorporated to offer detailed information. The following section discusses the research result.

## Results

### *Demographic composition of participants*

The demographics of the blue-collar participants in the selected manufacturing industry in Nigeria, with the frequency and percentage of responses to the questionnaire, as presented in Table 1 indicates that 432 (67%) of the respondents are males and 209 (33%) are female workers. Likewise, the majority group falls in the aged bracket of 26 and 35 years with 273 respondents (approximately 43%) and age brackets of 18 to 25 years (77), which brings the total to 350 (54.6%). This is followed by the 36-45 age group with 221 people (about 35%). Only 59 of them



were in the 46-55 years category (approx. 9%), while about 2% (11) of the respondents were over 56 years (1.7%). About 357 (approx. 56%) of the respondents had obtained higher education qualifications, 154 (24%) had secondary education, 64 (10%) of them were school leavers, a total of 62 respondents (roughly 10%) possess technical education, and only 4 persons, that is, less than 1% (0.6%) were without any form of formal education. Furthermore, the respondents are either holding a permanent job status namely 327 (51%), or alternative job arrangements including contract (198 or 30.9%), regular casuals (63 or 9.8%), or temporary casuals (53 or 8.3%). The data indicate that the category of workers in the manufacturing sector in Nigeria are agile, young, and might have the required capacity to obey set rules. The respondents' demographic profiles, which were captured with categorical variables are presented in Table 2. It is shown in Table 2 that the lowest duration of respondents' active work service is 1 month. About 6 respondents have only been employed less than 6 months while the highest year of experience is 300 months (25 years) with 2 respondents in this category. This shows that many of the respondents have been working in their places of work for at least 45 months. Also, there is a higher possibility of them being familiar with the organization's mission and goals. According to the demographic indications in Table 3, about 503 of the respondents (about 79%) have never experienced any safety-related incident while doing their jobs. 127 of the respondents (about 20%) have been involved in work accidents between 1 and 3 times, and 11 of them (about 2%) have been victims about 4 to 7 times. The information from most of this worker group implied that accidents and injuries at work in Nigerian factories are rare as suggested in the mean value (0.36 – 0.86). In addition to this information, 459 participants (approximately 72%) are certain that they have never experienced any major injuries in the line of duty. However, 167 persons (26.1%) have been exposed to fatal injuries that resulted in more than 3 days of work absence and such situations have been experienced about 1-3 times. Another 15 persons (2 %) have been exposed to fatal injuries that resulted in more than 3 days of work absence and such situations have been experienced about 4-7 times. Although this feedback has recorded a low mean value (0.55 – 1.034), the account of likely victims is an indication that the zero-incident expectation is yet to be attained in this industry.

Table 1: Demographic variables

Characteristics	Category	Frequency (641)	Percentage (%)
Gender	Male	432	67.4
	Female	209	32.4
	Total	641	100
Age	18-25	77	12.0
	26-35	273	42.6
	36-45	221	34.5
	46-55	59	9.2
	Over 56	11	1.7
Educational qualification	No education	4	0.6
	School leaver	64	10.0
	Secondary education	154	24.0
	Tertiary education (BSc/MSc/PhD)	357	55.7
	Technical	62	9.7
	Total	641	100.0
Employment status	Permanent staff	327	51.0
	Contract	198	30.9
	Regular casuals	63	9.8
	Temporary casuals	53	8.3
	Total	641	100.0

Source: Author's fieldwork

Table 2: Summary of frequency statistics on respondents' composition by job tenure (in Month)

Case Characteristics	Valid	Missing	Min		Max		Mean	Std. Dev.
			<sup>a</sup> Cases	<sup>b</sup> Value (month)	<sup>c</sup> Cases	<sup>d</sup> Value (month)		
Year of employment service	638	3	1	1	2	300	45.29	54.138
			1	2				
			3	3				

Source: Author's fieldwork

Note: a denotes the number of workers in the specified minimum months of employment

b denotes the minimum number of months of employment

c denotes the number of employees in the specified maximum months of employment

d denotes workers' maximum months of employment

**Table 3: Respondents’ accounts of work-related accidents and exposure to fatal injuries at work**

Case Characteristics	No of times	Frequency (641)	Valid Percent	Min.	Max.	Mean	Std. Dev.
Frequency of Involvement in work-related accidents	0 times	503	78.5	0	7	0.36	0.862
	1-3 times	127	19.8				
	4-7 times	11	1.7				
	Total	641	100.0				
Exposure to fatal injuries	0	459	71.6	0	7	0.55	1.034
	1-3	167	26.1				
	4-7	15	2.3				
	Total	641	100.0				

*Source: Author’s fieldwork*

**Summary of descriptive statistics**

The conducted correlation analysis presented a foundation for examining the place of a moderator in this work. The findings regarding the influence of government safety leadership are illustrated in this paper. The assessed relationships are presented with significant paths and established indirect effects in line with Hayes’s (2012) moderated mediation procedures, where the findings demonstrated that the significance of the moderator was not statistically substantiated. The result below (Table 4) showed that a significant overall model ( $f(1, 639) = 198.64, p < .001, R^2 = .38$ ) with Human Resource Practices (HRP) confirmed as a significant predictor ( $b = .625, 95\% \text{ Confidence Interval (CI) } [.538, .712], t(639) = 14.09, p < .001$ ). This basically confirmed the significance of path – "a", whilst indicating that HRP comprised about 38% of the variance in Safety Compliance Behaviour (SCB). Similarly, path – "b" was confirmed as significant with an overall significant model ( $f(4, 636) = 97.25, p < .001, R^2 = .45$ ), showing that the predictors explained about 45% of the variance in the mode. HRP positively and significantly predicted SCB ( $b = .218, 95\% \text{ CI } [.136, .300], t(636) = 5.21, p < .001$ ), while a predictive relationship also existed between Safety Climate

(SCL), which is the mediator and outcome variable of SCB ( $b = .268$ , 95% CI [.159, .376],  $t(636) = 4.85$ ,  $p < .001$ ), where  $b$  = Coeff of Mediator,  $t(df2) = t$ -score, and  $p = .000$ . However, the regression output showed that the interaction term (Int\_1), which was an indicator of the moderation relationship, was not statistically significant at the conventional level, with a 0.05 significance level ( $b = .015$ , 95% CI [-.063, .093],  $t = .375$ ,  $p = .707$ ), showing that the  $b$  - path was not moderated. It also suggests no evidence of moderation of the effect of SCL on SCB by Safety Leadership (SL). This result was validated by the effect size of the moderation (revealed in the  $R^2$  - change component), which showed that the interaction term did not contribute any additional variance to SCB in the model ( $R^2\text{-chng} = .000$ ;  $p = .707$ ). Likewise, the regression outputs presented various effects of the examined relationship (in terms of both HRP's direct and indirect effects on SCB) and their significance, attesting to a non-significant interaction effect. For instance, the direct effect of HR practices on SCB remained statistically significant with the inclusion of the moderator ( $b = .218$ , 95% CI [.136, .300],  $t = 5.21$ ,  $p < .001$ ). Also, the effect of the moderating variable at different levels of the moderating variable in the model confirmed this position.

The estimates of the three different regressions for the indirect effect showed that there were no statistically significant effects on the established mediating effects with the inclusion of the moderator in the model. Rather, the indirect effect remained significant when the level of moderation was low ( $b = .158$ , 95% CI [.074, .236]). Equally, the indirect effect of HRP predicting SCB was significant at the moderate level of the moderator ( $b = .169$ , 95% CI [.103, .239]), and at the maximum level ( $b = .175$ , 95% CI [.102, .253]). It is seen in the results that the direction of the relationship between HRP and SCB through the safety climate was not different in the presence of the moderator (SL). All the demonstrated significant indirect effects and the presented confidence intervals (with the same sign and no zero within their ranges) demonstrate a non-significant interaction effect. Furthermore, the index of moderation confirmed a non-moderated mediation relationship with an index value of .009. At the same time, the confidence interval bounds were of different signs and had zero in their range (CI =  $-.033$ , .058). This showed that the indirect effect relationship between HR practices and SCB was not contingent upon the presence of safety leadership, seeing that the strength and/or direction of the established mediating effect did not change on account of the moderator. It confirmed that government safety leadership (SL) did not influence the effectiveness of safety-related management practices at work, nor does it

influence top management’s safety commitment towards inspiring employees’ safety performance behaviour, in terms of compliance.

**Table 4: Moderated Mediation Effect of SL on SCL Indirect Impact on HRP-SCB Relationship**

Modelled Relationship: HR practices -> SCL -> SCB by SL							
Outcome Variable: SCL (Path-a)							
Model summary	R	R-sq	MSE	F(HC4)	df1	df2	p
	.618	.382	.523	198.636	1.0000	639.0000	.000
Model	Coeff	SE	T	p	LLC1	ULCI	
Constant	-2.313	.178	-12.969	.000	-2.663	-1.963	
HRP (X)	.625	.044	14.094	.000	.538	.712	
Outcome Variable: SCB (Path-b)							
Model summary	R	R-sq	MSE	F	df1	df2	p
	.671	.450	.375	97.247	4.000	636.000	.000
Model	Coeff	SE	t	p	LLC1	ULCI	
Constant	3.156	.165	19.123	.000	2.832	3.480	
HRP (X)	.218	.042	5.209	.000	.136	.300	
SCL	.268	.055	4.852	.000	.159	.376	
SL	.210	.060	3.495	.001	.092	.328	
Int_1	-.015	.040	-.375	.707	-.063	.093	
Test(s) of Highest Order Unconditional Interaction(s)							
M*W	R2-chng	F	df1	df2	p		
	.000	.141	1.000	636.000	.707		
Direct and Indirect Effects of X on Y							
Direct effect of X on Y	Effect	SE	t	p	LLC1	ULCI	
	.218	.042	5.209	.000	.136	.300	
Conditional Indirect Effects of X on Y							
Indirect effect HRP -> SCL -> SCB	SL	Effect	BootSE	BootLLCI	BootULCI		
	-.980	.158	.041	.074	.236		
	.220	.169	.034	.103	.239		
	.820	.175	.039	.102	.253		
Index of Moderated Mediation							
SL	Index	BootSE	BootLLCI		BootULCI		
	.009	.023	-.033		.058		

Source: Researcher’s fieldwork

Note: Y; SCB, X; HRP, M; SCL, W; SL

A similar pattern was observed in the safety participation behaviour of the Nigerian manufacturing blue-collars. Table 5 maintained the significance of the overall model with HRP supported as the predictor ( $f(1, 639) = 198.64, p < .001, R^2 = .38; b = .625, 95\% \text{ CI } [.538, .712], t(639) = 14.09, p < .001$ ).

**Table 5: Moderated Mediation Effect of SL on SCL Indirect Impact on HRP-SPB Relationship**

Modelled Relationship: HRP -> SCL -> SPB by SL							
Outcome Variable: SCL							
Model summary	R	R-sq	MSE	F(HC4)	df1	df2	p
	.618	.382	.523	198.636	1.0000	639.0000	.000
Model	Coeff	SE	T	p	LLC1	ULCI	
constant	-2.313	.178	-12.969	.000	-2.663	-1.963	
HRP(X)	.625	.044	14.094	.000	.538	.712	
Outcome Variable: SPB							
Model summary	R	R-sq	MSE	F	df1	df2	p
	.593	.352	.428	66.283	4.000	636.000	.000
Model	Coeff	SE	T	p	LLC1	ULCI	
Constant	3.391	.165	20.498	.000	3.066	3.716	
HRP (X)	.136	.043	3.201	.001	.053	.220	
SCL	.217	.052	4.187	.000	.115	.319	
SL	.237	.054	4.379	.000	.131	.343	
Int_1	-.010	.045	-.213	.831	-.097	.078	
Test(s) of Highest Order Unconditional Interaction(s)							
M*W	R2-chng	F	df1	df2	P		
	.000	.045	1.000	636.000	.831		
Direct and Indirect Effects of X on Y							
Direct effect of X on Y	Effect	SE	T	p	LLC1	ULCI	
	.136	.043	3.201	.001	.053	.220	

Modelled Relationship: HRP -> SCL -> SPB by SL						
Conditional Indirect Effects of X on Y						
Indirect effect HRP -> SCL -> SPB	SL	Effect	BootSE	BootLLCI	BootULCI	
		-.980	.141	.042	.059	.227
		.220	.134	.033	.074	.205
		.820	.131	.039	.061	.214
Index of Moderated Mediation						
SL	Index	BootSE		BootLLCI	BootULCI	
		-.006	.026		-.055	.050

Source: Researcher's fieldwork

Note: Y; SPB, X; HRP, M; SCL, W: SL

This indicates that path-a was significant, while HRP explained about 38% of the variance in SPB. In terms of its path – “b”, there was an overall significant model ( $f(4, 636) = 66.28, p < .001, R^2 = .35$ ), HRP still predicted SPB ( $b = .136, 95\% \text{ CI } [.053, .220], t = 3.20, p = .001$ ), while the mediator (SCL) also significantly predicted SPB ( $b = .217, 95\% \text{ CI } [.115, .319], t = 4.19, p < .001$ ). However as seen in Table 5, the interaction term (Int\_1) was not statistically significant ( $b = -.010, 95\% \text{ CI } [-.097, .078], t(636) = -.213, p = .831$ ), suggesting that the “b” - path was not moderated. Similarly, this position is supported by other indicators presented. For instance, the interaction effect size value showed that the moderator did not add to the model's variance ( $R^2\text{-chng} = .000; p = .831$ ). The direct effect of HRP on SPB remained statistically significant ( $b = .136, 95\% \text{ CI } [.053, .220], t = 3.20, p = .001$ ). In addition, the effect of the moderator (SL) at different levels of the indirect relationship showed the indirect relationship effects remained statistically significant, regardless of the moderator. The mediating effect was significant at the lowest level of the moderator ( $b = .141, 95\% \text{ CI } [.059, .227]$ ), at a moderate level ( $b = .134, 95\% \text{ CI } [.074, .205]$ ), and at its maximum level ( $b = .131, 95\% \text{ CI } [.061, .214]$ ). Added to this, the index of moderation confirmed that the tested mediating relationship was not moderated by SL (Index =  $-.006; 95\% \text{ CI } [-.055, .050]$ ). In addition to the confirmed non-significant status, the qualitative data revealed that safety leadership is a major challenge in the country.

### **Summary of information from qualitative data**

The feedback from the qualitative phase of the study showed participants' displeasure with a majority describing the OHS situation with words ranging from "problematic", "evidently poor", and "appalling" to "seriously challenged", 'far away from the reality, 'full of empty words, 'appalling safety culture', 'having the resemblance of the Dead Sea, 'second-hand issue', and 'filled with safety underperformances', and so on. For instance, a production personnel (PP) employee who has been in the production unit for 15 years, had this to say: "The safety culture is appalling, and we are far away from reaching the expected stage even within the industries in Nigeria, especially amongst the manufacturing sectors. There is no doubt that there is ongoing awareness, but for the most time, what we have had thus far are empty talks filled with so much noise. Since safety involves lots of money to get things going, the progress so far has been very slow". Similarly, a linesman (LM), with 16 years of working experience, indicated: "The level of safety within the workplaces in Nigeria is still poor majorly because of general negative safety attitudes. It is like pouring resources into a dead sea, which continues taking good things in but would not flow. Many employees are defiant, several industries deliberately flout safety guidelines, and several managements are not ready to practice all the requirements for one reason or the other. This has been a common practice because the existing government agencies are not enough to go around to check these companies". In addition, a supervisor (SM) stated: "OHS is basically poor because the practice is taken to be expensive, especially with several industries still trying to survive the economic situations of the country. While the government has been trying to ensure that people abide by standard safety practices, instructing compliance with rules and regulations in line with best practices, there are challenges with peoples' stubbornness, several employees and employers are habituated to cutting corners and over-economizing of resources to achieve their set goals/targets. In so doing, safety is usually slaughtered for increased productivity or to make more profits. No doubt! Lot of grounds to be covered". A safety officer (SO3) echoed in line with this view and remarked: "...Nigeria is not yet serious with safety, otherwise, by now OHS would have been considered a necessary act to be engaged in, a serious norm to be embraced and pursued. However, what we see is unnecessary spending on programmes which hold no water... just words". Another safety officer (SO2) attributed the failure of occupational safety to the reluctance of management to finance essential elements of safety and their usual deafening silence on reported issues, which is permitted because of the government's inaction or ineffectiveness in the compelling of



desired behaviour. He expounded on his viewpoints by saying the following: “Oftentimes, managements are not ready to really train staff as they should, so they cunningly dodge such investment and when issues touching on safety happens, they fail to say anything or respond on time. This is where the Government comes in, particularly, through the active involvement of the Ministry of Employment in factory inspections to see how things are done. However, it appears this ministry is not really empowered to be effective. For example, auditing, which should be a key function in their operations, is either not done or unsatisfactorily conducted. Most times, they notify the company before coming for an inspection, which ought not to be so. There should be unannounced visits in the monitoring of safety practices to restrict the usual practice of companies spending last minutes efforts in trying to solve a problem, which ought to have been done before”. Despite the impossibility of including every comment made throughout this conversation, the feedback reflects the perceived situation of OHS in the country with some of the impeding factors.

### Discussion

The demographic data revealed the likely nature of the Nigerian manufacturing blue-collar workers with reference to their features. Many of the hired blue-collar workers are male with 432 male employees (67%) and 209 (33%) female workers. This male-dominated nature of blue-collar employment is affirmed in other studies. As noted in extant works, such predominance is rooted in the perception that traditionally, this type of work is occupied by males. The data also shows that Nigeria's manufacturing sectors prefer to hire younger people, where the majority are among the millennial generation given that a larger percentage falls in the aged between 26 and 35 years with 273 of the respondents (approximately 43%) and age brackets of 18 to 25 years (77), which brings the total to 350 (54.6%) followed by the 36-45 age group with 221 people (about 35%). Only 59 of them were in the 46 - 55 years category (approx. 9%), while about 2% (11) of the respondents were over 56 years (1.7%). This attraction for youth may be explained by the fact that persons in this group have inherent vitality and energy, as well as the ability to be physically active.

This is also an indication that a large percentage of the hired workers are agile and might be capable of the associated demands with manufacturing processes as such satisfies the need of this industry. When compared to older generations, such traits increase their chances of being regarded as the qualified talent that the industry needs to survive. This is congruent with previous studies, explaining that

recruiting such employee categories is typically motivated by an organisation's profit-driven mission. In addition, young people are preferred mostly owing to their lower cost and flexibility in work schedules. Regarding the respondents' education levels, the data suggest that Nigeria's manufacturing industry has more learned fellows and people that might have the required capacity to obey set rules (approx. 56% of the respondents had obtained higher education qualifications, 24% had secondary education, 10% were school leavers, roughly 10%, possess technical education, and only 4 persons, that is, less than 1% (0.6%) were without any form of formal education). The presented statistics show that most blue-collar workers have the mental capacity to identify and understand workplace hazards and risks since many of them could read and understand any written rules, principles, or policies. It also implies that blue-collar workers were more likely to be knowledgeable and could give valid information when such is needed. This result corresponds with the findings of a previous study (Afube, Nwaogazie, & Ugbebor, 2019).

Added to this, there is a higher chance of them having a better picture of the espoused policy within their organizations, and familiar with the organization's mission and goals, given the data of some with about 25 years (300 months) in service. Many of the respondents have been working in their places of work for at least 45 months (approximately 4 years) based on a mean value of 45.29 (SD = 54.14). Based on this information, it is reasonable to draw the conclusion that Nigerian manufacturing blue-collar workers are more likely to be familiar with the organization's goals and objectives and have a better awareness of the proclaimed policy in their organisations. In addition, the respondents' years of service and relatively stable job status suggest that they might be more relaxed in demonstrating appropriate work behaviours. However, the Nigerian manufacturing industry has not achieved zero-incident expectations despite the calibre of workers in the industry and claims from many workers. This is in line with previous findings (Otitolaiye, Abd Aziz, Munauwar, & Omer, 2021; Afube *et al.*, 2019; Adeyemi *et al.*, 2016). Although, the information from most of this worker group claimed that accidents and injuries at work in Nigerian factories are rare as suggested in the mean value ( $0.36 \pm 0.86$ ). 503 of the respondents (about 79%) indicated that they have never experienced any safety-related incident while doing their jobs. 459 participants (approximately 72%) are certain they have never experienced any major injuries in the line of duty. Some of them had experienced work-related accidents up to seven times. 127 of the respondents (about 20%) have been involved in work accidents between 1 and 3 times, and 11 of them (about 2%)

have been victims of work-related accidents about 4 to 7 times. 167 workers (26.1%) have been subjected to fatal injuries that required more than three days off from work, and such occurrences have happened one to three times. Most claims that several factory workers are performing their duties without sustaining major injuries are questioned based on the record showing that fatal injuries (with a recorded mean value of  $0.55 \pm 1.034$ ), still happen at various workplaces with some being fatally injured about seven times. Furthermore, while there is convincing evidence to conclude that several of the respondents could have benefited from the accumulated experiences and knowledge from their long service years, accidents and fatal injuries remained a concern. The few blue-collar workers that claimed to have been hurt on the job or experienced accidents during work, support the need for safety attention since one accident is one too many thus confirming the imperativeness of this present study.

With reference to the regression analysis, the data revealed evidence that contradicts the predicted direction and strength of the presumed relationship, with sufficient evidence demonstrating that the moderator (safety leadership, i.e., SL) had no statistically significant interaction with the mediating impact of safety climate on the relationship between the examined HRM practices and safety behavioural practices. The index of moderated mediation substantiated that the interaction effect was negligible and statistically non-significant, with values much higher than the expected significant levels of less than 0.01 or 0.05. The consequence of this conclusion is that safety leadership (SL), regardless of its operational levels, had no influence on the likelihood of safety atmosphere (the mediator) influencing the impacts of the offered safety HR practices such that workers' safety behaviour was equally influenced. In a way, this non-significant interaction associated with safety leadership in the modelled relationship could be interpreted to imply that the mere involvement of federal government leaders in safety might not guarantee or aid meaningful improvement in safety practices (of employers and blue-collar employees) at their workplaces. Based on the findings, the presence of safety leadership (through government's safety transformational style) does not enhance or reduce the derived effects from top management's involvement in safety such that the offered management activities and workers' experiences with these HR practices inspire their safety compliance behaviour in the workplace. This result is not surprising, given that the effects of safety leadership in terms of government participation in workplaces have been notably weak (ILO, 2016; Adeyemi *et al.*, 2016; Abubakar, 2015; Umeokafor *et al.*, 2014). In contrast, their safety investments have yielded little progress in the

manufacturing industry safety context (Salminen & Seo, 2015). Similarly, it could suggest that these blue-collar workers have no positive perceptions about the existence of government safety leadership in safety improvements. According to the literature, when workers perceive a strong level of safety-supportive activities, it is interpreted as a show of good safety leadership, which could motivate workers' interest and willingness to embrace standard safety practices (Martínez-Córcoles & Stephanou, 2017; Clarke, 2013). Another possible justification might be associated with the extent to which the usefulness of government safety leadership in terms of levels of safety commitment has been experienced, which could have informed the employees' perceptions and judgments of its relevance to their displayed behavioural actions. Similarly, given the statistically significant, positive, and moderately strong correlation found between SL and Safety Performance Behaviour (SPB), where 30% of SPB's variation is explained ( $r = .548, p < .01$ ), and between SL and SCB, with SL accounting for approximately 36% of the variation in SCB ( $r = .598, p < .01$ ). These results show a higher tendency for government safety leadership to motivate employees and employers to participate in safety activities if appropriately demonstrated.

On the other hand, the moderately strong influence of safety leadership (SL) on safety compliance behaviour (SCB) indicated that appropriate safety compliance behaviour could be motivated if there were satisfactory demonstrations of safety leadership. Studies evidently support that employees often consider the general behaviour of safety leaders to form an opinion about safety expectations, especially from the priority placed on health and safety at work, which, in turn, influences them to act in accordance with what has been perceived (Zohar, 2010). The results confirm that the effect of top management's demonstration of safety commitment (safety climate) on the capacity of the offered safety-related HR practices influencing compliance or participation behaviour, is not contingent upon the presence of safety leadership (SL) regardless of the potential parameters of possible inducement (through idealised influence, inspirational motivation, intellectual stimulation, and individualised considerations) in Nigeria's manufacturing industry. This means that the presence of safety leadership (through government transformational behaviours) does not increase or diminish the expected commitment level of top management in providing good safety-enhancing HR practices nor does it influence employees' safety behaviour in a meaningful manner. Also, irrespective of the transformational leadership parameters displayed by the government, the established relationships between HR practices and top management's safety demonstrations remain unchanged. This is

in contrasts with literature (Clarke, 2013). Transformational leadership is noted with attributes that pull discretionary support for safety and have been shown to have a significant influence on employee safety outcomes. Since leaders are essentially role models, a good example of safety leadership from the top sets the stage for proactive approaches to preventing accidents at work, whilst encouraging employees or employers to participate in safety and to follow the rules (Hoffmeister *et al.*, 2014).

Therefore, according to this present work, the absence of a moderated mediation relationship implies that the established relationships conform with the predicted directions, providing sufficient evidence to suggest that the assumption about the established relationships is true. As a result of this information, the stated null hypothesis for this relationship could not be rejected, and the proving that the alternative hypothesis is false, thus unsupported. The information from the conducted interview is consistent with this quantitative result. This is because the participants seem to be convinced that the situation could have been better should the national government be firm in the discharge of their legal obligations. These indicators evidently support the manifest non-significant effect of government safety leadership impact in the country. This finding is consistent with several issues noted in earlier works advocating for the restoration of safety in Nigeria (Afube *et al.*, 2019; Abubakar, 2015; Adebisi & Charles-Owaba, 2009).

Based on this current finding, the recurring situation of OHS in the Nigerian manufacturing industry suggests the need for appropriate demonstration of transformational leadership from the top levels of governance to workplace relationship safety, especially with the significance of the transformational leadership style that has been well noted (Christian *et al.*, 2009). It has been acknowledged, for instance, for its capacity to motivate employees and provide a promising picture of anticipated performance (Martínez-Córcoles & Stephanou, 2017). This leadership style potentially strengthens subordinates' personal identification with their leaders and reinforces their sense of self-worth by going above and beyond for the sake of the organisation's success (Clarke, 2013). The effective manifestation of this leadership approach has been linked to a favourable safety atmosphere, wherein followers react in alignment with the established climate. According to Griffin and Hu's (2013) research, the display of safety-specific transformational leadership, specifically through activities that inspire, monitor, and promote safety learning, has a significant impact on safety performance behaviours. These attributes include effectively communicating a positive and motivating safety vision for their followers. They are proactive in

observing and addressing safety lapses and errors made by other stakeholders to suggest solutions and avert future occurrences. In addition, transformational leaders painstakingly make provisions to foster and advance safety-related learning, so they are willing to sacrifice for it by investing in standard platforms related to safety.

According to a scholarly investigation, there exists a positive correlation between the communication of an inspiring safety vision by leaders and the likelihood of employees dedicating their time and effort towards safety activities. Additionally, it was found that safety monitoring demonstrated a positive correlation with safety compliance, whereas safety inspiration exhibited a significant association with safety participation (Griffin & Hu, 2013). Predicated on the findings in this work, the appropriate application of safety-specific transformational leadership strategies by the top government could assist in promoting safety and reinforcing safety behaviour among individuals. It could drive the establishment of suitable safety related HRM practices and motivate improved top management safety commitment (Griffin & Hu, 2013). On the other hand, passive safety leadership has more drawbacks than benefits. It subjects stakeholders to exploitative employment, dysfunctional employment relationships, the concealment of beneficial information, impractical and harmful work views, and a misbehaviour-friendly workplace. Based on the above, the stated objective of this work is satisfied. The null and alternate hypotheses and the resulting decisions are illustrated as follows:

H1<sub>0</sub>: There is no moderating influence of the government's resilient safety leadership activities on the mediating effect of safety climate on the relationship between safety-related HR practices, and employee safety behaviours (compliance and participation) in Nigeria's manufacturing industry (Fail to reject it).

H1<sub>1</sub>: There is a moderating influence of the government's resilient safety leadership activities on the mediating effect of safety climate on the relationship between safety-related HR practices, and employee safety behaviours (compliance and participation) in Nigeria's manufacturing industry (Insufficient evidence to support it).

The recurring situation of OSH in the Nigerian manufacturing industry suggests the need for appropriate demonstration of transformational leadership from the top levels of governance to workplace relationship safety, especially with the significance of the transformational leadership style that has been well noted (Christian *et al.*, 2009). For instance, it has been commended for its ability to inspire members and provide a positive vision for anticipated performance

(Martínez-Córcoles & Stephanou, 2017). This leadership style potentially strengthens subordinates' personal identification with their leaders and reinforces their sense of self-worth by going above and beyond for the sake of the organisation's success (Clarke, 2013). The appropriate demonstration of such a leadership style has been associated with a positive safety climate in which subordinates respond in accordance with the created climate. According to Griffin and Hu's (2013) research, the display of safety-specific transformational leadership, specifically through activities that inspire, monitor, and promote safety learning, has a significant impact on safety performance behaviours. These attributes include effectively communicating a positive and motivating safety vision for their followers. They are proactive in observing and addressing safety lapses and errors made by other stakeholders to suggest solutions and avert future occurrences. In addition, transformational leaders painstakingly make provisions to foster and advance safety-related learning, so they are willing to sacrifice for it by investing in standard platforms related to safety. It has been argued that employees are more inclined to devote their time and energy to safety activities when leaders communicate an inspiring safety vision to them (Griffin & Hu, 2013). Also, it was found that safety monitoring had a positive correlation with safety compliance, whereas safety inspiration demonstrated a significant association with safety participation (Griffin & Hu, 2013). Predicated on the findings in this work, the appropriate application of safety-specific transformational leadership strategies by the top government could assist in promoting safety and reinforcing safety behaviour among individuals. It could drive the establishment of suitable safety related HRM practices and motivate improved top management safety commitment (Griffin & Hu, 2013). On the other hand, passive safety leadership has more drawbacks than benefits. It subjects stakeholders to exploitative employment, dysfunctional employment relationships, the concealment of beneficial information, impractical and harmful work views, and a misbehaviour-friendly workplace.

### **Conclusion**

Leadership concerns a process of influencing, through which the leader increases the followers' acceptance of objectives and achieving methods and facilitates their individual and collective efforts towards the shared objectives. According to extant studies, this is a vital contextual factor affecting safety performance and an indispensable prerequisite in explaining safe work behaviour, especially via the transformational leadership style of management. The

moderating-mediation procedures in this work concluded that the existing government safety leadership exerts no significant impact, irrespective, not even at its lowest state of inclusion. At this crucial stage worldwide, these findings are surprising and call for a rethink of governments' roles in gingering safety relationships at workplaces, particularly within the manufacturing sectors, and mainly because of this industry's significance and its blue-collar workers in respect of national economic sustenance. Past renowned philosophers like Albert Einstein acknowledged that understanding a problem is the first step towards solving it because the more a problem is understood, the more likely one will understand its root cause and should be able to create countermeasures to prevent it from recurring; otherwise, "solutions" may merely create new problems. Accordingly, the reports of these findings showed that, although there are records of safety interventions in the country, the blue-collar workers attached no significance to their usefulness in meeting their safety needs, which suggests the need for an overhauling of the existing safety leadership approach to improved practices that demonstrate Government's interest in the overall safety of the country, through the correct manifestation of transformational kind of leadership in motivating stakeholders' safety interest. The need for the federal government to make a deliberate effort at ensuring the matter of continuously upholding safety is crucial and must be taken seriously. This is crucial, even though other stakeholders have the legislative authority to adhere to the higher authority and do their bidding as much as expected, this obligation is contingent on the extent to which leadership is exhibited.

According to extant research, transformational leadership leads to greater exchange quality and enhanced concern for welfare since it is marked by value-based and personalised engagement (Clarke, 2013). Stakeholders are more receptive to accepting safety because transformational leadership styles allow for beneficial exchanges. Also, because transformational leadership styles allow for conducive exchanges, stakeholders are more receptive to embracing safety. There is appropriate feedback on safety practices and rewards for achieving safety objectives. There is continuous encouragement for safe working, maintaining a safe working environment, and suggesting new ways of working more safely. Likewise, its characteristics include encouraging stakeholders to openly discuss safety at work, discussing personal values and beliefs regarding the importance of safety, acting in a manner that demonstrates a commitment to safety, spending time demonstrating how to work safely, and listening to safety concerns and acting promptly (Pilbeam *et al.*, 2016). Adopting a transformational leadership style



demonstrates leaders' personal commitment to and active interest in occupational safety and followers' well-being, which typically support positive safety climate perceptions among followers, amongst other laudable benefits (Zohar, 2010). This is more fitting for the Nigerian manufacturing industry, where workers are relationship-oriented and accordingly tend to adapt their behaviours to what is generally accepted. As such, the embrace of transformational leadership is essential in the manufacturing sector safety management process to address the recurring features of unsatisfactory safety practices and motivate stakeholders' safety commitment. Importantly, subordinates are more likely to believe that safety is valued when it is perceived and believed that the state takes safety seriously on a consistent level in their interactions with the various stakeholders (Jiang & Probst, 2016). Based on the study's findings, the following recommendations are proposed.

### **Recommendation**

Respondent highlights revealed that blue-collar workers value active leaders' safety commitment and substantial participation in terms of attentiveness, readiness, provision, the authenticity of interventions, humanitarian acts, increased consciousness, the correctness of approach, creativity in managerial procedures, releasing financial support for awareness and educational programmes, and supportive media platforms for safety enhancement, among other things. Addressing these issues in such a manner that the government is seen as serious about their safety campaigns and measures in place has been found to have a substantial effect on employee safety outcomes as well as management conduct in general. This is vital for consideration because followers are more likely to generate an opinion about safety expectations based on the importance they put on health and safety to influence their own activities. Participants have advocated for significant safety commitment from safety leaders, particularly the national government, through support for the establishment of a good safety culture and a comfortable climate for safety at work, in which top management of organisation is driven to demonstrate genuine concerns for safety. These requirements emphasize the importance of the government's comprehensive commitment to safety and ensuring that the right criteria that enable transformational safety leadership are adopted.

The extent to which employees and employers embrace safety or manifest specific safety behaviour is a function of observed leadership safety actions and behaviour that such actions support, especially as leaders are recognised as safety role models through their actions and attitudes that set the tone for diverse

workplace climates. Furthermore, the national government should demonstrate its safety obligations by paying close and thoughtful attention to reported and/or observed potential hazards and risks at work, while stepping up efforts to ensure that the sources of such hazards are eradicated and appropriately fixed. Such activities contribute to achieving safe performance behaviour at many levels of the working relationship. This implies that leaders should become more actively engaged and increase their efforts to increase staff interest in safety. The federal government should lead safety efforts and give up-to-date safety information to all stakeholders. This is critical because when workers and employers show their devotion, they are more likely to trust them and obey. Importantly, the anticipated performance and growth processes of the manufacturing industry, which have been significantly delayed and weakened by the lack of proper safety measures, could be revived with significant government safety participation in safety handling procedures and execution in this sector, as this is a driving factor for the industry's growth.

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## ANALYSIS OF THE REAL ESTATE MARKET AND INVESTMENTS IN ROMANIA IN 2022 AND THE MAIN CHALLENGES IN 2023

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**Abstract:** *The real estate market in Romania is on an upward trend in recent years. Romania remains an attractive market in terms of real estate asset prices, rents, but also the need for modern, energy-efficient office, industrial and retail spaces. That is why, even in the conditions of an economic environment that is facing difficulties due to high inflation, the increase in financing costs; difficulties that are present all over the world, Romania can continue to attract both significant investments in the real estate sector and important tenants for the projects that will be built. In this scientific article, we aimed to analyse the residential and investment real estate market and the commercial real estate market in the year 2022, as well as presenting the main challenges for the year 2023.*

**Keywords:** *residential real estate market, investments, commercial real estate market*

**JEL Classification:** *E22, E44*

## Introduction

The term “real estate” is a legal term that refers to land and anything that is permanently fixed on land, such as buildings. Often this term is considered synonymous with the term “real property” or “realty”. However, for technical reasons, a distinction is currently made between real estate, which refers to land and what is attached to it, and real property, which refers to property rights over real estate. These terms were used for the first time in the field of common law, while civil law refers to immovable property. Along with the development of the private real estate, the real estate field has become extremely attractive for business. Buying a property requires a significant investment, each piece of land has unique characteristics, and as a result, the real estate field has now become a real industry, in continuous evolution.

## Literature Review

Globalization has stimulated the increase in the importance of transparency in real estate markets due to the demand from international investors (Razali and Adnan, 2012). According to the results of a survey on the intentions of investors, carried out by CBRE - Commercial Real Estate Services (2018), the low transparency of the markets is one of the major obstacles in the development of real estate investments. The lack of transparency, through the use of opaque and securitized financial instruments related to real estate, was also one of the main causes of the financial crisis of 2008 (Gorton, 2008). Thus, transparency becomes a fundamental factor in the efficient functioning of real estate markets because it facilitates decision-making and coordinates the actions of market participants. In ensuring a transparent environment for business, a considerable role rests with regulatory bodies, which can influence access to information and, at the same time, reduce market uncertainties (Banerjee, Davis and Gondhi, 2018).

### 1. Conditions for the emergence of real estate development in Romania

Once integrated into global capitalism, as a semi-peripheral country and emerging market, Romania started to become interesting for institutional financial actors who invest in real estate development. The first real estate sector occupied by them was the retail sector. As for residential real estate development as a business, it gained momentum in Romania starting in the 2000s. The conditions for its emergence were related to both the privatization of industrial platforms and the housing stock, but also to the privatization of the banking system and the



integration of local financial systems into global circuits of financial capital accumulation.

Equally necessary for its emergence was the legislation that made possible the formation of the capital market and the financial services necessary for real estate development (for example, laws on investments in general and alternative financial investments in particular or investment companies). Another condition of real estate development was the transformation of urban governance based on an entrepreneurial model focused on attracting investors, the flexibility of urban rules, and the withdrawal from investments in housing or other public buildings. On the one hand, real estate development is related to the process of privatization of the state economy and deindustrialization for several reasons.

Because, through the expansion of the private sector in the productive economy, the capital earned in business could reach a level of over accumulation that allowed the owners to reinvest their earned profit in real estate business as well. Then, after they were privatized, bankrupted and demolished, the former industrial platforms also gave way spatially for new real estate developments. On the other hand, through the privatization of the housing stock and the trading of housing units, a real estate market emerged that real estate development could use and expand.

In parallel, deindustrialization not only destroyed state economic units, but also the idea of housing provided to employees according to their jobs. Then, residential market specialists and investment consultants heavily promoted the new ideology about housing and, through marketing, helped build the desire for a new lifestyle that the new real estate developments promised to fulfil.

Moreover, the fiscal facilities provided by the state to investors and, in particular, those supporting the construction sector, as well as the marketing efforts of the Directorate for Foreign Investments of the Government of Romania (“Invest Romania”), have promoted real estate development both in the capital and in the regional cities of Romania.

Several online platforms promote Romania for its real estate investment potential.

The *Global Property Guide* provides up-to-date information, for example, on rental yields in Romania, which, compared to other EU countries, are very high at 6-7%.

The “*Move to Romania*” platform is a general invitation to Romania, among other things, as a good site for real estate investments due to the following arguments: there are no restrictions on the purchase of housing in Romania for foreign citizens, and since 2012 foreigners can also acquire land; demand for real

estate far exceeds market supply; there is a high possibility of property prices rising; the central bank of Romania implements the mortgage credit scheme for property buyers; and foreign investors can take advantage of the lower real estate prices in Romania compared to the rest of the European countries, which will grow in the future.

## **2. Analysis of the residential real estate market and investments in the year 2022**

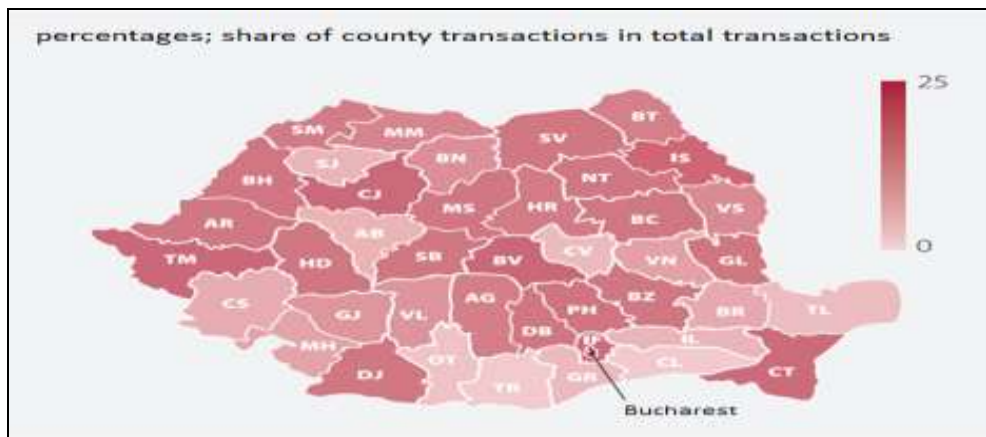
Contrary to all expectations, 2022 was a record year for the real estate investment market, as can be seen from the report published last year on the BNR website, regarding Financial Stability. The total volume of investments amounted to 1.26 billion euro, with an advance of 39% compared to the previous year.

The market saw steady growth during the first nine months, which was further boosted in the fourth quarter by the biggest transaction of the year: Paval Holdings' acquisition of CA Immo's office portfolio from the Austrians for 377 million euro. This not only brought the share of internal investments to almost half of the total activity for 2022, but also positioned the Romanian company as one of the main office owners in the country.

*The activity of the real estate market* has moderated in the recent period, an evolution reflected in the slightly decreasing number of real estate transactions (-3% in the period January-September 2022, compared to the same period of the previous year). Persistent problems on the residential real estate market in Romania are represented by the disparities regionally in terms of the demand and supply of real estate, the regional concentration of mortgage loans, as well as the reduced degree of inclusion and financial intermediation in the less developed regions of the country.

There are a quarter of all real estate transactions in Bucharest. About 28% more of the transactions are concentrated in the main regional centres in the country, respectively: Cluj, Braşov, Timiş, Constanta and Iaşi, as can be seen in the graph below:

**Graph no 1. Regional distribution of real estate transactions, September 2022**

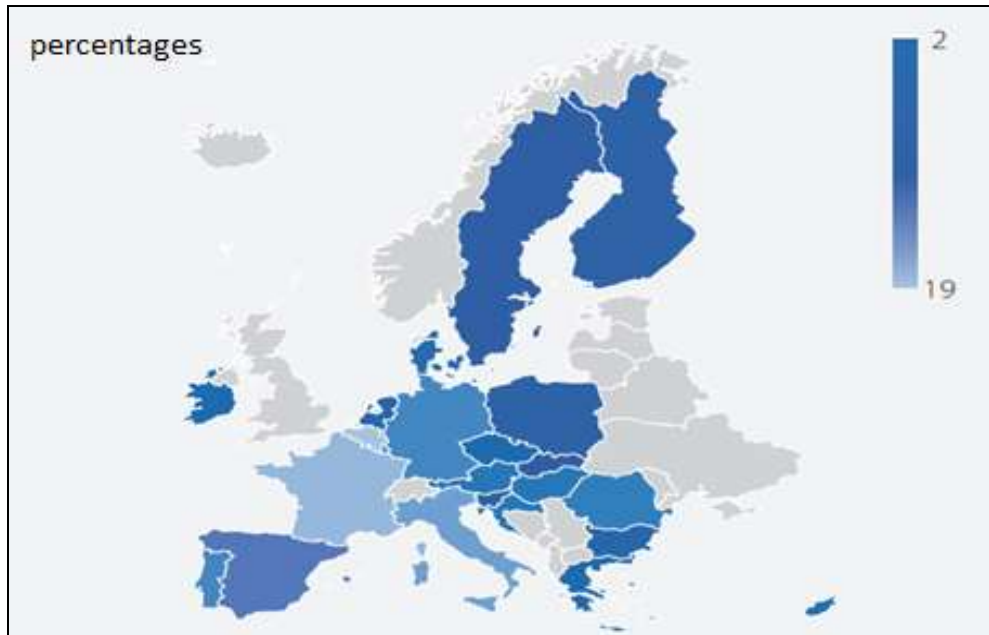


*Source: Financial Stability Report December 2022, pdf. p 54, BNR*

The lowest number of transactions is found in Giurgiu, Teleorman, Covasna, Olt or Sălaj counties (less than 0.6% of the number of transactions take place in each of these counties).

Transaction costs are moderate in Romania and are between 4.4 - 10.2% for the buyer and include: stamp duty, notary fees and registration fee and between 3% and 6% for the seller, aspects highlighted in graph no. 2:

**Graph no. 2 Total cost of trading a property (buying + selling)**

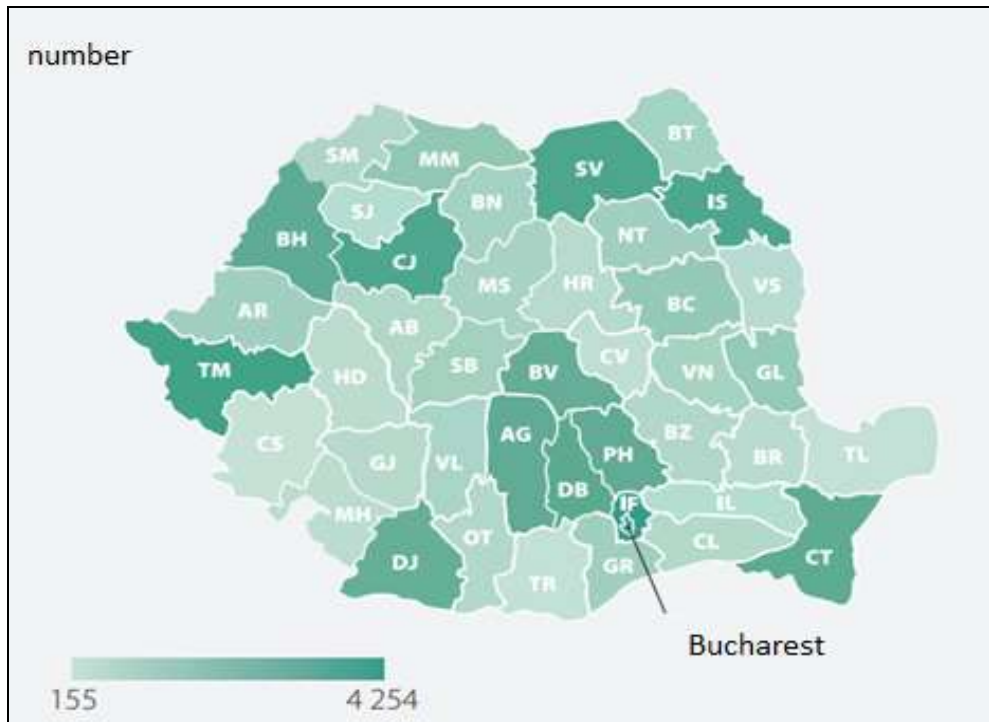


Source: *Global Property Guide Research*, <https://www.globalpropertyguide.com/Europe/Romania>

The highest transaction costs are recorded in France, Malta or Belgium, but in Bulgaria, the Czech Republic or Poland the transaction costs of real estate are lower than those recorded in Romania.

From the beginning of 2022, the construction authorization for residential buildings recorded a tempering. In the period January-September 2022, the number of permits issued decreased by 11.8% compared to the same period of the previous year. At the regional level, in the same reference period, the most construction permits were issued for Bucharest-Ilfov, Timiș, Suceava, Cluj and Iași, while the fewest were issued for Tulcea, Caraș-Severin, Teleorman and Covasna:

**Graph no. 3 Construction authorization for residential buildings by county, January-September 2022**



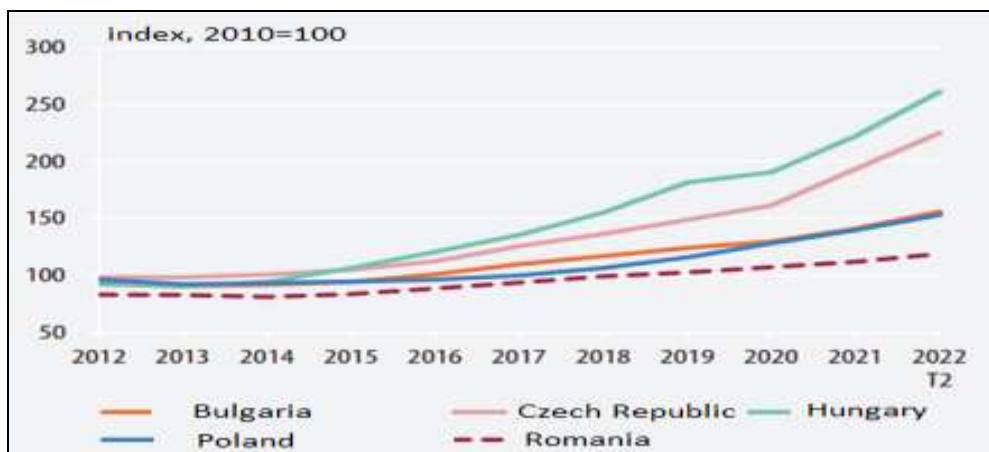
Source: INS, [insse.ro](http://insse.ro)

In the third quarter of 2022, 52,794 residential units were completed throughout the country, which represents an advance of 6% compared to the same period of the previous year, and most homes were put into use in the urban environment (56.3% of the total), according to the data published in the Financial Stability Report from December 2022, on the BNR website.

The volume of construction work for residential buildings remained relatively flat in September 2022 in annual terms. According to September 2022 data, the construction cost index for the residential building segment registered an annual growth rate of 14.3% amid rising raw material spending as well as supply chain issues.

Rising construction costs are likely to put further pressure on rising real estate prices. Residential property prices increased in Romania in the first half of 2022 (+8.5% in annual terms), but remained at the lowest level in the region and, at the same time, below the European Union average (+10%) and that of the euro area (+9.3%).

**Graph no. 4 Residential property price index, regional comparisons**

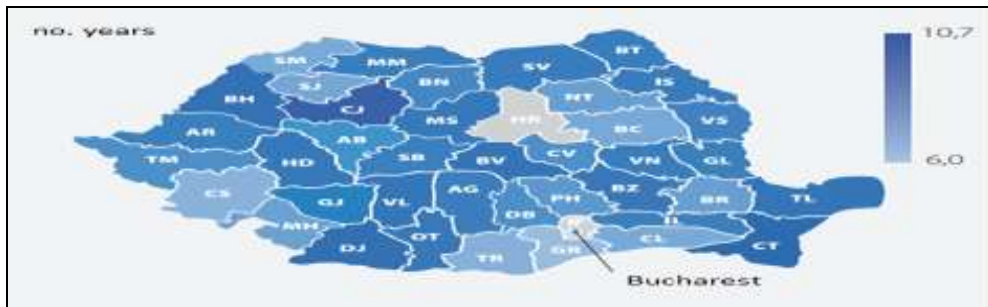


Source Eurostat

At the same time, during the last 10 years, the dynamics of residential property prices in Romania was lower compared to that of prices in the region, as can be seen in graph no. 4.

The price-to-income indicator highlights regional heterogeneities in terms of the time required to purchase a 2-room (55 square meters) home, without taking into account living expenses or saving and without financial support from at banks:

**Graph no. 5. Price-to-income indicator (PTI) regionally  
(2nd quarter of 2022)**

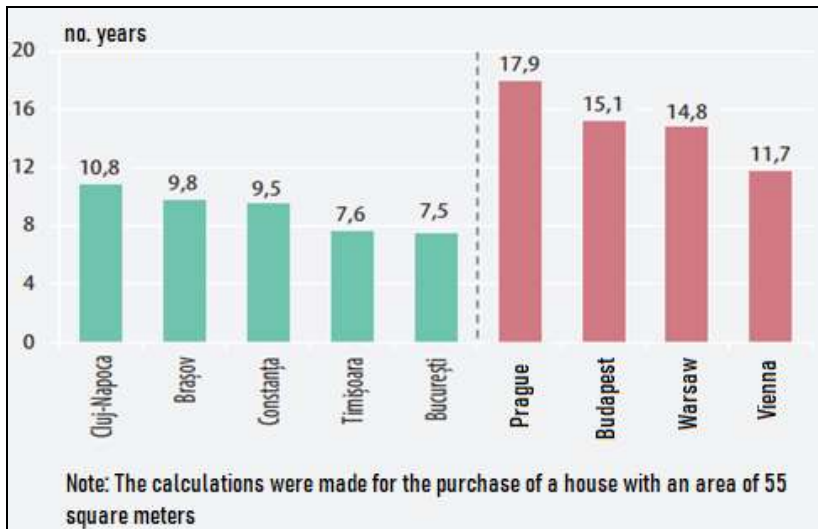


*Source: Financial Stability Report December 2022, pdf. pp. 56, bnr.ro*

The differences come both from the price of real estate valued differently by region and from income discrepancies. The highest level of the indicator is recorded in Cluj County, where it takes approximately 11 years to purchase a home without bank financing. In contrast, in counties like Giurgiu, the indicator does not exceed the value of six years.

Internationally, the main urban centres in Romania are below the values of the indicator calculated for the capitals of neighbouring countries. Thus, for the purchase of a 55 square meter home without taking out a real estate loan, it takes almost 18 years in Prague, around 15 years in Budapest and Warsaw and around 12 years in Vienna:

**Graph no. 6 Price-to-income indicator in the main urban centres in Romania and neighbouring countries, September 2022**



Source: imobiliare.ro

Price developments in the coming period depend on a number of factors such as macroeconomic conditions, the general tightening of financing conditions against the backdrop of rising interest rates, and the increase in uncertainties in the new geopolitical context. They are likely to decrease the potential demand from the population and, implicitly, to moderate the increase in real estate prices.

### 3. The commercial real estate market

Construction activity on the commercial real estate market picked up in the first eight months of the current year, with the volume of non-residential building constructions increasing by around 17.3% in annual terms. However, the number of building permits issued in the same reference period fell by 7%, while average construction costs for non-residential buildings increased by around 20%. These persistent increases in construction costs are likely to put pressure on both the supply and demand of commercial real estate through the impact on construction activity and prices.

The transactional activity of the commercial real estate market has revived, with the volume of investments amounting to around 654.2 million euro in the first nine

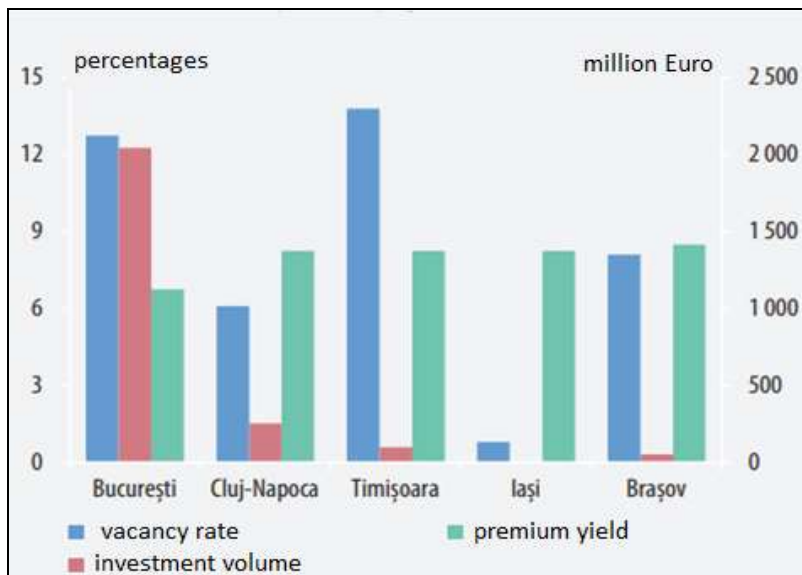


months of 2022, 16% more than in the same period of the previous year, but 12% less than the same period of the pre-pandemic year 2019. The majority of transactions were based on properties located in Bucharest (55%), with a growing interest in office space investments being noted.

The volume traded for such properties represented 45% of total investments since the beginning of the year.

In this context, an online survey<sup>1</sup> carried out by CBRE Research in April 2022 shows that 60% of respondents prefer to carry out their work in the office, without excluding the hybrid option, while the remaining 40% prefer working from home or the hybrid system.

**Graph no. 7. Office space statistics, April-June 2022**



*Source: Financial Stability Report pdf, pp. 58, bnr.ro*

The motivation of respondents who prefer working in a hybrid system consists in the following disadvantages of working from the office:

- Time lost in traffic;
- Additional expenses with transport and clothing;
- The impossibility of combining professional and personal life;

<sup>1</sup> CBRE, Romania Office Destinations 2022, cbr.ro

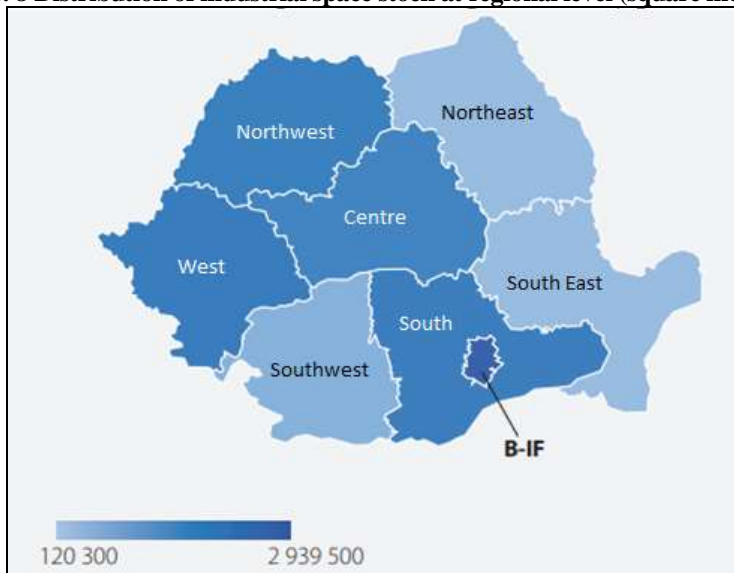
- Finding a parking space.

In this context, the stock of office spaces in Romania reached over 4.3 million square meters in the 2nd quarter of 2022, most of it being found in the Bucharest-Ilfov region, with a premium yield<sup>2</sup> of 6.75 % and a vacancy rate of about 12.75% (as can be seen in graph no. 7).

As for industrial premises, half of the stock of such sites is also located in the capital region (graph no. 8), given the countless advantages and opportunities associated with this area:

- connectivity with regional cities, developed infrastructure and public transport,
- high-quality premises, as 90% of the modern stock is of superior class (A),
- relatively new buildings, about 60 percent of the area of the stock of industrial spaces were delivered in the period 2015-2022,
- high market liquidity and
- Increasing demand for logistics spaces in the last two years.

**Graph no. 8 Distribution of industrial space stock at regional level (square meters), 2022**



*Source: JLL, Regional Cities Office Snapshot 2022 H1, jll.ro*

<sup>2</sup> Premium yield represents the best yield estimated to be achievable for office space of the highest quality and specification in the best location on the market

In the commercial space segment, Romania has become a very attractive market for international traders. The stock of modern retail space will reach 4.32 million square meters in 2023, currently insufficient supply for growing demand from international retailers.

#### 4. Real estate market challenges in 2023

The real estate market in Romania faces numerous challenges in 2023.

Rising prices, inflation, the war in Ukraine and the real estate blockade influence both the purchasing power of citizens and investment opportunities.

##### *The main real estate issues in 2023*

In 2023, *real estate prices* in Romania seem to increase artificially, to align with the European level (1000-1500 euro/square meters). Justifications for this increase include war, inflation and electricity costs. However, another factor that contributes to this growth is the intention to reduce the number of producers and monopolize the construction materials market.

*Inflation* is a major problem in Romania, affecting the purchasing power of citizens and, implicitly, the real estate market.

*The conflict in Ukraine* is causing major gas supply problems in Europe. Consequently, a transition from gas to other energy sources is necessary.

*Real Estate blockade*: The real estate market is experiencing a blockade and people are expecting a drop in prices similar to 2008. Although prices may fall, they will not reach the levels of 2009. The blockade period can be an opportunity for investors who want to avoid keeping savings in cash.

*The change in Romanians' options*: they are more interested in renting, rather than buying an apartment or a house, which represents a first on the real estate market in Romania.

#### 5. The advantages of investing in real estate in 2023

##### 1. *Alignment of prices at European level*

The trend of increasing real estate prices in Romania indicates an alignment at the European level. A property in Bucharest of 160 square meters, built on a plot of 300 square meters, costs half that of a similar property in other European capitals, which means that there is enough space for growth.

##### 2. *Energy independence through solar panels*

Real estate can provide energy independence through the use of solar panels, eliminating dependence on public utilities and protecting against unpredictable costs.

### *3. The interest of the great European and American powers*

Romania represents a major interest for the great European powers and for America, which implies an increase in real estate prices. Thus, investing in properties can protect liquidity from inflation.

### *4. The best investment: new houses from real estate developers*

Investing in new homes from serious real estate developers is the best option for real estate investors. Developers still have good deals on building materials due to volume negotiations and are flexible on financing terms.

Although the price of real estate loans is high in 2023, due to the increase in interest rates and the tightening of credit conditions, they can be refinanced in the future. Thus, investing in real estate remains an attractive opportunity for investors, in our opinion.

## **Conclusion**

The total volume of investments on the real estate market amounted to 1.26 billion euro, with an advance of 39% compared to 2021.

The real estate transactions in 2022 were decreased by 3%.

The low number of building permits issued led to a slowdown in the pace of new construction, while sales increased for all housing types.

The highest transaction costs are recorded in France, Malta or Belgium, but in Bulgaria, the Czech Republic or Poland the transaction costs of real estate are lower than those recorded in Romania.

The construction cost index for the residential building segment registered an annual growth rate of 14.3% amid rising raw material spending as well as supply chain issues.

It takes almost 18 years in Prague, around 15 years in Budapest and Warsaw, and around 12 years in Vienna to buy a 55 square meters apartment without taking out a real estate loan. In Romania, 10.8 years are needed in Cluj-Napoca and 7.5 years in Bucharest.

The transactional activity of the commercial real estate market has revived, with the volume of investments reaching around 654.2 million euro in the first nine months of 2022.

The main challenges facing the real estate market in 2023 are: real estate prices, inflation, the Russia-Ukraine conflict and the real estate blockade.

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## ORGANIC HOTEL COSMETICS – THE PREMISE OF ECOLOGICAL SUSTAINABILITY

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### **Abstract:**

*Analyzed from the perspective of the hotel industry, sustainable development refers to the concept of "triple bottom line", promoting social responsibility, ecological and economic responsibility. Sustainability intervenes to correct the negative effects caused by entrepreneurial activities that have led to accelerated degradation of the ecosystems. Looking from this perspective, hotel entrepreneurs align with the sustainable development goals, integrating innovative technologies that capitalize on renewable energy, as well as environmentally friendly consumables, friendly to the surrounding menu and guest's skin.*

**Key words:** *hotel industry, ecological sustainability, entrepreneurial innovation, organic cosmetics, ecological ingredients*

**JEL Classification:** *Q56, L66*

## Introduction

The dedication and responsibility assumed for sustainability and social innovation prove to be the primary attributes of sustainable hotels, militating for the eradication of poverty and hunger, maintaining the integrity of the planetary contour, promoting a responsible consumption of resources necessary for the development in conditions of maximum efficiency of entrepreneurial services in the hotel industry.

The vision attached to these enterprises is outlined on obtaining the honorary title of organic cosmetics manufacturers for hotel enterprises in Romania. The ideal attached to this concept focuses on eliminating the devastating effects of conventional cosmetics that are of alarming intensity in the contemporary entrepreneurial context, causing adverse reactions, allergies or hormonal imbalances.

The vision supported by sustainable hotel enterprises integrates the concepts promoted through sustainability and social innovation, wishing to provide a model of sustainable behavior for all enterprises operating in the cosmetics industry in Romania.

The sustainable mission of organic organizations is to provide hotel businesses with organic cosmetics with soothing, moisturizing, emollient and antibacterial properties, reducing the risks associated with conventional cosmetics.

## 1. Literature review

The sustainable development directives applicable to the hotel industry involves the inclination of interest towards the sustainable approach of ecological cosmetics. With numerous benefits for both guests and the environment, eco-friendly cosmetics highlight sustainable innovation in the hospitality industry.

### 1.1. Defining aspects of hotel organic cosmetics

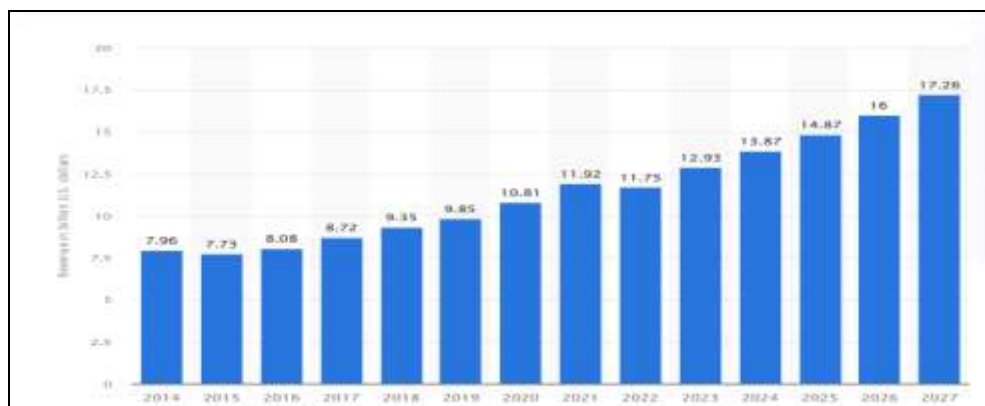
The global hotel industry focuses on meeting guest's needs and expectations in superior conditions (Ashwini et al., 2022). Looking from this perspective, hotel cosmetics are represented as the category of consumable products on which tourists attach great importance. The passion of the female population for proper body care is the foundation of ecological innovation promoted through natural cosmetics, integrating skin and environmentally friendly ingredients (Farghali et al., 2023).

Market research conducted by Singhal and Malik (2018) provided an objective view of respondent's preference towards organic cosmetics. From the total sample integrated in the research, 89.14% of respondents mentioned that they prefer

natural cosmetics to the detriment of body care products that have notoriety, proving increased efficiency and a lower price.

The specialists integrated in the international hotel activity studied the benefits of natural cosmetic ingredients and considered it opportune to integrate them into the tourist service, thus contributing to achieving the Sustainable Development Goals. Organic cosmetics do not pose a danger to the environment, and their integration into accommodation structures ensures the reduction of water and soil pollution (Cervellon and Carey, 2011).

The organic cosmetics market highlights an upward trend, outlined through the following statistics:



**Figure no. 1. Evolution of the global organic cosmetics market**

*Source: Statista (2023)*

According to data provided by Statista (2023), the global organic cosmetics market highlights accelerated growth. This situation encourages hotel operators to focus their interest on integrating organic consumables from the cosmetics category into the tourist service. The level of 2027 forecasts an increase equivalent to 54.55% compared to the figures obtained in 2022.

## 1.2. Typology of organic cosmetics

Organic cosmetics, which contain at least 95% ingredients of natural origin, ensure the highest and strictest level of international certification, meeting all quality standards attached to certified organic cosmetics. Looking from a



typological perspective, organic hotel cosmetics are presented through the following categories:

1) Shampoo and conditioner

Natural cosmetics promote the circular economy, using natural ingredients grown according to international standards for organic crops (Bozza et al., 2022).

Featuring ingredients of natural origin, hair cleansers and moisturizers are proven effective in effectively cleansing the scalp without causing irritation. Organic extracts combat hair loss, gently caring for guests' hair adornment. The lack of chemical ingredients ensures increased tolerance of tourists for organic body care products without causing allergies (Morganti et al., 2013).

2) Soap

Organic soaps impress the senses of tourists with the intense fragrance that is maintained after use. The organic ingredients used to prepare soap possess emollient properties, gently caring for the skin of tourists (Rybowska, 2014).

The natural ingredients in organic soap have notable benefits, such as effective cleansing, soothing and deep hydration. Compared to hotel cosmetics that do not have safe ingredients, natural soap does not cause allergies or discomfort from use.

3) Moisturizing lotion

The skin is exposed daily to both pollution and certain irritants (perfume, chemical ingredients, synthetic materials), unbalancing the microbiome identified in the epidermis. During the stay, the skin of tourists requires proper care. Hotel entrepreneurs have turned their interest to the benefits of fragrance-free moisturizers, which contain at least 95% natural ingredients with soothing and nourishing properties (Bozza, 2022).

### 1.3. The necessity for organic cosmetics used in the hotel industry

Most cosmetics found in accommodation contain harmful ingredients that can cause hormonal imbalances or allergies. Looking from this perspective, it is considered necessary for all body care products integrated into the tourist service to ensure the maintenance of the integrity of human health, without exposing tourists to biological risks.

The need to use organic hotel cosmetics is sustained by eliminating the risks attached to compromising human health and the environment, offering tourists safe, ecologically certified products that have undeniable benefits (Secchi et al., 2016).

Conventional cosmetics contain numerous toxic substances that endanger the health of customers. From allergies to triggering hormonal imbalances and

carcinogens, cosmetics have become a real danger to human health, while degrading natural ecosystems.

Petroleum compounds are present in many ingredients in conventional cosmetics and are used to produce perfumes or UV filters. Mineral oils in hotel cosmetics are classified as potentially carcinogenic, but above all these aspects have a negative impact on the environment. In the manufacturing process of silicone-containing cosmetics, the resulting residues migrate to water sources, degrading water quality and the sustainability of aquatic ecosystems (Dugonski et al., 2022).

Conventional cosmetic products contain the following ingredients that endanger the integrity of human health:

**Table no. 1. Toxic cosmetic ingredients**

Ingredient	Efect
Dioxine	Carcinogenic
Dietanolamine și trietanolamine	Sensitizes the scalp, dries the hair
Parabens	Sensitizes the scalp, intensifies hair loss
Formaldehilde	Excessive hair loss
Propilene glycon	Sensitizes the scalp, intensifies hair loss
Dimeticone	Causes severe irritation of the scalp
Alchool	Sensitizes the skin

*Source: personal processing by Peterson (2021)*

The negative effects highlighted by conventional cosmetics substantiate the need to integrate organic cosmetics into the hotel provision, giving tourists the certainty that the ingredients used to manufacture organic cosmetics do not highlight any health risk factor (Kolling et al., 2022).

#### **1.4. Benefits of using organic hotel cosmetics in tourism**

The use of organic cosmetics has numerous benefits both for maintaining human health and for protecting ecosystems and the environment. The main benefits of existing natural ingredients in organic cosmetics are presented through the following variables (Morganti et. al, 2023):

- 1) No risks to human health. Specialized studies have revealed an alarming aspect: in one year, the human body absorbs about 5 kilograms of harmful substances through the use of cosmetics (Silva et al., 2022). The revealed negative impact on the body results in increased intolerance to cosmetics, severe hormonal imbalances, generalized decrease in immunity and cancer (Lee et al., 2022).
- 2) Harmful ingredients in conventional cosmetics stay on the body for a long time, thus degrading ecosystems (Morganti et al., 2023). A recent study, conducted to highlight the impact of cosmetics on aquatic organisms, presents a worrying conclusion: cosmetics directly and decisively impact the coral reef, causing its discoloration. Natural ingredients do not impact natural ecosystems, providing environmental sustainability (Limbu et al., 2023);
- 3) Harmful ingredients in conventional hotel cosmetics highlight an increased risk for both the development of hormonal diseases and the sustainability of global ecosystems. Triclosan, formaldehyde and aluminium highlight high pollutants for the environment, particularly the environment, marine life and water (Suphasomboon et al., 2023).
- 4) The organic ingredients used to prepare natural cosmetics support the circular economy and sustainable agriculture, thus contributing to the achievement of the Sustainable Development Goals. The ingredients come from crops that have not been treated with chemicals, thus having no negative impact on people and the environment;
- 5) Natural ingredients integrated into certified organic cosmetics provide soothing, emollient and moisturizing properties, protecting the skin's natural barrier and contributing to premature aging of the upper layer of the epidermis;
- 6) Hotel entrepreneurs who integrate consumable products from the organic cosmetics category into their tourism performance ensure the sustainability attribute imposed by the sustainable development objectives outlined by the European Commission.

The undeniable benefits of organic cosmetics intervene to reduce the incidence of carcinogenic diseases that have proven an alarming magnitude at international level, thus motivating the need to integrate them into the tourist service.

Organic ingredients highlight the following determinant:

**Table no. 2. Organic cosmetics ingredients**

Organic ingredients	Properties
Vitamin E	Deep hydration, soothing irritated skin, antioxidant properties
Vitamin C	Antioxidant properties, diminishing the effects of premature aging of the skin, promoting collagen production
Green tea extract	Anti-inflammatory and antioxidant properties
Beta Caroten	Deep hydration
Avocado oil	Deep hydration, emollient properties
Aloe vera	Antibacterial and anti-inflammatory properties
Coconut oil	Antimicrobial and antifungal properties

Source: <https://www.alyaka.com/en-eu/blogs/alyaka-magazine/natural-beauty-ingredients-missing-cosmetics>

The undeniable benefits of natural ingredients underline their importance in hotel cosmetics, offering customers a perfect experience.

Organic ingredients in the category of emollients, antioxidants and humectants provide deep care of the epidermis without causing allergic reactions.

These benefits, approached from the perspective of the hotel industry, ensure that the physical integrity of customers is maintained without causing them discomfort.

The organic ingredients do not impact human health, protecting the epidermis against bacteria and free radicals.

It is considered particularly important for hotel operators to integrate safe cosmetics for human health into their provision without compromising the physical integrity of guests (Moslehpour et al., 2023).

To complete the benefits of organic cosmetics integrated into the hotel service, the following aspects outlined through personal subjectivity are highlighted:

- 1) Promotes social responsibility, ensuring continuity of sustainable agriculture in Romania, representing the main supplier of organic ingredients, with moisturizing and emollient properties;
- 2) It encourages the sustainable consumption of cosmetics, promoting a consumption model directed towards natural ingredients. The aggressive marketing practiced by conventional cosmetics companies directly impacts customers' purchasing decisions. The harmful ingredients present in these

products negatively impact human health, causing strong hormonal imbalances. The introduction of organic cosmetics into hotel practice can change customers' consumption habits, giving them the opportunity to test organic products;

- 3) The biodegradability of organic cosmetics favours their recycling for biomass production (Goyal et al., 2023);
- 4) The lack of polluting factors allows recycling water for internal consumption, reducing the expenses of the hotel enterprise.

Organic cosmetics promote both ecological responsibility and social and economic benefits, representing a sustainable innovation in the hotel industry.

## 2. Analysis of the organic cosmetics industry in Romania

The undeniable benefits of organic ingredients introduced in organic cosmetics have boosted the desire of entrepreneurs to carry out this field of activity. The barriers highlighted when entering the organic cosmetics market are presented through the following variables:

- 1) **Legislative barriers** – the organic cosmetics market is regulated by ISO 9001:2015, on global quality management, as well as by ISO 22716 standard that delimits good practices for manufacturing products in the cosmetics industry. Companies wishing to carry out this object of activity must cumulatively meet the criteria attached to international quality standards. **The solution** for eliminating legislative obstacles is for entrepreneurs to meet all quality requirements attached to the process of manufacturing, storing, handling and transporting organic cosmetics, avoiding compromising the integrity of their composition and contamination with biological, chemical or physical factors;
- 2) **Financial barriers** – the investment budget required to carry out this object of activity requires a considerable financial contribution, preventing entrepreneurs from easily entering the cosmetics market. The increase in inflationary level inevitably determined the generalized increase in costs incurred by entrepreneurs for providing the object of activity. Analyzed simultaneously with the decrease in customers' purchasing power, the financial barrier can be eradicated through the following **solutions**: the existence of a sustainable financial contribution, covering for at least 12 months of activity the financial needs of the economic organization; accessing European funds to ensure the majority share of financial resources necessary for the production of organic cosmetics; willingness of

entrepreneurs to request bank loans to start the prospected business in the field of organic cosmetics (Giustra et al., 2022);

- 3) **Technical and material** barriers: natural ingredients, coming from organic agricultural crops, exist in a negligible proportion on the territory of Romania. Small producers identified at national level cannot provide the necessary ingredients to meet the demand of entrepreneurs who want to enter the organic cosmetics market. Looking from this perspective, there is a risk of unmet demand for natural ingredients needed to produce natural cosmetics, leading to disruption of the production flow (Mitterer-Daltoé et al., 2023). The technology specific to the production activity of organic cosmetics does not highlight a competitive offer at national level, requiring their purchase from international suppliers, thus increasing the costs attached to carrying out the object of activity. UV technology, which ensures proper sanitation of cosmetics, has low availability at national level, representing a barrier for entrepreneurs who want to enter this object of activity. **The optimal solution** to eradicate this barrier is for entrepreneurs to study very carefully the availability of natural ingredients needed to produce organic cosmetics, forecasting their quantity needs. It is recommended that new entrants on the natural cosmetics market acquire high-quality technology that can ensure the requirements set out through international quality standards (Fonseca et al., 2023);
- 4) **Barriers attached to human resources** – the competence of specialists in the production of natural cosmetics is considered a determining factor of their quality. The experience, expertise and professionalism of employees are mandatory variables for the preparation of organic cosmetics. Compared to conventional cosmetics, organic cosmetics require special attention, ensuring the optimal amount of ingredients introduced into organic cosmetic preparations. Both active and natural ingredients highlight the risk of faster biological compromise. The number of specialists who can respond promptly to the organic cosmetics industry is relatively low at national level, representing an impediment for companies entering this field of activity. **The effective solution** for eliminating this barrier is for entrepreneurs to get involved in the recruitment process at the early stage of the investment project, integrating into the production activity only candidates who meet the requirements related to studies and experience;
- 5) **Difficult know-how to acquire** – organic cosmetics represent a significant impediment in the provision of this object of activity, requiring a rich

portfolio of knowledge to prepare cosmetics that have moisturizing, emollient, antibacterial properties or that can improve the protective barrier of the epidermis. Partial knowledge of this field of activity does not allow entrepreneurs to enter the market of organic cosmetics, thus limiting the success of the prospected business (Kalasariya et al., 2021). The opportune solution to eliminate this barrier highlights the need to identify competent specialists who can ensure the fluidity of the technological flow and the quality of organic cosmetics.

## 2.2. Presentation of the main operators in the organic cosmetics industry in Romania

The main economic organizations that dedicate their economic activity to the production and marketing of organic cosmetics on the territory of Romania are:

### 1) Fereto Organics

The premium organic ingredients used by Fereto Organics motivate the impressive number of customers of the enterprise. Presenting an effective marketing strategy and a diversified portfolio of natural cosmetics, the company delineates the following determining aspects:

**Tabelul no. 3. SWOT analysis of Fereto Organics**

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Loyal customers who regularly purchase natural cosmetics;</li> <li>• High quality natural ingredients, coming strictly from existing organic agricultural crops at national level;</li> <li>• Positive image obtained at national level;</li> <li>• Efficiency of digital marketing activity;</li> <li>• Experience and expertise of human resources.</li> </ul>	<ul style="list-style-type: none"> <li>• The price is approximately 25% above the level practiced by the main competitors;</li> <li>• Dependence on suppliers who provide the necessary organic ingredients;</li> <li>• Duration between 20 and 35 days for delivery of orders to business customers.</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• Accessing European funds for an own culture of natural ingredients.</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased purchasing power of customers;</li> <li>• Customer confidence in conventional cosmetics.</li> </ul>

*Source: personal elaboration*

The experience and notoriety of Fereto Organics are two of the elements of the competitive context that disadvantage the penetration of new economic organizations carrying out the same object of activity.

The proven effectiveness of the active ingredients intervenes to correct the main skin conditions, motivating the impressive number of customers. In 2022, Fereto Organics fulfilled 235,000 orders delivered to 176,428 customers.

## 2) Sabio Cosmetics

The products marketed under the tutelage of Sabio Cosmetics are highly appreciated by consumers, enjoying a strategic exposure inside the intensely transited commercial spaces. Natural extracts from vegetables, fruits and plants effectively soothe and moisturize the skin, arguing the preference of hotel entrepreneurs to introduce high quality products into the tourist service, which are distinguished by their undeniable properties. Sabio Cosmetics' analysis highlights the incidence of the following:

**Table no. 4. SWOT analysis of Sabio Cosmetics**

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Product portfolio highly appreciated by customers;</li> <li>• The existence of strategic partnerships concluded with hotel operators in Romania;</li> <li>• Competitive prices that ensure a constant flow of customers within physical sales premises;</li> <li>• Proven effectiveness of bioactive ingredients.</li> </ul>	<ul style="list-style-type: none"> <li>• Limited assortment range;</li> <li>• Limited production capacity.</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• Diversification of assortment range;</li> <li>• Increase in production capacity.</li> </ul>	<ul style="list-style-type: none"> <li>• Weather factors can adversely influence organic crops. This situation compromises the effectiveness of the active ingredients;</li> <li>• Diminishing the purchasing power of customers.</li> </ul>

*Source: personal elaboration*



Sabio Cosmetics stands out as a strong competitor for companies looking to enter the organic cosmetics market, limiting their ability to gain sustainable market share.

Hotel entrepreneurs operating 5 star hotel structures integrate consumable cosmetics supplied by Sabio Cosmetics into their tourism activity, impressing guests who entrust their stay in premium accommodation. The proven efficiency of all organic cosmetics offered by Sabio motivates the strategic partnerships highlighted between the company and national hotel operators.

### 3) Nala Cosmetics

Nala Cosmetics offers customers a diversified portfolio of cosmetics with natural ingredients, impressing the olfactory filter of all people who use the products sold by the company. Nala Cosmetics' analysis highlights the influence of the following key aspects:

**Table no. 5. SWOT analysis of Nala Cosmetics**

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Diversified portfolio of natural cosmetics;</li> <li>• High quality ingredients with proven effectiveness;</li> <li>• Strategic location in heavily transited shopping centers;</li> <li>• Strategic partnerships concluded with business customers;</li> <li>• Sustainable production capacity.</li> </ul>	<ul style="list-style-type: none"> <li>• Staff turnover;</li> <li>• The dependence of the enterprise on local producers who can supply bioactive ingredients.</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• Purchase of raw materials from international suppliers.</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased purchasing power of customers.</li> </ul>

*Source:* personal elaboration

Products marketed under the tutelage of Nala Cosmetics show great appreciation from customers, obtaining a favorable market share for the economic organization.

Excluding the previously analyzed enterprises, 24 economic organizations operate on the market of the organic cosmetics industry in Romania that satisfy customer requirements in superior conditions.

## Conclusions

Concluding, the responsibility assumed by hotel operators is directed towards achieving the Sustainable Development Goals, continuously identifying technologies and consumables that effectively meet the sustainability criteria set by the European Commission.

Conventional cosmetics contain numerous toxic substances that endanger the health of customers. From allergies to triggering hormonal imbalances and carcinogens, cosmetics have become a real danger to human health, while degrading natural ecosystems.

The natural ingredients in organic soap have notable benefits, such as effective cleansing, soothing and deep hydration. Compared to hotel cosmetics that do not have safe ingredients, natural soap does not cause allergies or discomfort from use.

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## SUSTAINABLE TOURISM IN ROMANIA

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### **Abstract:**

*The sustainable trends attached to world tourism highlight hotel structures with innovative design and facilities, leaning towards the directives drawn through sustainable development.*

*The main purpose of this study is to identify the respondent’s perception of sustainable tourism. The objectives set for this research are seen from a double perspective: the objective attached to the conceptual approach of sustainable tourism from the perspective of the consequences denoted by the pandemic context and the objective of identifying the perception of the sample regarding sustainable tourism in Romania.*

**Keywords:** *sustainable tourism, tourism innovation, rural tourism, technological innovation, sustainable tourism*

**JEL Classification:** *Q01, L83*

## Introduction

The literature highlights a determining difference between ecotourism and sustainable tourism (Agustina et. Al, 2023). Looking from this perspective, ecotourism focuses more on ecological conservation and educating travelers about local environments and natural surroundings, while sustainable tourism focuses on travelers who have minimal impact on the environment and local communities (Caciora et al., 2021).

Sustainability is also reflected on the hotel innovation attached to accommodation structures that intend to have a reduced impact on the environment (Antunes et al., 2023). The innovative techniques attached to the hospitality industry combine traditional techniques with those identified in the digital environment, offering customers possibilities that were not available within this industry not so long ago. The introduction of virtual reality in the tourism concept leads to the visual simulation of natural areas, offering tourists the possibility to visualize in detail the tourist attractions from the comfort of their own home or from inside travel agencies specialized in digital tourism. Technological innovation pushes the boundaries of conventional tourism, thus witnessing the premises of a new era in the hospitality industry. In travel agencies there is the possibility of viewing prospected tourist objectives or destinations through VR glasses. This technique visually stimulates potential customers and, as a result, boosts sustainability.

### 1. Theoretical approach of sustainable tourism

The literature highlights a decisive difference between ecotourism and sustainable tourism (Gheorghe et. al, 2018). Looking from this perspective, ecotourism focuses more on ecological conservation and educating travelers about local environments and natural surroundings, while sustainable tourism focuses on travelers who have minimal impact on the environment and local communities (Mugauina et. al, 2020).

Rural tourism and agritourism have highlighted a sustained growth under the pandemic context, highlighting the attraction of tourists to panoramic guesthouses. In Romania this concept is promoted by the Green Hill Panoramic accommodation structure in Poiana Mărului.

This unique accommodation structure offers tourists a perfect visual experience, identifying itself as an oasis of peace and relaxation.

In the law of sustainable tourism highlighted in rural areas, the innovation promoted by accommodation in coviltir carts is highlighted.

The sustainability driven by rural tourism is a foundation for aligning tourism activity with sustainable development goals.

Viglia et al. (2023) highlights the importance of sustainable tourism for the growth of the national economy. Ramkissoon (2023) conducted an international study in which it identified tourist's perceptions of sustainable tourism. Participants in the research said that rural tourism and agritourism increase the quality of life of residents, providing jobs for the population located in rural tourist areas.

Utami et al. (2023) consider rural tourism entrepreneurship to be a model of sustainable tourism. From this perspective, rural areas that have wonderful landscapes or natural resources that can be made available to tourists (spa tourism) are an important foundation for the development of sustainable tourism.

Sustainable tourism highlights a low impact on the environment by being ecosystem-friendly (Nunkoo et al., 2023). Martínez-Martínez et al. (2023) highlights the need for sustainable management, harnessing the resources of sustainable tourism without endangering the population or the environment.

Green hotels, which predominantly use renewable energy, have become a sustainable trend (Lin et al., 2023). These hotels are promoted through social media, avoiding pollution caused by conventional marketing materials (Kilipiri et al., 2023).

Sustainability is highlighted as a global tourist attraction (Ivars-Baidal et al., 2023). Han et al. (2023) point out the importance of involving the local population in sustainable tourism activity. The population benefits from a clean, pollution-free environment, thus encouraging the development of sustainable tourism (Gautam et al., 2023).

Dias et al. (2023) consider sustainable tourism to be a model of entrepreneurial behaviour. This view is also supported by Demeter et al. (2023) as well as Antunes et al. (2023).

## **2. Research on identifying respondent's opinions, attitudes and perceptions regarding sustainable tourism in Romania**

The research methodology was carried out through a questionnaire distributed in the digital environment. The targeted respondents were identified in social media groups dedicated to tourism, with a predicted sample of 100 people.

In researching respondent's opinions, attitudes and perceptions regarding sustainable tourism in Romania, the following questions were analyzed:

1) Have you spent in the last 12 months your vacation in a sustainable tourism accommodation?

The answers provided by respondents have the following weights:



**Figure no. 1. Share of respondent's answers to the question "Have you spent in the last 12 months your vacation in a sustainable tourism accommodation?"**

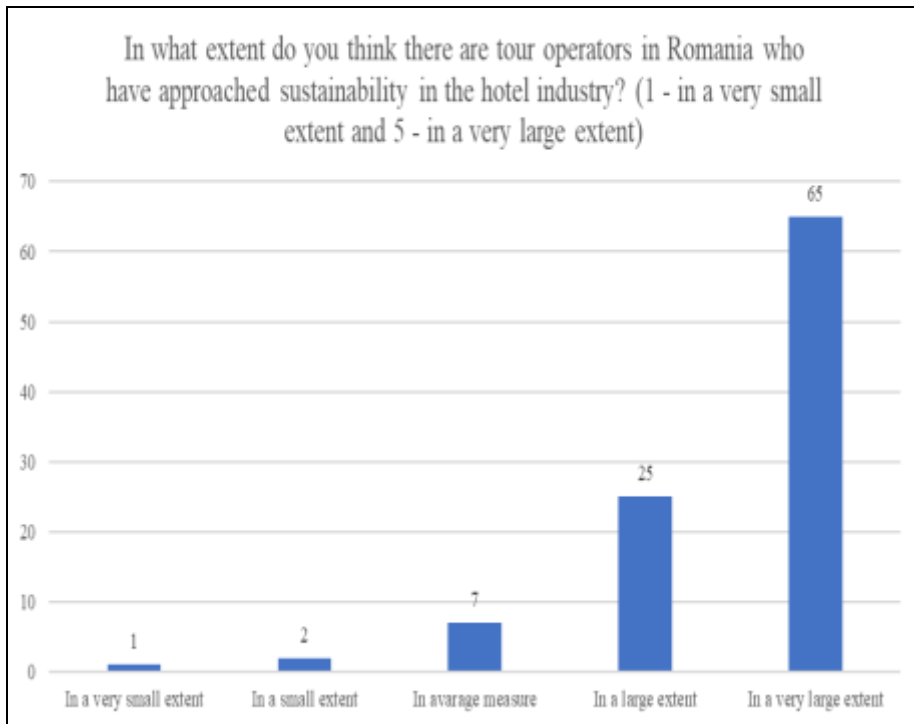
Source: Google Forms

According to the information presented in the previous chart, it is found that 53% of all respondents, respectively 53 respondents, said that they spent their stay in a sustainable tourism accommodation unit in the last 12 months. They have

focused on accommodation units that have a special respect for the environment, reducing pollution and protecting the integrity of ecosystems. Out of the total collected responses, 47% of respondents preferred conventional accommodation structures, which did not implement the premises of sustainable tourism.

2) In what extent do you think there are tour operators in Romania who have approached sustainability in the hotel industry? (1 - to a very small extent and 5 - to a very large extent)

The responses collected from the target sample can be seen through the following graph:



**Figure no. 2.** Share of responden’s answers to the question "To what extent do you consider that there are tour operators in Romania who have approached sustainability in the hotel industry?"

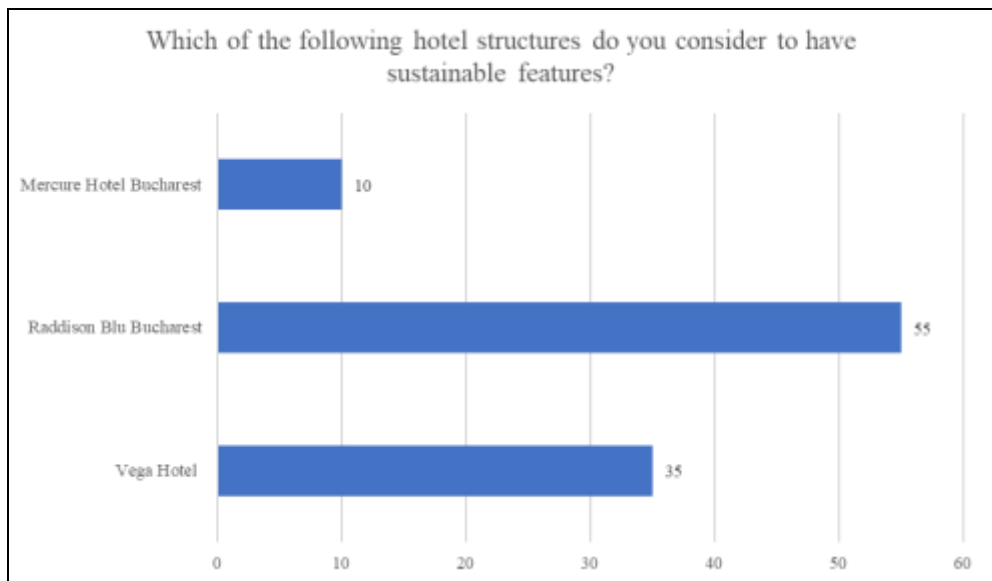
Source: Google Forms



The answers provided by respondents provide a realistic view of the importance attributed to outlined sustainability from the respondent's perspective. Of the total responses recorded, only one respondent attributed very little importance to the analyzed variable, while 2% of all respondents attributed a small importance to tour operators addressing sustainability in the hotel industry. The average measure was reported by 7 respondents, while the large measure was stated by 25% of all respondents. Those who checked the option "in a very large extent" cumulated 75% of the total recorded responses.

3) Which of the following hotel structures do you consider to have sustainable features?

The responses collected from the target sample can be seen through the following graph:



**Figure no.3. Share of respondent's answers to the question "Which of the following hotel structures do you consider to have sustainable features?"**

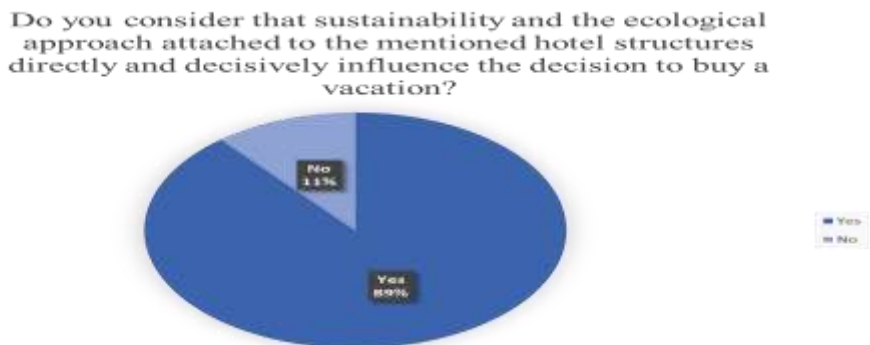
*Source: Google Forms*

The data presented above reflect respondent's opinion on the structures in Romania that have sustainable features. According to the recorded answers, Hotel Vega, the first ecological hotel in Romania, obtained 35%. Radisson Blu holds the

majority share, cumulating 55% of the total recorded responses. The lowest share is attributed to the Mercure Hotel in Bucharest, representing 10% of the total recorded responses.

- 4) Do you consider that sustainability and the ecological approach attached to the mentioned hotel structures directly and decisively influence the decision to buy a vacation?

The responses collected from the target sample can be seen through the following graph:



**Figure no. 4. Share of respondent's answers to the question "Do you consider that sustainability and the ecological approach attached to the mentioned hotel structures directly and decisively influence the decision to buy a vacation?"**

*Source: Google Forms*

Out of the total recorded responses, 89% of respondents consider that sustainability and the ecological approach attached to the mentioned hotel structures directly and decisively influence the decision to buy vacation. People who denied the analyzed variable cumulated 11% of the total recorded responses.

- 5) Hotel sustainability is correlated with digital progress, readdressing national tourism benefits. To what extent do you agree with the implementation at national level of the following innovative aspects implemented by international hotel structures?

The responses collected from the target sample can be seen through the following table:

**Table no. 1. Responses collected from the sample**

Variable	Strongly disagree	Disagreement	Neutral	Agreement	Total agreement
Virtual receptionist	35	30	20	15	0
Self check-in	1	2	7	10	80
Entering rooms through digital apps installed on tourist's phones	0	0	0	10	90
Communication with hotel staff through digital tools	0	0	5	15	80
Ordering food from the restaurant through QR technology	0	0	0	10	90
Room temperature and ventilation system management via digital applications	0	0	0	10	90
Integration of artificial intelligence into the hotel structure through robots that manage the room-service activity	20	30	15	20	15
Payment of the value of the stay through cryptocurrencies	10	20	10	50	0

*Source: Responses collected through Google Forms*

In the analysis of the aforementioned variables, the following aspects are distinguished: the majority share assigned to the virtual receptionist coincides with the 35 percent that designate the total disaccumulator of respondents for this type of innovation. The self-check-in highlights a significant openness on the part of the sample, with the claim supported by the 80 people who gave their full agreement. Entering rooms through digital apps installed on tourists' phones highlights total agreement for 90% of all respondents, while communicating with hotel staff via digital tools holds 80% of responses for total agreement.

Ordering restaurant food via QR technology was highlighted as total agreement by 90% of all responses. The management of the temperature and ventilation system in rooms through digital applications highlights the same percentage as the aforementioned variable, while the integration of artificial intelligence into the hotel structure through robots that manage the room-service activity highlights a majority share equivalent to 30% of the disagreement. The majority share for the payment of the value of the stay through cryptocurrencies is registered next to the 50 people who have expressed their agreement for this payment method.

6) What do you consider to be the main benefits reported in sustainable tourism in Romania?

Analyzing the answers provided by respondents, the 15% figure is attributed to the following variables: Boosting competing hotel structures to implement ecological innovation, thus increasing the degree of innovation and sustainable development; increasing the visibility and awareness of sustainable hotel structures. Out of the total responses registered, 20% of respondents ticked the increase in occupancy levels within sustainable hotel structures and the increase in foreign tourists' interest in sustainable hotel structures. The majority share is attributed to the 30 respondents who mentioned the increase in turnover and net profit in sustainable hotel structures.

7) What do you consider to be the main impediments reported in sustainable tourism and hotel innovation in Romania?

The responses collected from the target sample can be seen through the following graph:



**Figure no. 6. Share of respondent's answers to the question "What do you consider to be the main impediments signaled in sustainable tourism and hotel innovation in Romania?"**

*Source: Google Forms*

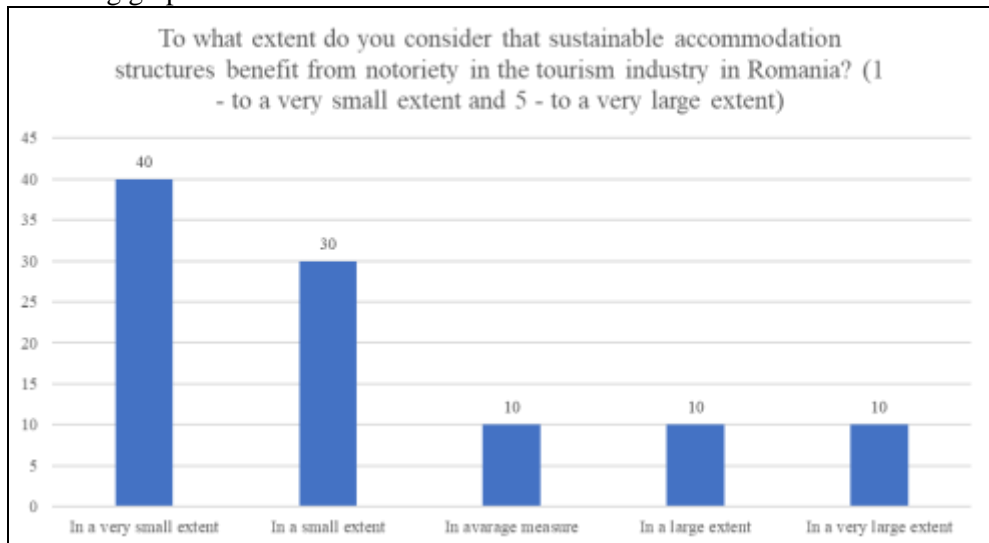
The percentages attached to respondents' answers highlight the following values:

- The limited nature of the financial resources held by hotel operators – 50%;
- Reluctance of tourists regarding unconventional methods of providing hotel and restaurant services – 5%;
- The difficulty of tourists in operating digital applications offered by tour operators – 10%;
- Lack of interest in innovation and sustainability existing at the level of tour operators – 20%;
- Limited skills of virtual reality and artificial intelligence specialists in Romania – 15%.

According to the answers provided by respondents, it is found that the majority share is attributed to the 50 respondents who mentioned the limited nature of hotel operators' financial resources.

8) To what extent do you consider that sustainable accommodation structures benefit from notoriety in the tourism industry in Romania? (1 - to a very small extent and 5 - to a very large extent)

The responses collected from the target sample can be seen through the following graph:



**Figure no. 7. Share of respondent's answers to the question "To what extent do you consider that sustainable accommodation structures benefit from notoriety in the tourism industry in Romania?"**

*Source: Google Forms*

The respondent's opinion is reflected through the following percentages: to a very large extent – 10%, to a large extent – 10%, to a medium extent – 10%, to a small extent – 30% and to a very small extent – 40%.

9) To what extent are you willing to pay a higher price for hotel services designed by sustainable tourism structures? (1 - to a very small extent and 5 - to a very large extent)

The responses collected from the target sample can be seen through the following graph:



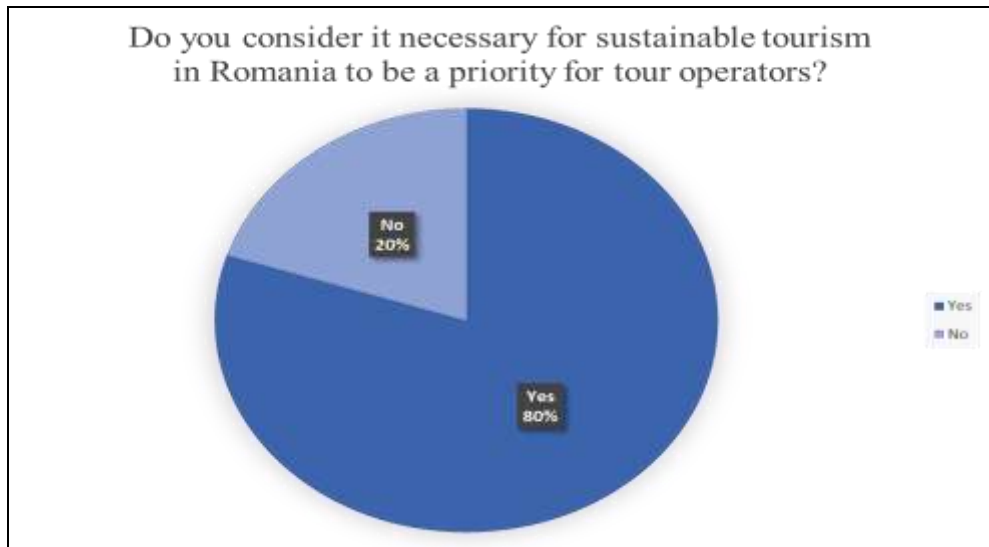
**Figure no. 8. Share of respondent's answers to the question "To what extent are you willing to pay a higher price for hotel services designed by sustainable tourism structures?"**

*Source: Google Forms*

The respondent's opinion related to the analyzed variable is highlighted by the following percentages: 5% - to a very large extent, 5% - to a large extent, 5% - to a medium extent, 5% - to a small extent, 80% - to a very large extent.

10) Do you consider it necessary for sustainable tourism in Romania to be a priority for tour operators?

The responses collected from the target sample can be seen through the following graph:



**Figure no. 9.** Share of respondent's answers to the question "Do you consider it necessary for sustainable tourism in Romania to be a priority for tour operators?"

Source: Google Forms

According to the information presented above, 80% of all respondents affirmed the analyzed variable, while 20 people mentioned the opposite.

### Conclusions

- Rural tourism and agritourism have highlighted a sustained growth under the pandemic context, highlighting the attraction of tourists to panoramic guesthouses. In Romania this concept is promoted by the Green Hill Panoramic accommodation structure in Poiana Mărului;

- In the law of sustainable tourism highlighted in rural areas, the innovation promoted by accommodation in coviltir carts is highlighted;

- 53% of all people surveyed, respectively 53 respondents, said that they had spent their stay in a sustainable tourism accommodation unit in the last 12 months. They have focused on accommodation units that have a special respect for the environment, reducing pollution and protecting the integrity of ecosystems. Out of the total collected responses, 47% of respondents preferred conventional accommodation structures, which did not implement the premises of sustainable tourism.



- According to the recorded answers, Hotel Vega, the first ecological hotel in Romania, obtained 35%. Radisson Blu holds the majority share, cumulating 55% of the total recorded responses. The lowest share is attributed to the Mercure Hotel in Bucharest, representing 10% of the total recorded responses;
- Out of the total recorded responses, 89% of respondents consider that sustainability and the ecological approach attached to the aforementioned hotel structures directly and decisively influence the decision to buy a tourist package. People who denied the analyzed variable cumulate 11% of the total recorded responses;
- Ordering restaurant food via QR technology was highlighted as total agreement by 90% of all responses. The management of the temperature and ventilation system in rooms through digital applications highlights the same percentage as the aforementioned variable, while the integration of artificial intelligence into the hotel structure through robots that manage the room-service activity highlights a majority share equivalent to 30% of the disagreement. The majority share for the payment of the value of the stay through cryptocurrencies is registered next to the 50 people who have expressed their agreement for this payment method.

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## TYPES OF INTERNAL PUBLIC AUDIT MISSIONS CARRIED OUT BY THE INTERNAL AUDIT DIRECTORATE IN ENTITIES OF THE MINISTRY OF NATIONAL DEFENSE

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**Abstract:** *In this article I want to present the salient features of the basic missions carried out by the Internal Audit Directorate of the Ministry of National Defense, under normal conditions, in the context of the COVID-19 pandemic and in recent years. As a result, I structured the article on 5 issues: 1) general methodological elements related to the conduct of assurance missions in the field of internal public audit; 2) specific characteristics of the general methodologies that refer to the performance of advisory and evaluation missions in the internal public audit; 3) particularities of the general methodology for organizing and carrying out missions focused on the performance audit; 4) key aspects resulting from the missions carried out in recent years by the teams of professionals from the Internal Audit Directorate of the Ministry of National Defense; 5) characteristics of the internal public audit activity in conditions of the COVID-19 pandemic in the profile structures in Romania and in the Ministry of National Defense.*

**Key words:** *preparation of the assurance mission; on-site intervention; advisory missions; performance audit assignments; telecommuting; electronic signature.*

**JEL Classification:** M42

## 1. Introduction

The internal public audit missions carried out by professionals and in the entities of the Ministry of National Defense are in their major aspects the same as those carried out in the other structures of the public administration in our country. However, such missions, whether assurance, advisory, evaluation or performance, carry a number of aspects specific to the military.

Also, the outbreak and unfolding during the years 2020-2022 of the COVID-19 pandemic led the relevant body responsible for coordinating the internal audit in the army (I mean the Internal Audit Directorate) to rethink the way such missions are carried out.

The Internal Audit Directorate of the Ministry of National Defense uses all the normative acts, guides and other instruments issued by the Ministry of Public Finance and UCAAPI, specifying that it makes permanent efforts to customize certain normative acts, by initiating orders of the Minister of National Defense or internal decisions of the army profile body.

The period to which I refer in the article also included the stage in which the internal audit structures at the country level and in the army faced challenges generated by the COVID-19 pandemic, which required the rethinking of audit procedures in this unprecedented context.

Also, my research in this article referred to the internal audit missions carried out by the profile structure in the army in recent years, focusing on the types of missions carried out and the practical effects generated for the benefit of the audited entities.

The entire research allowed me to also advance certain proposals to improve the conduct of these internal audit missions, to help increase the added value that such missions should bring to military entities.

## 2. Literature review

The issue of internal public audit missions in our country is constantly under the attention of national-level profile bodies (the Central Harmonization Unit for Internal Public Audit - UCAAPI), which takes over and adapts to the specifics of Romania, regulations issued by international bodies (the Institute of Auditors Internal – IIA, based in the USA) and European (European Court of Auditors) profile. UCAAPI also takes into account the regulations in the field of internal public audit developed by the Court of Accounts of Romania (site:

<https://www.curteadeconturi.ro>), to which it is subordinated from the point of view of the control of this type of activity.

In this sense, you can see regulations and other coordinating instruments posted on the profile sites of the institutions listed above: UCAAPI: <https://mfinante.gov.ro/domenii/informatii-contribuabili/institutii-publice/ucaapi/>; IIA: <https://www.theiia.org/en/certifications/cia/>; European Court of Auditors: <https://www.eca.europa.eu>.

Specific elements of these internal public audit missions are addressed and presented in the form of specific normative acts (ministerial orders, internal decisions, various guidelines and other procedural instruments) on the website of the Internal Audit Directorate (DAI) of the Ministry of National Defense (<https://dai.mapn.ro>).

We cannot omit from the list of highlighted bodies that have concerns in the area of internal audit missions, but in the private environment (but with close connections with the professional bodies in the public sector listed above) the Association of Internal Auditors from Romania - AAIR (site: <https://www.aair.ro>), which adapts international auditing standards to the requirements of private actors in our country, as well as elaborates or establishes guides, manuals, procedures and other tools necessary for professionals in this field.

In the series of national bodies that have important connections and responsibilities also in the field of internal audit in the private environment, but partly also in the public sphere, we must also mention the Chamber of Financial Auditors from Romania - CAFR (site: [www.cafr.ro](http://www.cafr.ro)). This body has signed collaboration agreements with AAIR and the Court of Accounts of Romania in the field of internal audit, develops or establishes guides, manuals, procedures and other tools necessary for professionals in this field and publishes articles in its own magazine "*Financial Audit*".

As an example, we present several articles published relatively recently in this magazine on the field of internal audit: *Internal audit in the context of ERP systems* (authors: Igna Roxana Dana, Ionescu Bogdan Ștefan, article published in the magazine "*Financial Audit*" no. 163-3/2021, pp 443 – 544, [www.https://auditfinanciar.cafr.ro](http://www.https://auditfinanciar.cafr.ro));

*The perception of financial auditors regarding the added value of internal audit services* (authors: Farcane Nicoleta, Deliu Delia, Burcă Valentin, article published in the magazine "*Financial Audit*" no. 1(165)/2022, pp. 24 - 117, [www.https://auditfinanciar.cafr.ro](http://www.https://auditfinanciar.cafr.ro)); *Organizational practices related to internal audit in economic entities from a pandemic perspective* (authors: Gavrilă Mihai-Daniel,

Ștefan Alexandra, article published in the magazine "*Financial Audit*" no. 170-2/2023, pp. 260 - 340, [www. https:// auditfinanciar.cafr.ro](http://www.auditfinanciar.cafr.ro)).

Also, a series of works have appeared in recent years that separately or partially address major aspects related to internal audit, regardless of whether it is public or owned by private entities. In this sense, we have in mind the work of professors Ionescu Luminița and Nica Dumitru entitled *Internal public audit*. The 2nd edition revised and added, published in the "Romania de Maine" Foundation Publishing House, Bucharest, in 2023, which has a distinct chapter dedicated to the methodology regarding the internal public audit mission.

In the same vein, we also mention the work of the collective of authors coordinated by prof.univ.dr. Munteanu Victor entitled *Financial audit - accountant. Methodological approach and practical cases*, published at the University Publishing House, Bucharest, in 2020, in which a chapter of the work is reserved for audit types, both financial and internal.

Of course, there are other works by foreign or Romanian authors that address various aspects related to internal audit (public or for the private environment), which, along with those listed, come to complete the very complex and varied picture of the types of internal audit and the role their in improving managerial activity at public institutions and private entities. We are not doing anything else with this article than to bring to attention lesser-known facets of the performance of various types of internal public audit missions within the entities of the Ministry of National Defense.

### **3.The theoretical foundation of the theme**

The issue of internal public audit missions in military entities was analyzed by us, starting from the fundamental aspects of the methodological line developed by the relevant international and European bodies (IIA, European Court of Accounts) through standards and guidelines, continuing with the adopted normative acts by the legislative forums in our country (Parliament, Government, Ministry of Finance, Ministry of National Defense) and concluding the approach with the elements completed and customized by the national bodies in the area of internal audit (UCAAPI, CAFR, AAIR) through various guides, manuals, instructions and other tools which they have the obligation and duty to configure.

This research approach continued with the revelation of a series of peculiarities of the internal audit missions carried out in recent years by the profile directorate (DAI) of the Ministry of National Defense, derived from the balance sheets

presented by the persons at the head of this ministry and processed through analysis methods and synthesis, induction and deduction.

In the final part of our scientific approach, we captured a series of particularities of these internal public audit missions in the structures of the national army as a result of the outbreak and extension of the COVID-19 pandemic, with the whole procession of methodological and relational changes, both for auditors and for auditees.

#### **4.Types of internal public audit missions carried out by the Internal Audit Directorate in entities of the Ministry of National Defense**

##### **4.1.General methodological elements related to the conduct of assurance missions in the internal public audit**

According to *HG no. 1086 of December 11, 2013* for the approval of the *General Norms regarding the exercise of the internal public audit activity (published in the MO of R no. 17/2014)*, the performance of assurance missions involves the completion of the following stages: 1) *mission preparation*; 2) *the intervention at the place where the mission takes place*; 3) *activity reporting*; 4) *following the recommendations (HG no. 1086/2013, point 3.4).*

*Missions of this type* are carried out in accordance with the types regulated by normative acts and can be: a) *regularity/compliance*; b) *aiming at performance*; c) *of the system.*

*The preparation of the assurance mission involves the following moments: the initiation of the audit, the drawing up of the service order, the notification regarding the start of the audit mission, the holding of the opening meeting, the collection and processing of information and the establishment/updating of the permanent file, the configuration of the objectives of the mission (risk analysis; initial assessment of the own control that each audited entity performs) and the elaboration of the mission program (GD no. 1086/2013, point 3.4., Scheme, Procedures code: P-01 to P-09).*

*The on-site intervention includes as moments: the collection and analysis of evidence, the analysis of problems and the drafting of recommendations, the review of documents and the creation of the audit file and the meeting to complete the mission (HG no. 1086/2013, point 3.4., Scheme, Procedures code: P -10 to P-14).*

We will only point out some defining aspects at some of these moments.

As *techniques used to collect evidence*, we mention *verification*, and the main techniques in this activity are: *a) confirmation; b) examination; c) calculation; d) comparison; e) agreement; f) tracking; g) guarantee (HG no. 1086/2013, points 3.8.1.1 and 3.8.1.1.1.)*

*The following specific techniques are used to obtain audit evidence: physical observation; the interview; questioning; analyze; external confirmations; the investigation; sampling; testing (HG no. 1086/2013, points 3.8.1.1.2 to 3.8.1.1.9.)*

*The techniques used to interpret evidence collected in such missions are: documentary examination; observation; the analysis in chronological order, and for the actual analysis of these samples: the diagnosis; evaluation. As audit tools that can be used in such missions, we can mention the questionnaire and the interview (HG no. 1086/2013, points 3.8.1.2.1. to 3.8.1.4.2.)*

*Collection of evidence* is carried out following *tests* completed in accordance with the mission schedule.

*The analysis of the problems and the drafting, in the first form, of the recommendations* constitute another key moment in the internal public audit. The following documents are used in this sense: *Identification and analysis sheet of the problem - FIAP (HG no. 1086/2013, Annex 16); Form for ascertaining and reporting irregularities - FCRI (HG no. 1086/2013, Annex 17)*.

*The FIAP* is completed for the dysfunctions identified during the mission, if they refer to the same examined case.

*The FCRI* is completed in the situation where the auditors detect certain irregularities.

*The review of all the documents prepared and the compilation of the file* is an extremely important moment for the mission team and is carried out to have the guarantee that all the documents prepared up to that moment are properly and adequately prepared.

*The purpose of the meeting to complete the mission* is to present to the audited the findings, conclusions and recommendations of the auditors, obtained after the completion of the tests and the other applied procedures, and the results of the meeting are inserted in its minutes.

*The draft audit report* must comply with a certain *standardized structure*: *a) The first page corresponding to the cover; b) Introduction; c) Methodology for carrying out the mission; d) Findings; e) Recommendations; f) Conclusions; g) Internal audit opinion; h) Appendices (HG no. 1086/2013, Point 3.9.1.5.)*

*This draft report that is sent to the audited structure* must meet a number of requirements: be complete; to present synthetically and objectively the positive and



negative findings, the causes and consequences of the negative findings; recommendations and conclusions on the entire mission; the opinion of the team of auditors (*HG no. 1086/2013, Point 3.9.2.1.*).

The auditors prepare *the conciliation meeting*, within 10 calendar days of receiving the opinions and requests of the authorized representatives of the audited entity, before organizing the actual conciliation action. During this meeting, the possible observations of those audited on the draft report are examined (*HG no. 1086/2013, Point 3.9.3 and Procedure P-17.*).

*The audit report* is finalized by including the changes agreed by both parties (auditors and auditees) in the conciliation meeting, including recommendations not accepted by the audit team. In the most favorable case that the legal representatives of the audited entity do not request conciliation and do not formulate proposals to the draft audit report, it can become the final report (*HG no. 1086/2013, Points 3.9.4.1. and 3.9.4.2.*).

*The head of the audit department submits the report in final form* to the head of the audited entity for analysis and approval, accompanied by a summary of the main findings and recommendations (*HG no. 1086/2013, Point 3.9.5.1.*). *The head of the audit department* is responsible for *supervising all the stages and procedures used during the entire duration of the audit mission*. The quality of supervisor within such an audit mission falls either to the head of the profile department, or to another internal auditor in the structure, designated by the head of the department, in case he cannot fulfill this role, having other more complex tasks of fulfilled at that time (*HG no. 1086/2013, Points 3.9.6.1., 3.9.6.2. and procedure P-20.*).

*The objective of following up* the recommendations is both to guarantee that they are implemented as they were formulated, at the established deadlines and in an effective manner, as well as to assess the consequences in the event of their non-application (*HG no. 1086/2013, Point 3.10. 1.1.*).

*The audited structures and the audit department also have responsibilities in the implementation of the recommendations.*

*In applying the recommendations resulting from such a mission, the audited structure has very high responsibilities* in the following subsequent actions that must be undertaken: *a) configuring the plan of actions that must be undertaken to implement the recommendations; b) establishing the persons responsible for the application of each recommendation; c) exact implementation of the recommendations in practice; d) communication of the stage of implementation of the recommendations at the time intervals established by the audit team in the report; e) evaluation of the results obtained* (*HG no. 1086/2013, Point 3.10.2.1.*).

*The internal auditors who carried out the mission periodically examine the action plan for the implementation of the recommendations and propose, if necessary, possible changes to it.*

*The assessment of the stage of the implementation of the recommendations in practice and the correctness of the actions taken in this regard are followed by the head of the profile department, depending on the information sent to the audited structures.*

Actions applied inappropriately are identified by the audit team. This, in turn, proposes to the audited structure changes to the action plan for the practical implementation of the recommendations, as they were conceived (HG no. 1086/2013, Points 3.10.3.1. to 3.10.3.3.).

An internal auditor from the army (Marcu Radu-Viorel, 2015) opines that the added value brought by the internal audit must be highlighted within the FUIR. Such a model was appropriated by the profile direction and the leadership of the army and was included in *the Methodological Norms regarding the exercise of the internal public audit in the Ministry of National Defense, approved by the Order of the Minister of National Defense no. M.67/2014 (published in MO of R, no. 463 of 25.06.2014).*

This model stipulates that the FUIR should include the following headings: *a) noted problems (in summary); b) the content of the recommendation; c) stage of implementation (implemented; partially implemented; not implemented); f) planned/extended implementation/actual implementation date; g) activities or actions carried out for implementation; supporting documents regarding the implementation; h) results obtained and the added value of internal public audit (the model presented in point 2.7 of OMApN no. M67/2014).*

#### **4.2. Specific characteristics of the general methodologies for carrying out advisory and evaluation missions in the internal public audit**

This type of mission is regulated by HG no. 1086 of December 11, 2013, and in OMFP no. 13/2015 (posted on [https://mfinante.gov.ro/documents/35673/222496/Ghid\\_general\\_consileire\\_14012015.pdf](https://mfinante.gov.ro/documents/35673/222496/Ghid_general_consileire_14012015.pdf)) the main stages of such a mission are inserted.

*The stages, procedures and documents that are completed and drawn up in the formalized advisory missions are the same in terms of requirements as those presented in the insurance mission, with a few exceptions: a) the procedures related to the risk analysis are not applied; b) the procedures related to the analysis of problems and the formulation of recommendations are not used; c) the findings of the auditors are entered directly into the advisory reports; d) proposed*

*solutions are offered for the findings and problems identified; e) possible detected irregularities are brought to the attention of the head of the audited entity and the control structure; f) the procedures related to the drafting of the advisory report, its transmission and the conciliation meeting do not apply to these missions (HG no. 1086/2013, Chapter IV – Advisory Mission, Point 4.4.1.).*

*The counseling report is drawn up directly after the on-site intervention stage. It is intended to adapt to the specifics of the mission all the documents completed within the procedures of the formalized counseling mission.*

*The evaluation mission of the internal public audit activity as another specific audit mission is also regulated by GD no. 1086/2013.*

*Within such a new mission, the stages, procedures and documents that are drawn up comply with the same requirements as for the insurance mission, with two exceptions: a) no risk analysis is performed for such missions; b) the possible irregularities found are brought to the attention of the head of the audited public entity and the control structure (HG no. 1086/2013, Chapter V – The evaluation mission of the internal public audit activity, Point 5.4.1.).*

The documents developed during such a mission are adapted to its specifics, within the limits in which this is possible.

An assessment, on an analytical basis, of the internal audit function organized and carried out within the public entity is carried out by *evaluating the internal public audit activity*, an activity that provides assurance regarding the achievement of objectives, according to the requirements of international standards in the field.

In order to objectively examine the internal audit activity carried out at public entities, under the compliance and performance ratio, periodic checks are carried out, at least once every 5 years, under conditions of total independence.

*The following structures in the field* are involved in the evaluation of the internal public audit activity:

*a) The Central Harmonization Unit for the Internal Public Audit (UCAAPI), which evaluates the internal audit activities of public entities with the status of principal orderer of credits;*

*b) the internal audit departments organized at hierarchically superior public entities, which evaluate the internal audit activity of the subordinate profile structures (HG no. 1086/2013, Chapter V – The mission of evaluating the internal public audit activity, Point 5.1. 3.), as is also the case with the Internal Audit Directorate of the Ministry of National Defense.*

*The internal auditors give an opinion on the activity evaluated in relation to the levels of appreciation granted and the results of the findings regarding: a)*

*compliance with the general and specific methodological norms in each audit activity performed; b) respecting the concordance between the audit activities and the procedures of the profile department; c) if through the audit missions carried out the degree of coverage of all the processes and activities of the audited public entity was ensured; d) the level of effectiveness achieved by the internal audit; e) the added value brought to the audited public entity by any type of internal audit (HG no. 1086/2013, Chapter V – The mission to evaluate the internal public audit activity, Point 5.1.5.).*

*The following activities or documents are included in the scope of the evaluations of the internal public audit activity: a) the content of the missions, competences and responsibilities regarding each profile compartment; b) the level of independence of the internal audit structure within the public entity; c) competence and professional conscience proven in any mission by internal auditors; d) the quality level of the management of this activity; e) the nature and specifics of the internal audit activity; f) the content and quality of the audit activity assurance and improvement program; g) strict compliance with all own rules in carrying out internal audit missions; h) the correct and complete communication of the results of missions of this type (HG no. 1086/2013, Chapter V – The mission to evaluate the internal public audit activity, Point 5.1.6.).*

Within each assessment engagement objective, internal auditors track both compliance and performance aspects of the activities being assessed.

#### **4.3.Features of the general methodology for carrying out internal public performance audit missions**

According to the general methodology, UCAAPI develops a specific methodology for the evaluation missions of the internal public audit activity, through a general guide, approved by order of the Minister of Public Finance or by another normative act. We consider *GD no. 1086/2013 and OMFP no. 1624/2014 (published in MO of R no. 730/2014 and posted on [https://mfinante.gov.ro/documents/35673/222496/Ghidgeneralmisiunepperformanta\\_UCAAPI\\_09122014.pdf](https://mfinante.gov.ro/documents/35673/222496/Ghidgeneralmisiunepperformanta_UCAAPI_09122014.pdf)).*

According to this guide, *the following stages are distinguished in such missions: 1) Mission preparation; 2) Intervention at the location of the audited entity; 3) Reporting the results of the mission; 4) Monitoring the implementation of the recommendations (OMFP no. 1624/2014, Scheme from Point 2).*

*The preparation of the mission as the first stage in the performance audit includes the following moments: a) elaboration of the service order; b) drawing up*

*the declaration of independence; c) sending the notification regarding the launch of this type of mission; d) the opening meeting; e) collection and processing of information; f) the analysis of all possible risks and the assessment of the audited entity's own control; g) drawing up the mission program (OMFP no. 1624/2014, Points 2.1.1.1. to 2.1.1.3., 2.1.2., 2.1.3., 2.1.4. and 2.1.5.).*

*The on-site intervention as the next stage of this type of audit is executed in the following sequence: a) the collection and analysis of audit samples (in the framework of which take place: performing tests and formulating findings; analyzing problems and formulating recommendations; analyzing and reporting irregularities) b) reviewing the documents and creating the audit file; c) the closing meeting (OMFP no. 1624/2014, Scheme from Point 2).*

*The on-site intervention as the next stage of this type of audit is carried out in the following sequence: a) the collection and analysis of audit samples (in the framework of which take place: performing tests and formulating findings; analyzing problems and formulating recommendations; analyzing and reporting irregularities) b) reviewing the documents and creating the audit file; c) the closing meeting (OMFP no. 1624/2014, Scheme from Point 2).*

*The third stage is entitled Reporting the results of the mission and includes the following two moments: a) the drafting of the internal public performance audit mission report draft (in the framework of which take place: the drafting of the internal public performance audit mission report draft; the submission of the draft Mission Report of internal public performance audit; conciliation meeting); b) drawing up the report of the internal public audit mission of the performance, in which: the report of the internal public audit mission of the performance is carried out; dissemination of the Report of the internal public audit mission of the performance (OMFP no. 1624/2014, Scheme from Point 2).*

*The last activity is the follow-up of the recommendations, in which attention is focused on their implementation with the help of a sheet that is expressly dedicated to this purpose (OMFP no. 1624/2014, Scheme from Point 2).*

*The performance audit focuses on the results obtained by each public entity, by checking the following aspects known as the 3Es: a) economy; b) efficiency; c) effectiveness (OMFP no. 1624/2014, 1. General requirements, Point 1.3).*

*A reference system is established for carrying out missions of this type, to which the results of completed checks should be reported, based on good practices in the field and by analyzing the data and information resulting from the following reliable sources: a) legislation and public policies, standards national or international in the field; b) regulations and guidelines of the relevant*

*departments; c) established managerial practices in the field of internal audit; d) specific contractual requirements for such missions; e) standards in the field and other suggestive indicators; f) essential profile literature; g) various references obtained upon request; h) the results from similar public entities; i) criteria used in similar audits; j) performance criteria set by legislative bodies; k) criteria resulting from the experience of specialists, experts or researchers in the field.*

#### **4.4.Key aspects resulting from the internal public audit missions carried out in recent years by the teams of professionals from the Internal Audit Directorate of the Ministry of National Defense**

We further present in summary the activity of the Internal Audit Directorate of the Ministry of National Defense for the years 2018, 2019, 2020, 2021 and 2022, from the reports presented by the Minister of Defense for the mentioned 5 years.

According to *the Internal Public Audit Plan of the Ministry of National Defense for 2018*, the specialized structure in the field of internal public audit within the Ministry carried out 2,024 missions, carried out in a time fund of 17,354 days/man.

Following the activity carried out by the audit structures in 2018, improvement proposals were formulated for important systems or processes within the Ministry of National Defense, such as: *a) the mode of administration of the patrimony under the administration of military units; b) application of legal provisions in the development of investment works; c) the educational system, the medical system, the activity of the mutual aid houses established next to the military units; d) preventing/stopping uneconomic expenses; e) development of internal managerial control systems in units by capitalizing on their preventive potential; f) advising the management of the units in order to improve risk management; g) monitoring the performances and the fulfillment of their proposed objectives; h) the administration with maximum efficiency of their allocated monetary funds, of the revenues achieved and the expenses incurred, in accordance with the legal norms in force and with the objectives of the audited structures (MApN, Rap.pe 2018, published in the MO of R no. 566/27 May 2019, page 15).*

*The internal public audit activity carried out in 2019* aimed to identify the main risks associated with the operation of the military system, advise and support the management of central structures, large units and military units to achieve their own objectives, by increasing the effectiveness and efficiency of patrimonial operations, compliance with legislation and internal regulations regarding the administration of heritage, the development of internal managerial control systems

in all structures and at all hierarchical levels of the army, as well as the strengthening of managerial responsibility.

According to the *"2019 Internal Public Audit Plan of the Ministry of National Defense"*, over 1,700 internal public audit missions were carried out, over 2,700 recommendations were formulated, fully adopted by the commanders/heads of the audited structures, of which over 1,100 have already been implemented, the others being implemented (at that time of analysis).

The recommendations formulated mainly aimed at correcting the dysfunctions found, preventing them in the future, as well as increasing the effectiveness and efficiency of the management act at all departments and hierarchical levels of the military institution, through the concrete and permanent exercise of the function of internal managerial control over the planned activities and the resources allocated in order to achieve the proposed objectives (MAPN, Rap.pe 2019, published in MO of R no. 415/June 29, 2020, page 13).

In accordance with the *Internal Public Audit Plan of the Ministry of National Defense for 2020*, the Internal Audit Directorate and the subordinate territorial structures carried out: 132 regularity audit missions, one system audit mission, involving 25 military units, 1,504 missions of audit of procurement procedures, 10 ad hoc missions, 26 missions of audit of real estate modification operations, 51 advisory missions, of which 37 were at the request of the loan officers, 2 missions of managed liquidation of dissolved units and 82 missions to verify the implementation of the recommendations.

In 2020, the Internal Audit Directorate fulfilled its missions under conditions of legality, independence and objectivity. The organization of the department at that time, as well as the way of planning and carrying out the activities ensured compliance with the requirements imposed by Law no. 672/2002, the orders of the Minister of National Defense and the provisions of the standard relating to the internal audit from the Code of Internal Managerial Control of Public Entities, approved by the Order of the Secretary General of the Government no. 600/2018. All these normative acts were scrupulously respected by this specialized structure of the army (MAPN, Rap.pe 2020, published in MO of R no. 552/June 18, 2021, page 14).

In accordance with the *Internal Public Audit Plan of the Ministry of National Defense for 2021*, the Internal Audit Directorate and the subordinate territorial structures performed: 131 regularity audit missions, two system audit missions, involving 44 military units, 1,460 missions of audit of procurement procedures, three ad-hoc missions, 37 missions of audit of real estate modification operations,

54 advisory missions, of which 45 were at the request of loan officers and 173 implementation verification missions recommendations.

During the internal public audit missions carried out in 2021, 2,756 recommendations were formulated, fully appropriated by the commanders/heads of the audited structures, of which 1,481 have already been implemented (approx. 54%), the others being implemented at the moment the analysis. At the same time, during the year, 173 missions were carried out to verify the implementation of the recommendations, with a number of 5,790 recommendations being verified, of which 4,455 were fully implemented (approx. 77%).

The formulated recommendations were mainly aimed at correcting the dysfunctions found, preventing their occurrence in the future, as well as increasing the effectiveness and efficiency of the leadership act at all departments and hierarchical levels of the military institution (*MApN, Rap.pe 2021, published in the MO of R no. 965/28 July 2022, page 20*).

In accordance with the *Internal Public Audit Plan of the Ministry of National Defense for the year 2022*, the Internal Audit Directorate and subordinate territorial structures carried out: 136 regularity audit missions, 2 system audit missions, involving 47 military units, 1,571 missions of audit of procurement procedures, 3 ad hoc missions, 19 missions of audit of real estate modification operations, 49 advisory missions, of which 38 were at the request of credit orderers, 4 audit missions of liquidation activities management and 125 missions to verify the implementation of the recommendations.

During the internal public audit missions carried out in 2022, 2,275 recommendations were formulated, fully adopted by the commanders/heads of the audited structures, of which 1,021 have already been implemented (approx. 45%), the others being implemented. At the same time, during the year, a number of 125 missions were carried out to verify the implementation of the recommendations, with a number of 4,314 recommendations being verified, of which 3,092 were fully implemented (approx. 72%).

The recommendations formulated were mainly aimed at correcting the dysfunctions found, preventing their occurrence in the future, as well as increasing the effectiveness and efficiency of the management act at all departments and hierarchical levels of the military institution, by exercising the internal control function (*MApN, Rap.pe 2022, published in MO of R no. 220/24 May 2023, page 22*).

From the above, we can make a few remarks: 1) the military profile direction carried out in each of the 5 years (2018, 2019, 2020, 2021 and 2022) for which we



*had data from official sources, a remarkable number of missions (between 1700 and 2024 annually); the range of these missions was varied (from regularity audit missions, continuing with advisory, system missions, but also missions related to public procurement, managed liquidation of disbanded units or checking the implementation of recommendations); c) the audit actions were based on both the national regulations in the field and specific normative acts adopted by the Minister of National Defense; d) the recommendations formulated as a result of such missions mainly concerned the development of internal managerial control systems, the improvement of risk management, the adequate, efficient administration and in the spirit of the legislation in force of the army's patrimony, the correction of dysfunctions found during the various missions carried out and other recommendations .*

#### **4.5. Characteristics of the internal public audit activity in conditions of the COVID-19 pandemic in the profile structures in Romania and in the Ministry of National Defense**

To begin with, we bring to your attention a study carried out by UCAAPI from Romania regarding internal public audit activity in conditions of a COVID pandemic.

The internal audit during the pandemic was a novelty in the activity of this field. Activity in this field in public institutions during a pandemic cannot be stopped or postponed.

In the context of the pandemic, the activity of the internal audit structures is influenced by the measures taken by the public authorities: social distancing, limiting travel, telework, limiting meetings and access to various public institutions or commercial units, etc.

UCAAPI evaluated the impact of the state of emergency, declared as a result of the COVID-19 pandemic, on the functioning of the internal audit, for which purpose it carried out *a survey that included 10 questions and aimed at collecting information, randomly addressed to a number of 100 managers from internal public audit functional structures.*

*The most difficult problem perceived by internal auditors following this survey, during the state of emergency, the most difficult problem perceived by internal auditors was the performance of specific missions.*

*Among the changes determined by the pandemic on the internal public audit activity, resulting from this study, we mention the following: 1) the extension of the activity through telework; 2) the implementation of the electronic signature and its*

*application on all documents that circulate between auditors and auditees and between different auditors in the teams that carry out such missions; 3) every auditor working from home should have at least a laptop or other type of computer, a printer and a scanner; 4) the supervisors will check the printed documents, then they will print, sign, scan and return them to the auditors (using a document signing system called TSST (print - sign - scan - send); using the "Adobe Scan" application; the use of Word-type documents (in communications between auditors or between them and supervisors) in which the formula "assumed by auditor in telework" - AAT. is mentioned instead of the signature); 5) communication between auditors and auditees by phone or email; 6) conducting the opening and closing meetings by videoconference or telephone conference (where teleconferences are not possible); 7) the collection of the requested information, the transmission and receipt of the information questionnaire requested by the audit mission will be carried out in the TSST system; 8) communication of the questionnaire between the auditor and the supervisor through the AAT system; 9) issuing and supervising the same documents through the AAT system; 10) on-site intervention can be carried out in two other ways: a) without a visit to the audited structure; b) with a short on-site visit and collection of a preliminary set of documents; the rest of the intervention will be carried out by electronic means; 11) obtaining documents and interviewing the staff of the audited structure using the video-conference facilities as well as those for storing or transferring files; 12) the auditors must analyze the documents, determine the questions and topics for discussion and video-conference with the audited structure and schedule it afterwards; 13) during the tests, it is required to hold discussions with the staff of the audited entity, to complete the tests only based on the signature of the auditors and the supervisor, and the circulation and signing of documents, in the TSST or AAT system; 14) the auditors can use the video conference to discuss the FIAPs with the auditees, and they will later be signed by the auditors and supervisors and communicated to the auditees for signing; the circulation and communication of FIAPs will be carried out in the TSST or AAT system, as the case may be; 15) the analysis and reporting of irregularities will be similar to that of FIAPs, with the difference that the audited structure does not sign these documents, and their signing is done within the internal audit structure (auditors and supervisor) in the normal way or through the TSST system or AAT, as the case may be; 16) the audit file can be created electronically, on paper or in a mixed version; 17) the subjects of the closing meeting will concern the preliminary findings, the resolution of any questions or concerns of the auditees, as well as the discussion of*

*the procedure for completing the mission (the draft and the final report); the documentation of the meeting will be done in the minutes of the closing meeting and will be signed in the TSST system; 18) the documentation of the closing session will be done in the minutes of the conciliation session and will be signed in the TSST system; 19) the preparation and transmission of the audit report can follow the usual procedure in the sense that it can be printed, signed and later scanned and communicated to the audited structure (Diaconescu Mioara, Niculae Dragoș Cătălin, Croitoru Ion, 2020, [www.ucaapi.ro](http://www.ucaapi.ro)).*

From this study it emerged that remote internal auditing has *some advantages, but also some disadvantages.*

Among the advantages, *the following can be mentioned: a) reduction of costs and time spent traveling to and from the office; b) obliging some auditors who are less familiar with modern technology but to quickly set up to be able to work efficiently from home with computing technology; c) preferring the use of electronic mail (and less of the fast one), which reduces office costs; d) telecommuting contributes to a better balance between personal and professional life and can attract competent staff; e) possible increase in performance.*

*The following can be listed as disadvantages: a) possible distractions of the auditor's attention from his activity (by family members, especially children, pets, etc.); b) possible decrease in performance; c) social isolation, which induces the feeling of isolation and exclusion; d) possible information security risks; e) the need to demonstrate the work done, a more difficult issue to achieve (Diaconescu Mioara, Niculae Dragoș Cătălin, Croitoru Ion, 2020, [www.ucaapi.ro](http://www.ucaapi.ro)).*

Some similar measures were also taken at the level of the Internal Audit Directorate of the Ministry of National Defense to adapt some internal audit missions to the new restrictions imposed by the COVID-19 pandemic. One such regulation is *D.A.I-2/28.04.2020 (published on <https://dai.mapn.ro>)* which approved the guide on the conduct of internal public audit missions by using electronic means of communication for auditing the procedures provided for in *D.A.I.-1/2019 (published on <https://dai.mapn.ro>).* *It is about the awarding of public procurement contracts/framework agreements, the leasing, capitalization and concession of goods, the provision of services performed by military units, as well as the operations of modifying the real estate.*

*The solution proposed by this regulation involves sending the documents subject to audit, in electronic format where possible and, as the case may be, under an extended electronic signature, to the mailing address of the internal audit*

structure, at least 5 working days before the date set for sending the announcement / the invitation to participate or the signing of the contract/framework agreement.

Regarding *the transmission of documents under extended electronic signature*, the solution is facilitated by the following favorable conditions: 1) *the existence of the legal framework represented, mainly, by Law no. 455/2001 approved by Government Decision no. 1259/2001 (published in MO of R no. 847/2001)*; 2) *the existence, at the level of credit orderers, of at least one extended electronic signature certificate that is currently used for the online transmission of declarations in relation to the National Fiscal Administration Agency (ANAF) and the National Insurance House of Health (CNAS)*.

At the level of the audit structure, missions of the type mentioned in D.A.I.-1/2019 are planned by entering information into *the IT system for the management of the internal public audit activity (S.I.M.A.P.I.)*.

The following internal audit documents are subject to transmission in electronic format, for such missions, through S.I.M.A.P.I.: 1) *work order*; 2) *declaration of independence*; 3) *information regarding the launch of the mission*; 4) *documents that refer to the collection and analysis of evidence (signed electronically by the representative of the audited entity)*; 5) *the supervised internal public audit report, which is transmitted to the audited entity*.

The advantages determined by the application of the proposed solution reside, mainly, in the following: a) *significant savings of financial funds*; b) *saving time*; c) *increasing the quality of document verification activities*; d) *the efficient use of internal auditors, as well as the significant increase in the reaction capacity of the internal audit structure to the requests of the contracting authorities*; e) *significantly reducing the risks of losing classified documents and data carriers, as well as exposing auditors to the consequences of traffic accidents*.

The impact of the implementation of the solution will be realized in: 1) *the enrollment of internal audit structures in the general effort to bring to fruition the opportunity of more efficient use of the resources made available*; 2) *increasing the importance and necessity of the internal audit function, by amplifying the conceptual and action capacity, as well as the reactivity*; 3) *faster adaptation to the challenges determined by technical progress and the knowledge society*.

From what has been presented so far, I would like to formulate *a few proposals*:

1) The internal audit department of the Ministry of National Defense should be concerned with developing guidelines for all types of audit missions adapted to the current requirements and the specifics of the activity in the army, as it did for

regularity/compliance audit missions in the field of public procurement and several other missions;

2) This structure to adopt its own decisions for the extension to other audit missions of the methodology by which electronic means are used on a large scale (imposed by the COVID-19 pandemic situation), as was done for the missions of awarding contracts public procurement/framework agreements, the rental, capitalization and concession of goods, the provision of services performed by military units, as well as the operations to modify real estate and as it resulted from the study carried out by UCAAPI on this issue;

3) To achieve as much as possible a balance by types of missions and by fields of activity, which are carried out by the audit teams from the profile direction in the army, to also cover system missions or evaluation of the internal audit activity or areas of activity related to the operational, logistical, legal or information technology areas of the units in our army

## 5. Conclusions

1) And within the structures of the Ministry of National Defense, the Internal Audit Directorate carries out the same missions specific to this field (assurance missions; advisory missions; internal audit evaluation missions; advisory missions; performance audit missions), according to the same regulations specific to public institutions, with the mention that this relevant ministry reserves the right to customize the application of national regulations to the specifics of entities in the army, by orders of the Minister of National Defense or own regulations of the head of the central structure of the army;

2) The methodology for carrying out these missions also in the army respects the rules established by the regulations adopted by the Ministry of Public Finance and UCAAPI, and for some missions, guides adapted to the specifics of the army have also been created;

3) The audit structure in the army is configured and acts according to the same established rules for public institutions and reports on its activity to the UCAAPI at the deadlines established by regulations (annually);

4) The central and territorial internal audit structures in the army have in recent years carried out a variety of audit missions that have proven to be of real use to the management structures in the army for risk management and increasing the effectiveness of internal controls;

5) A special problem that appeared starting in 2020 in the performance of public audit missions was generated by the CORONAVIRUS pandemic, a situation that

required the taking of specific measures also in internal public audit missions in the army, such as: telework; using the TSST document signing system (print - sign - scan - send); using the "Adobe Scan" application that scans documents successfully using the mobile phone; conducting video conferences; collecting information, testing as well as formulating findings and recommendations by electronic means; with short on-site visit and collection of a preliminary set of documents; the rest of the on-site intervention will be carried out by electronic means; a similar measure, although not following a separate study, was also taken in the military, by conducting missions with the help of information technology, but for a limited number of missions.

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**THE CONCLUSIONS OF THE COURT OF ACCOUNTS  
FROM THE EVALUATIONS, CONTROL, AND AUDIT  
MISSIONS RELATING TO THE ACTIVITY OF THE  
INTERNAL AUDITORS AND THE PROFILE  
STRUCTURES REGARDING THE FINANCIAL-  
ACCOUNTING ACTIVITY OF PUBLIC INSTITUTIONS  
IN ROMANIA AND IN PARTICULAR FROM THE  
MINISTRY OF NATIONAL DEFENSE**

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***Abstract:***

*Our article draws attention to a current and very important issue for public institutions, in general, but especially for decision-makers from entities of the Ministry of National Defense, namely the quality of the financial accounting activity carried out by the departments that perform this activity, evaluated by two superior control structures (Court of Accounts and UCAAPI), in order to correct the various dysfunctions that occur in this field. As a result of this proposed approach, I structured the material on 4 aspects, namely: 1)the activity of the professionals of the Court of Accounts when they audit the financial statements for the fulfillment of this mission and the evaluation of the activity of internal auditors in the area of this type of missions at public*



*institutions in our country; 2) the conclusions of the Court of Accounts derived from the control and audit missions regarding the financial-accounting activity of public institutions in Romania; 3) the conclusions of the Court of Accounts' control over the financial statements and various accounting aspects found at the audited entities of the Ministry of National Defense in the years 2019, 2020 and 2021; 4) conclusions.*

**Keywords:** *Court of Accounts of Romania; internal public audit; evaluation of the internal audit; the external public auditor; the objectives of the internal public audit in the financial - accounting area; the objectives of the Court of Accounts in the sphere of financial-accounting activity;*

**JEL Classification:** *M42*

## Introduction

This article focuses on a problem of great interest and very current for decision-makers in all public institutions and, in particular, in the Ministry of National Defense, a problem represented by the quality of the financial-accounting activity evaluated by structures empowered to do so (Court of Accounts of Romania and the Central Harmonization Unit for Internal Public Audit - UCAAPI).

We considered that the two mentioned evaluation and control bodies are complementary, have structures, personnel and methodology that allow them to carry out missions in the financial - accounting field, to easily report possible dysfunctions that may appear and to propose appropriate solutions to correct these, for the benefit of public entities periodically subject to such operations.

In the final part of our article, we focused our attention on the evaluations carried out by the Court of Accounts in the financial-accounting area in different structures in the Ministry of National Defense in order to better understand the mechanism of this supreme audit body through which it detects various dysfunctions in this area, how he appreciates them as serious and how he chooses the most appropriate solutions to correct the negative aspects encountered.

For me, as an internal auditor in a profile structure in the army, this interest in this topic was all the greater, as I participated in some missions that had as their object, exclusively or partially, the financial-accounting activity and I wanted to see what objections the Court of Accounts has both to the internal auditors (who also evaluate this activity periodically) and to that of the professionals in the field

from the army entities, so that we too can join more successfully in the general effort to improve this accounting activity.

In order to respond to the chosen research topic, we investigated the conclusions of the Court of Accounts from the normal or special annual reports that referred both to the evaluation of the internal audit in the financial and accounting area, to the audits of the annual financial statements at various public institutions in the country, but also to the missions carried out by this supreme national external audit body in 2019, 2020 and 2021 at various entities in the Ministry of National Defense.

The issue of this article is part of the broader research carried out by other specialists from the country and abroad regarding the evaluation of the internal audit activity and the strictly profile one by the professionals of the Court of Accounts, with the mention that in the end we focused only on the unfavorable aspects and the corrections that were required in the financial-accounting activity in the army, where we also work as professionals in the area of internal public audit.

### Literature review

The issue of the evaluation of the financial-accounting activity by the supreme national external public audit body represented by the Court of Accounts of Romania is one that is carried out by this institution, both on those in the immediate subordination who must make a similar evaluation (we are referring to the structures of internal audit) as well as regarding the specialized structures that put into operation, to the specifics of public institutions, the financial - accounting operations imposed by the dynamics of the activity of the institutions in which they operate.

Starting from the fact that the Romanian Court of Accounts also uses the profile standards and methodologies of the international and European bodies to which it is subordinated and with which it collaborates, we researched the standards issued by the International Organization of Supreme Audit Institutions (INTOSAI) or by The International Auditing and Assurance Standards Board (IAASB) and which this national body also uses (we mean ISSAI 1610, developed by INTOSAI (<https://static1.squarespace.com/static/57019a6db6aa607cbb909ab2/t/58dd8a48414fb5663b59d53c/1490913867837/issai-1610-pn.pdf>) and ISA 610 (Revised) entitled "Using the work of internal auditors" issued by the IAASB taken from the Manual of International Regulations for Quality Control, Auditing, Reviewing,

Other Assurance Services and Related Services, Edition 2020, Vol.I, translated by CAFR in 2022).

Another source of documentation was the reports from the last years of the Court of Accounts posted on the IT platform of this institution (website: [www.curtea.de.conturi.ro](http://www.curtea.de.conturi.ro)) regarding the missions in the financial - accounting field (as is the case of the Manual of compliance audit, 2014, still valid, posted on: [https://www.curteadeconturi.ro/uploads/ba799d10/00f73f99/0b553817/efbebc95/dcafc673/e1638e13/9edcf166/e54c9a73/Manu-al\\_de\\_audit\\_de\\_confor-mitate.pdf](https://www.curteadeconturi.ro/uploads/ba799d10/00f73f99/0b553817/efbebc95/dcafc673/e1638e13/9edcf166/e54c9a73/Manu-al_de_audit_de_confor-mitate.pdf)), to which are added reports, guides and other profile tools developed and posted by UCAAPI on the profile website (<https://mfinante.gov.ro/domenii/informatii-contribuabili/institutii-publice/ucaapi/>).

Also in our investigations we also researched doctoral theses elaborated on the activity of the Court of Accounts and here we have in mind the thesis entitled "The impact of public audit activity on the formation and use of public resources" which belongs to the doctoral student Otetea (Niculescu) Alexandra, coordinated by Professor Ungureanu Mihai Aristotel, from the Doctoral School at "Lucian Blaga" University in Sibiu (<https://doctorate.ulbsibiu.ro/wp-content/uploads/Rezumat-Otetea.pdf>).

Then we also have in mind a doctoral thesis developed in 2023 entitled "The role of systemic audit in the management of risk areas of the public sector", which was carried out by PhD student Lazăr (Pleșa) Teodora Nicoleta, under the coordination of prof. univ. dr. Popescu Constanța, from the Doctoral School at "Valahia" University in Târgoviște (<https://sd.valahia.ro/wp-content/uploads/Rezumat-teza CV-LAZAR-PLESA.pdf>).

Along with the sources listed above, we must also add some communications and articles that deal with aspects of the activity of the Court of Accounts in the area of examining financial reports. A communication from this category is the one with the title "The role of the Court of Accounts in the development of financial reporting in the public sector", presented by a representative of the Court of Accounts at the international conference organized by the Body of Chartered Accountants and Certified Accountants from Romania (CECCAR) in 2013 (<https://ceccar.ro/ro/wp-content/uploads/2013/11/Rolul-Curtii-de-Conturi-a-Romaniei.pdf>).

In Romania, CAFR regularly publishes the Financial Audit magazine, which also publishes articles on external and internal audit activity at public institutions and private companies. Such an example is the article The accounting and auditing

profession in the era of digitization developed by Stoica Oana Cristina and Ionescu-Feleagă Liliana (Financial Audit magazine no. 165/2022, pp. 41-54, [http://revista.cafr.ro/RevistaDetalii\\_RO?Code=1101](http://revista.cafr.ro/RevistaDetalii_RO?Code=1101)).

We cannot omit from the list of sources investigated in the area of controls carried out by the Court of Accounts at public institutions, the consulting materials developed and posted on its website (<https://www.rsonline.ro/contabilitate-2/consilier-contabilitate-for-public-institutions-53/p-65/>) to the part related to the accounting of public institutions.

Obviously, there are other researches, articles and studies on the issue of evaluations carried out by the Court of Accounts on the financial-accounting activity, but we consider that those listed by us above are suggestive for the approach to investigate the specialized literature in the field.

Through this article, we specifically aimed to bring to attention lesser-known facets of the audit missions of the Court of Accounts carried out in recent years within the entities of the Ministry of National Defense.

### **Theoretical foundation of the theme**

The issue of the evaluation of the financial-accounting activity in public institutions and the army by the external public audit carried out by the Court of Accounts was investigated by us, starting from the highlighting of the scientific, normative and professional foundations in this field, continuing with the investigation of the analyzes and conclusions drawn by this body following the numerous missions in this field carried out in recent years at various civil public institutions and ending with the missions carried out in the last 3 years by the same institution, at entities from the Ministry of National Defense.

We used as research tools the examination of various reports, analyses, guides, normative acts, specialized works, their multidimensional and complex analysis, making correlations between the phenomena and problems contained in these documents and formulating deep and realistic conclusions.

At the same time, in the last part of our research, we very carefully analyzed the findings of the Court of Accounts on financial - accounting issues and the proposed measures, in order to understand their complexity and seriousness and the substantive arguments for which certain corrective measures were proposed at public institutions from the Ministry of National Defense.

1) The activity of the professionals of the Court of Accounts when they audit the financial statements for the fulfillment of this mission and the evaluation of the activity of internal auditors in the area of this type of missions at public institutions in our country

The Court of Accounts is the public authority that exercises the function of control over the way of formation, administration and use of the financial resources of the state and the public sector.

The information collected by the Court of Accounts following the control and audit actions carried out by its auditors is transmitted in a formalized way to the Parliament and, respectively, to the deliberative public authorities of the administrative-territorial units.

The reports of the Court of Accounts contain information on the use and administration of public resources according to the principles of legality, regularity, economy, efficiency and effectiveness.

The main activities carried out by the Court of Accounts are those of external public audit, including: a) financial audit; b) performance audit; c) the compliance audit (the control exercised within public institutions and other entities subject to the jurisdiction of the Court of Accounts, according to the legal provisions in force).

Through its verifications according to the legal competences in the financial - accounting area, the Court of Accounts pursues as objectives: 1) the accuracy and reality of the data reflected in the financial statements drawn up by the audited entities; 2) the method of establishing, highlighting and tracking the revenue collection of the general consolidated budget; 3) evaluation of internal management and control systems (including internal audit) at verified entities (including authorities with tasks regarding the follow-up of financial obligations of legal or natural persons to budgets or to other public funds established by law), of their implementation method and of the causes of possible deficiencies found by the Court of Accounts in the activity of the respective entities; 4) the quality of economic - financial management by correlation with the purpose, objectives and attributions provided in the founding documents of the verified entity; 5) other objectives, within the limits of legal powers, if applicable.

The Romanian Court of Accounts performs the financial audit on the execution accounts of all types of budgets (the state budget; the state social insurance budget; the budget of special funds; local budgets; the budget of the State Treasury; the budgets of autonomous public institutions; other budgets according to the public finance law) (Art. 26 of Law no. 94 of 1992, republished), but also audits of annual

financial statements and other missions that fall within the scope of responsibility of this institution.

One such specific mission of the Court of Accounts is the evaluation of the internal audit.

Regarding this previously mentioned mission of the Court of Accounts, we must make some methodological and regulatory clarifications.

The internal public audit is an integral part of the internal control system and plays an essential role in the evaluation of control systems within public entities, and in this context, the Lima Declaration - ISSAI 1 (adopted at the 9th Congress of the International Organization of the Supreme Audit Institutions (INTOSAI) gathered in Lima (Peru) in 1977) provides that the audit is not an end in itself, but an indispensable part of a regulatory system that aims to discover deviations from accepted standards and violations of the principles of legality, efficiency, economy and effectiveness of financial management, early enough to make it possible to take corrective measures in individual cases, to make those responsible take responsibility, to obtain compensation or to take preventive measures so so that such deviations do not happen again.

In this context, for the Court of Accounts of Romania it is very important that the internal public audit activity organized and carried out at the level of public entities is effective, given that it can and must anticipate and prevent errors and omissions, fraud and irregularities from an early stage, faster than the external public audit can do and, at the same time, the reliability and effectiveness of the internal audit can generate an optimal and efficient use of the resources of the external public audit (Court of Accounts).

Law no. 94/1992 on the organization and operation of the Court of Accounts, republished, provides the following: "(1) In fulfilling the duties conferred on it by law, the Court of Accounts also has the following duties: a) to evaluate its own financial control activity and internal audit of controlled legal entities; b) (...); c) to request and use, for the exercise of its control and audit functions, the reports of the other bodies with financial control, fiscal, internal audit and bank inspection attributions; d) (...)

Legal entities subject to the control of the Court of Accounts are obliged to submit to it, by the end of the first quarter for the previous year, the Report on the implementation and implementation of the internal audit program.

The Court of Accounts will develop collaboration with the internal audit structures at the level of legal entities, in order to ensure complementarity and

increase the efficiency of the audit activity" (Art. 42 of Law no. 94 of 1992, republished).

The Romanian Court of Accounts assesses the internal managerial control system (ICSM) at the level of public entities within its verification competence, in order to analyze the capacity of this system (including the internal audit) to prevent, detect and correct significant errors/deviations which may appear in the activity of the audited entities.

Also, the external public auditors of the Court of Accounts must use the information obtained, as a result of the evaluation carried out on the internal managerial control and the internal audit activity, as audit evidence for establishing the existing risks in the activity of the audited entities - which highlights the importance of which has, for the activity of the Court of Accounts, that the internal managerial control system, including the internal audit, be organized and function according to legal regulations.

Reporting to the Court of Accounts (the report on the implementation and implementation of the internal audit program) is based on the framework report issued by the Central Harmonization Unit for the Internal Public Audit (UCAAPI) within the Ministry of Public Finance (MFP), as responsible with the coordination and supervision of the internal audit for all loan officers ([https://www.curteadeconturi.ro/uploads/bfc9cc4a/f0737f15/d77cb121/51adf5-99/7dc06\\_fe8/429\\_3613e/cda80583/cdce90f1/Raport\\_special\\_Audit\\_Intern.pdf](https://www.curteadeconturi.ro/uploads/bfc9cc4a/f0737f15/d77cb121/51adf5-99/7dc06_fe8/429_3613e/cda80583/cdce90f1/Raport_special_Audit_Intern.pdf), October 2018, pp. 5-6).

Regarding the evaluation of the internal audit by the external public audit, we would like to refer to a series of important elements from a guide of the Court of Accounts somewhat closer to the time of our analysis and still in force (Courtea de Conturi of Romania, "Evaluation guide of the internal control system in public entities", Bucharest, 2011).

Internal Auditing Standard ISA 610 (Revised) entitled "Utilization of the Work of Internal Auditors" (IAASB, Handbook of International Regulations for Quality Control, Auditing, Reviewing, Other Assurance and Related Services, 2020 Edition, Vol.I, translated by CAFR, pp.712-734) issued by IFAC and ISSAI 1610 called "Using the work of internal auditors", developed by INTOSAI (<https://static1.squarespace.com/static/57019a6db6aa607cbb909ab2/t/58dd8a48414fb5663b59d53c/1490913867837/issai-1610-pn.pdf>, pp.1-4), establishes the external auditor's objectives when he considers the entity's internal audit function to be relevant, respectively: a) to establish whether and to what extent he will use the specific activity of internal auditors; b) if it will analyze the

specific activity of the internal auditors, to determine whether the activity is appropriate for the purposes of the audit.

To decide whether and to what extent he will use the specific activity of internal auditors, the external public auditor must evaluate: a) the objectives of the audit function; b) if the activity of internal auditors was carried out with due attention (planning, supervision, existence of audit files, etc.); c) if the communication relationship between the internal auditors and the external public auditor is effective.

In order to determine the degree of adequacy of the specific activity carried out by the internal auditors, the external public auditor must evaluate whether: a) the activity was properly supervised, reviewed and documented; b) the audit evidence obtained is sufficient, appropriate and relevant for the formulation of reasonable conclusions by the internal auditors; c) are the causes that led to the non-conformities reported by the internal auditors real or are they just the effects of other causes and if they were limited/eliminated following the application of corrective measures by the management; d) the recommendations formulated are appropriate in the given circumstances and if the prepared reports are consistent with the results of the activity carried out; e) any finding reported by the internal auditor has been properly dealt with by the audited organization.

The external public auditor must analyze whether the internal audit was focused strictly on its scope of activity, respectively on the following aspects: 1) the financial activities carried out by the public entity; 2) the establishment of public revenues; 3) administration of public patrimony; 4) financial management and control systems.

In order for the external public auditor to use the specific activity of the internal auditors, he must evaluate and apply audit procedures regarding this activity, in order to establish its adequacy for the purpose of the external audit.

In the evaluation action of the internal auditors by the external public ones, 3 situations can arise in this process.

The first situation: if the external public auditor, as a result of applying the audit procedures, evaluates that the internal audit is not satisfactory, he must communicate his findings to the management of the entity.

The second situation: if the activity of the internal auditors does not cover all areas or does not show confidence, then the external public auditor must carry out an additional volume of activity.

The third situation: if the external public auditor relies on and uses the specific activity of internal auditors, following the assessment of the activity of these



professionals, he must include in the audit documentation the conclusions formulated regarding the assessment of the adequacy of this activity and the audit procedures on who used them in this sense.

The evaluation of the internal audit function influences the conclusion on the possible use of the internal audit in the verification activity of the external public auditor and therefore, the modification of the nature, planning and extent of the subsequent audit procedures (Court of Accounts, Guide for the evaluation of the internal control system in entities publice, 2011, pp.44-46, [https://www.conta-conta.ro/miscellaneous/864\\_miscellaneous\\_contabilitate\\_files% 20864\\_. pdf](https://www.conta-conta.ro/miscellaneous/864_miscellaneous_contabilitate_files%20864_.pdf)).

We will now present extracts from the last analysis posted on the website of the Romanian Court of Accounts regarding the special report made in 2018 regarding the activity of the internal public audit structures at the level of the central public administration authorities for the part related to the financial-accounting activity ([https://www.curteadeconturi.ro/uploads/bfc9cc4a/ f0737f15/d77cb121/51adf5-99/7dc06fe8/4293613e/cda80583/cdce90f1/Raport\\_special\\_Audit\\_Intern.pdf](https://www.curteadeconturi.ro/uploads/bfc9cc4a/f0737f15/d77cb121/51adf5-99/7dc06fe8/4293613e/cda80583/cdce90f1/Raport_special_Audit_Intern.pdf), October 2018).

The main objectives set and addressed by the internal public audit, regarding the financial-accounting field, were mainly aimed at verifying/ensuring compliance with the application of specific financial-accounting regulations, and can be grouped into the following categories: a) the organization and functioning of the financial-accounting activity; b) management of accounting and financial activity; c) preparation of financial statements; d) organization of the financial-accounting data reporting system to management; e) the reliability of the financial-accounting IT system and the organization and archiving of financial-accounting documents, etc.; f) organization, implementation and operation of the internal managerial control system in the financial-accounting field, including preventive financial control (CFP) etc.

The findings of the internal public audit mainly concerned aspects regarding the organization of the financial-accounting process, the execution of operations, the structure and circuit of documents, approvals, the related internal procedural framework, etc., as follows:

a) the insufficiency of human resources allocated to the financial and accounting activity and the inadequate dimensioning of the specialized internal structures depending on the volume, complexity and difficulty of the objectives and the operations carried out;

b) not developing, updating, disseminating to employees or not complying with operational procedures related to activities specific to the financial-accounting field, including those intended for the asset inventory process;

c) non-updating or non-compliance with the internal procedural framework for granting the CFP visa, at the level of subordinate public entities - establishing authorized persons, operations and documents subject to CFP, the circuit of documents, coordinating persons, the separation of powers and responsibilities, etc.;

d) making expenses without supporting documents or without them being committed, liquidated and properly ordered;

e) dysfunctionalities in the organization and use of financial-accounting IT systems for making and maintaining records, operative access to data and information, generation of centralizing and comparative situations, etc.;

f) making accounting entries in the computer program without being consistent with the attached supporting documents or without supporting documents;

g) deficiencies in the way of organizing the activity of preparing the financial-accounting documents in order to submit them to the entity's archive;

h) non-elaboration, deficient elaboration or non-application of the internal procedural framework for the improvement of continuous professional training of executive and management personnel from financial-accounting structures, including those with attributions in granting the CFP visa ([https://www.curteadeconturi.ro/uploads /bfc9cc4a/f0737f15/ d77cb121/51adf5-99/7dc06fe8/429\\_3613e/cda80583/cdce90f1/Raport\\_special\\_Audit\\_Intern.pdf](https://www.curteadeconturi.ro/uploads/bfc9cc4a/f0737f15/d77cb121/51adf5-99/7dc06fe8/429_3613e/cda80583/cdce90f1/Raport_special_Audit_Intern.pdf), October 2018, pp.35-37).

Unfortunately, with all the findings of the internal public audit in the area of financial-accounting activity in central public institutions, which are relatively important and worthy of consideration, in the context of all missions of this type (including the one in the financial and accounting area), the Court of Accounts in the report for 2018 presented to the Romanian Parliament, he also highlighted some fundamental shortcomings of the entire internal public audit system in our country, which we will list below:

1) the internal public audit of the central public administration entities is not able to respond, at an acceptable qualitative level, to the objectives established by the applicable legal regulations;

2) the organization and operation of the internal audit still presents weak points and dysfunctions related to the establishment and organization of the audit structures, the provision of the necessary resources (human, financial, time, etc.),

the actual operation under conditions of effectiveness, identifying risks and establishing internal audit missions, implementing recommendations, etc.;

3) at the management level of these entities, the role and necessity of the internal audit was not fully understood and it was not realized that it is an insurance and advisory lever, through which significant risks can be identified and evaluated and which supports the management of the public entity to achieve the objectives, evaluate and improve the risk management, control and governance processes, as well as to achieve the quality levels established in the fulfillment of individual responsibilities;

4) the internal audit focused, as a rule, on the "formalized" aspects of the organization and operation of public entities and less or not at all on the identification of the real, deep causes of dysfunctions and low performance, as well as on the firm approach of some specific aspects " "responsible" for the emergence and perpetuation of major failures and gaps that Romania faces at the macroeconomic level;

5) The Central Harmonization Unit for Internal Public Audit (UCAAPI) within the Ministry of Public Finance still has a lot to do in order to fulfill all its legal duties and perform in the important role that the law established for it (<https://www.curteadeconturi.ro>, Special Report of the Court of Accounts regarding the activity of internal public audit structures at the level of central public administration authorities for 2018, presented to the Romanian Parliament, p.2).

The Court of Accounts presented in this special report published on the institution's website the objectives that the internal audit should address, regarding the areas in its area of responsibility: budgetary; public procurement; HR; IT; legal; European funds; specific functions - during the periodic meetings they will have with internal auditors from public entities at the level of the central public administration (we have in mind Instructions no. I 40855/29.05.2018).

With regard to the financial-accounting field, the specialized structures of the Court of Accounts at the central level will identify and implement in the future, within each audit action carried out at public entities at the level of the central, hierarchically superior and subordinate public administration, the following aspects:

- the real reasons why there continue to be, after so many years since the internal audit has been operating, the same types of non-conformities in the financial-accounting field, regarding: inventory, accounting records, supporting documents, preventive financial control (CFP), reports, managerial internal control to;

- the manner in which the heads of the public entities of the central public administration, including the subordinate entities, were involved in ensuring the necessary resources for the financial-accounting activity (material, human, financial, IT, etc.) but also in the implementation of the previous recommendations of the public audit internal report on this field ([https://www.curteadeconturi.ro/uploads/bfc9cc4a/f0737f15/d77cb121/51adf5-99/7dc06fe8/4293613e/cda80\\_583/cdce90f1/Raport\\_special\\_Audit\\_Intern.pdf](https://www.curteadeconturi.ro/uploads/bfc9cc4a/f0737f15/d77cb121/51adf5-99/7dc06fe8/4293613e/cda80_583/cdce90f1/Raport_special_Audit_Intern.pdf), October 2018, pp.57-58).

An outstanding jurist relatively recently synthesized several assessments of the new management system in public institutions in the EU member states, which we highlight below.

With the entry into the European Union of the new member countries and the allocation of funds to them, it was desired to respect the principles established in the White Book of managerial reforms within the services of the European Commission from the year 2000 and the implementation of a unitary internal control framework in all public entities, in order to analyze how they are administered.

In 2006, the European Commission developed a reference document whose main purpose was to guide the implementation of internal control and internal audit requirements, which was named the Yellow Book of the European Commission, "Welcome to the world of Internal Public Financial Control ( CFPI)".

Yellow Book, defines CFPI based on 3 elements/pillars: a) managerial responsibility (for the introduction of financial management systems and management control/control); b) functional independent internal audit (introduction of internal audit in public entities); c) central harmonization unit (UCA) for the development of methodologies and standards related to the first two elements (managerial responsibility and internal audit).

We have moved from the old approach of internal control to a new one, which requires transparency and the understanding that any government is forced to answer to civil society regarding its designation for the collection of revenues and the correct allocation of expenses, on its behalf (Tăvală Florina Maria, "Aspects regarding the harmonization of legislation in the field of internal public financial control with European and international legislation and standards", published in *Universul Juridic* no. 3/2019).

Based on all the recommendations from international bodies such as INTOSAI, the European Commission or SIGMA21, the Romanian Court of Accounts concluded with the Ministry of Public Finance a Protocol for cooperation and

collaboration in the process of strengthening the internal public financial control system.

Another collaboration agreement in the process of consolidating the functions of internal audit and external public audit was concluded between the Court of Accounts and the Association of Internal Auditors from Romania (AAIR) for the private sector (companies and non-profit organizations) ([https://monitorul.fisc.md/editorial/curtea\\_de\\_conturi\\_si\\_asociatia\\_auditorilor\\_interni\\_acord\\_de\\_collaborare\\_in\\_procesul\\_de\\_consolidare\\_a\\_functiilor\\_de\\_audit\\_public\\_extern\\_si\\_intern.html/](https://monitorul.fisc.md/editorial/curtea_de_conturi_si_asociatia_auditorilor_interni_acord_de_collaborare_in_procesul_de_consolidare_a_functiilor_de_audit_public_extern_si_intern.html/)).

From what is presented in this first chapter, we can draw some conclusions:

1)The Court of Accounts performs a variety of audit and control missions, from financial audit, performance audit, compliance audit to various types of controls and other missions according to the legal provisions in force; from this list of missions of this supreme national audit body, we focused on the evaluation of the internal public audit;

2)The evaluation of the internal public audit activity by the Court of Accounts is done, on the one hand, on the basis of the annual reports that this body receives from UCAAPI as a higher-ranking structure for managing the internal public audit, then on the occasion of the periodic audit of to the Ministry of Finance by the same Court of Accounts (on which occasion UCAAPI is also audited as a structure subordinate to this ministry) and, last but not least, based on the reports of the Court's audit teams when they audit the financial statements of public institutions (on which occasion they also evaluates the internal audit activity carried out at public institutions subject to external financial audit);

3)The Court of Auditors connected and updated its activity to the new public control system established by the European Union among the member states, with the entry of Romania into this economic, political and other continental structure, a system that was designed with more steps or filters for checking how public money is used in each institution in our country;

4)The auditors of the Court of Accounts, when evaluating the internal audit during the examination of the financial statements of public institutions, can rely on different degrees of confidence, which leads them to rely more or less or not at all on the findings of the internal audit, a fact for which the last special report of the Court of Accounts in 2018 had many critical notes on this type of audit and recommended that internal auditors avoid the formal, procedural aspects of their missions and focus on identifying the real, deep causes of dysfunctions and reduces the performance achieved by a number of public institutions.

## **2.The conclusions of the Court of Accounts derived from the control and audit missions related to the financial and accounting activity of public institutions in Romania**

One of the objectives pursued by the Court of Accounts within the control actions carried out at the level of public institutions/administrative-territorial units is that of the accuracy and reality of the data reflected in the financial statements, according to art. 29 para. (1) from Law no. 94/1992 on the organization and operation of the Court of Accounts, republished, with subsequent amendments and additions.

We present below a series of situations related to the deviations frequently found by the auditors of the Court of Accounts, within this objective. We will first refer to the frequent deviations found by the auditors of the Court of Accounts regarding the financial statements.

The most typical deviations are those listed below with A, B, C, D and E.

A) Non-recording in the accounting of economic operations at the time of their performance. The legislation that sanctions such deviations is represented by two defining normative acts for public accounting: 1) Accounting Law no. 82/1991, art. 9 para. (1) and (2) (republished, with subsequent amendments and additions, in the Official Gazette of R, no. 382/20.06.2015); 2) O.M.F.P. no. 1,917/2005 for the approval of the Methodological Norms regarding the organization and management of the accounting of public institutions, the Chart of accounts for public institutions and its application instructions, with subsequent amendments and additions, Cap. II, point 2.7.1.1 (published in the Official Gazette of Romania, Part I, no. 1186 bis of December 29, 2005).

Such acts are classified as misdemeanors, and the penalties consist of a fine from 300 to 4,000 lei (art. 42 para. (1) of the Accounting Law no. 82/1991, republished, with subsequent amendments and additions).

An example of this type of violation of the violation was the one in which a public institution did not reflect in the accounting the current repairs related to a swimming pool, in the amount of 30,000 lei, repairs carried out, received according to the supporting documents and invoiced (based on the estimate of works) in August of the year N, the invoice of the service provider being recorded in the accounting at the time of payment of the works, respectively in November of the year N. In this case, the principle of accrual accounting, provided by O.M.F.P., was not respected. no. 1.917/2005, since, although the operation and its payment took

place during the same budget year, the quarterly statements on 30.09.N were distorted by not including the expenditure on repairs in the amount of 30,000 lei.

B) Making erroneous accounting records. The legislation that sanctions such violations is represented by 2 representative normative acts: 1) Accounting Law no. 82/1991, republished, with subsequent amendments and additions, art. 9 para. (1) and (2); 2) O.M.F.P. no. 1.917/2005, Cap. II, point 2.8 and point 2.9.

Such acts are classified as misdemeanors, and the penalties consist of a fine from 200 to 1,000 lei (art. 42 para. (1) of the Accounting Law no. 82/1991, republished, with subsequent amendments and additions).

An example of this type of deviation of the deviation was the one in which during the budget year N, a public institution contracted a feasibility study for an investment objective - construction, recording in the accounting the invoice no. 1/23.06.N in the amount of 5,000 lei and invoice no. 2/05.08.N in the amount of 10,000 lei, by affecting the expense accounts of class 6. The Court of Accounts control took place in the budget year N+1, after the submission of the annual financial statements related to year N.

The total estimated value of the deviation found by the auditors of the Court of Accounts was 15,000 lei, according to the supporting documents (provider's invoices), account statements and registered accounting notes. The deviation of 15,000 lei affected the patrimonial result highlighted in the financial statements of the budget year N. The person responsible took ownership of the deviation, and the error was corrected during the control action (respectively, in the budget year N+1).

C) Non-calculation or incorrect calculation of depreciation of tangible fixed assets. The legislation that sanctions such violations is represented by 2 representative normative acts: 1) Accounting Law no. 82/1991, republished, with subsequent amendments and additions, art. 9 para. (1) and (2); 2) O.M.F.P. no. 1.917/2005, Cap. III, point 1.1.5.

Such acts are classified as misdemeanors, and the penalties consist of a fine from 200 to 1,000 lei (art. 42 para. (1) of the Accounting Law no. 82/1991, republished, with subsequent amendments and additions).

An example of this type of deviation was when a public institution classified a bus for transport (code 2.3.2.1.3.1 – duration of operation between 4 and 8 years) in the range of values related to other types of buses (code 2.3.2.1.3, operating periods between 5 and 9 years) and established the maximum amortization period of 9 years. The bus was purchased on 14.06.N-3 and was put into use in July N-3, and the audit by the Court of Accounts took place in year N, in November.

The entrance fee of the bus is 90,000 lei. Keeping the same reasoning of using the maximum value allowed by the Catalog regarding the classification and normal operating durations of fixed assets (H.G. no. 2.139/2004 for the approval of the Catalog regarding the classification and normal operating durations of fixed assets, with subsequent amendments and additions, published in MO of R, no. 46/13.01.2005), according to the decision of the credit authority, the maximum duration allowed for code 2.3.2.1.3.1 should have been 8 years. Thus, in the previous years, the financial statements erroneously presented an expense with depreciation undervalued by 3,125.10 lei.

D) Failure to highlight guarantees of good execution. The legislation that sanctions such violations is represented by 2 representative normative acts: 1) Accounting Law no. 82/1991, republished, with subsequent amendments and additions, art. 9 para. (1) and (2); 2) O.M.F.P. no. 1.917/2005, Cap. IV, point 2.5.

Such acts are classified as misdemeanors, and the penalties consist of a fine from 300 to 4,000 lei (art. 42 para. (1) of the Accounting Law no. 82/1991, republished, with subsequent amendments and additions).

An example of this type of misconduct was the one in which a contractor presented the acquiring public institution with the Letter of Bank Guarantee for good execution, for the amount of 50,000 lei. According to O.M.F.P. no. 1.917/2005, this letter of bank guarantee must be shown in an off-balance sheet account, respectively 804.90.00 "Bank guarantee for good execution". The accountant of the institution omitted the registration of this off-balance sheet item.

Correctly, the off-balance sheet items must be entered in a monthly trial balance. This trial balance can be a separate one only for the off-balance sheet items or they can be included in the trial balance that also contains the balance sheet accounts of the institution. Also, these off-balance sheet accounts must be detailed analytically, if the situation requires it, for a more correct and rigorous record.

E) Lack of analytical records of some accounting accounts, mandatory according to the regulations in force. The legislation that sanctions such violations is represented by 2 representative normative acts: 1) Accounting Law no. 82/1991, republished, with subsequent amendments and additions, art. 9 para. (1) and (2); 2) O.M.F.P. no. 1.917/2005, Cap. I, point 1.1.

Such acts are classified as misdemeanors, and the penalties consist of a fine from 300 to 4,000 lei (art. 42 para. (1) of the Accounting Law no. 82/1991, republished, with subsequent amendments and additions).



Examples of analytical records that must be drawn up by public institutions are those listed below: a) of claims and debts, separated for individuals or legal entities, by seniority (the analytical record of uncertain or disputed claims and debts is also required); b) of the guarantees submitted by the managers; c) of the fixed assets given in custody or in loan; d) fixed assets, taking into account their belonging to the public or private domain of the state or administrative-territorial units; e) analytical records of income and expenses.

Frequent deviations were found by the auditors of the Court of Accounts regarding the quality of economic and financial management.

These deviations were found within the objective pursued by the Court of Accounts within the control actions carried out at the level of public institutions/administrative-territorial units regarding the quality of economic-financial management.

In this case, among the deviations identified by the auditors of the Court of Accounts, we mention the following: a) non-revaluation of tangible fixed assets of the nature of buildings and land or failure to carry out the revaluation of tangible fixed assets at least once every 3 years, according to the provisions of the legislation in force; b) failure to carry out an inventory of all patrimonial elements, as stipulated by the legislation in force; c) unexpected non-verification of cashiers, where applicable; d) deficiencies in the process of hiring, liquidation, ordering and payment of expenses, which can lead to damages.

With regard to the above-mentioned objective, we further list a series of deviations that can lead to unfavorable opinions in the reports of the Court of Accounts: 1) deviations related to the revaluation of tangible fixed assets; 2) deviations related to the inventory of the heritage; 3) non-registration of economic-financial transactions in accounting; 4) the erroneous registration in the accounting, in the tangible fixed assets group, of goods that do not cumulatively meet the criteria provided by the legislation to be recognized in this category; 5) erroneous registration in the material expense accounts of materials of the nature of inventory objects; 6) the non-existence of the supporting documents that were the basis of the recording in the accounting of some economic-financial transactions, which confirm the accuracy of the payment amounts, the receipt of material goods, the provision of services, respectively the execution of works (Rantrop & Straton, C35-Control of the Court of Accounts - Case studies, taken from [www.rsonline.ro](http://www.rsonline.ro)).

As conclusions, we can mention the following at the end of this second part of the article:

1) The Court of Accounts found, during the control or audit activities of the annual financial statements of public institutions, a series of shortcomings, of which the most frequent are those aimed at the non-recording of economic operations in the accounting at the time of their performance, then those related to the making of erroneous accounting records, followed by those that presuppose the non-calculation or incorrect calculation of the depreciation of tangible fixed assets, the failure to highlight guarantees of good execution and, last but not least, the lack of analytical records of some accounting accounts;

2) A second set of errors found by the Court of Accounts on the occasion of the same audit missions of the financial statements are those that can lead to unfavorable opinions in the final audit reports and refer to aspects such as: a) deviations related to the revaluation tangible fixed assets; b) deviations related to the inventory of the heritage; c) non-registration of economic-financial transactions in accounting; d) the erroneous registration in the accounting, in the group of tangible fixed assets, of goods that do not cumulatively meet the criteria provided by the legislation to be recognized in this category; e) erroneous registration in the material expense accounts of materials of the nature of inventory objects; f) the non-existence of the supporting documents that were the basis of the recording in the accounting of some economic-financial transactions, which confirm the accuracy of the payment amounts, the receipt of material goods, the provision of services, respectively the execution of works; these shortcomings must be the basis of the thorough training of the personnel working in public accounting, so that such errors do not repeat themselves in the future.

### ***3. The conclusions of the Court of Accounts control over the financial statements and various accounting aspects found at the audited entities of the Ministry of National Defense in the years 2019, 2020 and 2021***

In this last part of our article, we mention that we have researched the reports of the Court of Auditors for the years 2019, 2020 and 2021 (the report for the year 2022 was not completed at the time of preparing our research report), to see the conclusions drawn by this body supreme control following the missions carried out at various structures in the Ministry of National Defense.

During 2019, the Court of Accounts of Romania carried out several specific missions in entities of the Ministry of National Defense. Following the financial audit mission carried out, the Court of Accounts issued a qualified opinion, with an audit paragraph highlighting certain aspects of the financial statements drawn up on December 31, 2019.

The main shortcomings for which the audit opinion was reserved and their value was below the threshold of significance, refer to the following aspects: a) the erroneous registration in the credit of the "Unclaimed personnel rights" account and the "Provisions" account of significant amounts, leading to an unjustified increase in the entity's obligations; b) non-compliance with the principle of commitment accounting in the case of expenses paid and recorded in January 2019 instead of December 2018; c) the non-clarification, in order to collect, of important sums representing compensations paid by the audited entity, based on the provisions of the North Atlantic Treaty regarding the status of forces.

The Court of Accounts made the following recommendations:

a) establishing and updating the amounts representing "Unclaimed personnel rights", remaining in the account balance, as well as the regularization of the accounting records and the budget execution of expenses/payments for each financial year, so that the annual financial statements provide a true picture of the financial position of the institution;

b) ensuring the registration in the accounting records of economic operations generating expenses and payments, in compliance with the principle of accrual accounting;

c) recovery of the debit registered as compensation paid by the audited entity (Courtea de Conturi of Romania, Public Report for the year 2019, December 2020, pp.83-84, [www.curteadeconturi.ro](http://www.curteadeconturi.ro));).

During 2020, the Court of Accounts of Romania carried out other specific missions in entities of the Ministry of National Defense. From these entities we mention the following: The Ministry's own apparatus; Department of Domains and Infrastructures; Central Military Emergency University Hospital "DR. CAROL DAVILA"; "Ferdinand I" Military Technical Academy; Army Sports Club "Steaua".

Within the own apparatus of the Ministry of National Defense, the Court of Accounts found the following shortcomings: a) the erroneous registration directly on expenses, in correspondence with the financing account from the budget, of some payments made to suppliers, contrary to the provisions of the accounting regulations regarding the record of obligations their payment and extinguishment; b) making unjustified payments, caused by the erroneous determination of the winning bid for the supply of construction materials to a military unit and unjustified payments representing monthly rent compensation to another military unit; c) granting increases for difficult working conditions in amounts higher than those provided by law, at 3 military units.

At the Department of Domains and Infrastructures within the Ministry of National Defense, the supreme audit body found the following shortcomings: a) non-transfer to the state budget of a large amount, representing revenues which, according to the provisions of Law no. 500/2002 on public finances, had to be paid in full to the budget from which they are financed; b) non-payment by a subordinate structure in Bucharest from SC E-Distribuție Muntenia SA and non-transfer to the state budget of a sum of money, representing regularization of the connection contract and non-payment by the economic operator as "payment of compensation as first user" and another amount, representing punitive legal interest for monetary obligations, the total amount being fully recovered and transferred to the budget after the end of the audit.

At the Central Military Emergency University Hospital "DR. CAROL DAVILA" following the compliance audit, the following irregularities were found by the Court of Accounts: a) failure to register in the accounting records a significant amount, representing hospitalization expenses of victims of road accidents and physical aggressions, established on the basis of final court sentences, as well as another amount representing debts not recovered within the legal limitation period; b) the non-transfer to the state budget of an amount representing guarantees for participation in tenders and established good performance guarantees, the restitution of which was not requested by the suppliers within the legal limitation period.

At the "Ferdinand I" Military Technical Academy, the Court of Accounts found that the financial statements concluded on 31.12.2020 did not reflect the accounting operations of the transfer of a land-type building with an area of 5 ha.

At the "Steaua" Army Sports Club, the same control and audit body detected that the amount of several hundred thousand lei was not recorded in the operational and accounting records, representing the value of some materials used for current repairs under own direction, as well as another amount of almost one million lei, representing legal commitments remaining to be paid on 31.12.2020 (Courtea de Conturi of Romania, Public report for the year 2020, Bucharest 2021, pp.91-92, [www.curteadeconturi.ro](http://www.curteadeconturi.ro)).

During 2021, the Court of Accounts of Romania carried out other specific missions in entities of the Ministry of National Defense. Of these, we list the following: "CANTACUZINO" National Medical-Military Research-Development Institute; General Staff of the Land Forces; United Logistics Command; National Institute of Aeronautical and Space Medicine "Gen. Dr. Aviator Victor Anastasiu" Bucharest; Communications and Information Command.

At the "CANTACUZINO" National Medical-Military Research-Development Institute, the Court found the following irregularities: a) non-registration in the Land Register of some real estate, building - land, located in Ciorogârla; b) the identification of significant inconsistencies between the accounting records and the cadastral records in the case of real estates in the public and private domain of the state, given to the administration of the institute; b) non-clarification of the nature, date of establishment and non-undertaking of all steps for the recovery of some debts; c) the unjustified removal from the records of some prescribed receivables, in the amount of several hundred thousand lei.

At the General Staff of the Land Forces, the same control institution detected that the collection of claims in the amount of several hundred thousand lei, representing goods and services allocated on the occasion of carrying out international military activities, was not pursued.

At the United Logistics Command, the Court of Accounts found that the registration and updating of all performance guarantees related to procurement contracts, services and works carried out in 2021, in the amount of over one hundred thousand lei, was not followed.

National Institute of Aeronautical and Space Medicine "Gen. Dr. Aviator Victor Anastasiu" from Bucharest audited by the Court of Accounts did not analyze the causes and circumstances that led to the non-validation by the OPSNAJ House of medical benefits in the amount of over two hundred thousand lei and funds representing medical equipment and devices were immobilized used only temporarily, not permanently.

At the Communications and Information Command, this supreme audit body identified inconsistencies in the amount of over one million lei between the value of state public domain assets reflected in the accounting records and the value reflected in the centralized inventory of state public domain assets (Court of Accounts of Romania, Public report for the year 2021, Bucharest 2022, pp.103-104, [www.curteadeconturi.ro](http://www.curteadeconturi.ro)).

Following the controls and audit missions carried out by the Court of Accounts in recent years at central and local level public institutions, as well as in the army, irregularities were detected for which this control body had to make criminal reports to the legal bodies for resolution such very serious irregularities.

We must note with satisfaction that following the content of the Situation of criminal reports addressed to criminal investigation bodies by the Court of Accounts in 2021 ([https://www.curteadeconturi.ro/publicatii/66-rapoarte-cu-privire-la-cazurele -in which-the-court-of-accounts-appreciated-that-there-are-](https://www.curteadeconturi.ro/publicatii/66-rapoarte-cu-privire-la-cazurele-in-which-the-court-of-accounts-appreciated-that-there-are)

indications-of-commitment-of-some-criminal-acts-and-notified-the-competent-organs) no I have not identified any entity from the Ministry of National Defense that is the subject of such notification by this supreme public audit body.

And at the end of this third chapter I drew some conclusions:

1)The Court of Accounts found also during the control or audit activities of the annual financial statements of the public institutions in the army, in addition to numerous outstanding achievements, also certain shortcomings that led the auditor teams to formulate audit reports with reservations and to presents in a separate paragraph of this document a list of the most representative such deficiencies; as a positive fact to point out, it would be that in the last year (2021) for which there is a completed annual report of the Court of Accounts, no entity from The Ministry of National Defense was not the subject of a criminal complaint by this supreme public audit body;

2)Through its actions of this type, the Court of Accounts annually covered an important number of institutions in the Ministry of National Defense (somewhere between 5 and 10 in number), both from among the central structures of the ministry, as well as central structures of some weapon categories and headquarters, educational and scientific research units, hospitals and other operative entities;

3)The shortcomings found were quite diverse, but they usually ranged from the following aspects: a) the erroneous registration of some sums of money in the accounts; b) non-compliance with the principle of commitment accounting in the case of expenses paid and recorded at another point in time; c) granting increases for difficult working conditions in amounts higher than those provided by law; d) failure to transfer to the state budget an amount representing guarantees for participation in tenders and established good performance guarantees, the restitution of which was not requested by the suppliers within the legal limitation period; e) the identification of significant inconsistencies between the accounting records and the cadastral records in the case of real estates in the public and private domain of the state, given to the administration of some entities of the army; of course the list is much longer, but I have scored the most frequent and representative.

#### 4. Conclusions

From what was presented regarding the problems examined about the activity of the Court of Accounts on the 3 aspects researched in this article, the following more important conclusions can be drawn:

1)The Court of Accounts when carrying out audit missions of the annual financial statements of public institutions has the obligation to evaluate the activity of internal auditors in this field and depending on the degree of adequacy or inadequacy of the activity of these professionals, it can be based on their activity or no, and he will have to have his specialists deepen the external audit activity, to make up for the insufficiency shown in their specific missions to the internal auditors, which is very unpleasant for them and results in measures against such professionals;

2)The Court of Accounts also periodically audits the activity of the Central Internal Public Audit Harmonization Unit (UCAAPI) at central and territorial level, as well as that of the Central Unit for Harmonization of Financial Management and Control Systems (UCASMFC), in order to establish if they work at the parameters requested by the European Commission, because these structures are mechanisms that must promote the standards regarding internal public financial control and must support the internal control systems in achieving their role of strengthening and coordinating the public sector's effort to improve the economy , efficiency and effectiveness in the field of public finances;

3)The main activities carried out by the Court of Accounts are those of external public audit, including: a) financial audit; b) performance audit; c) the compliance audit, and through its verifications it pursues as objectives: a) the accuracy and reality of the data reflected in the financial statements drawn up by the audited entities; b) the method of establishing, highlighting and tracking the revenue collection of the general consolidated budget; c)evaluation of internal management and control systems (including internal audit) at verified entities (including authorities with tasks regarding the follow-up of financial obligations of legal or natural persons to budgets or to other public funds established by law), of their implementation method and of the causes of possible deficiencies found by the Court of Accounts in the activity of the respective entities; d) the quality of the economic-financial management by correlation with the purpose, objectives and attributions provided in the founding documents of the verified entity; e) other objectives, within the limits of legal powers, if applicable;

4) Following the audit missions carried out by the Court of Accounts in the financial - accounting area in recent years at public institutions in Romania, it identified shortcomings in the following more important aspects of this activity: a) failure to register economic operations in the accounting at the time of their execution; b) making erroneous accounting records; c) non-calculation or incorrect calculation of depreciation of tangible fixed assets; d) failure to highlight

guarantees of good execution; e) lack of analytical records of some accounting accounts, mandatory according to the regulations in force; f) deviations related to the revaluation of tangible fixed assets; g) deviations related to the inventory of the heritage; h) failure to correctly record in accounting the transactions regarding the goods that make up the public domain and those that belong to the private domain of the state; h) the erroneous registration in the accounting, in the tangible fixed assets group, of goods that do not cumulatively meet the criteria provided by the legislation to be recognized in this category; i) erroneous registration in the material expense accounts of materials of the nature of inventory objects; j) the non-existence of the supporting documents that were the basis of the recording in the accounting of some economic-financial transactions, which confirm the accuracy of the payment amounts, the receipt of material goods, the provision of services, respectively the execution of works.

5)The Romanian Court of Accounts has carried out financial audit, regularity and other types of missions at the Ministry of National Defense in the last 3 years (2019-2021), both at the headquarters of the Ministry of Defense and at the following subordinate structures: Directorate Domains and Infrastructures; Central Military Emergency University Hospital "DR. CAROL DAVILA"; "Ferdinand I" Military Technical Academy; Army Sports Club "Steaua"; "CANTACUZINO" National Medical-Military Research-Development Institute; General Staff of the Land Forces; United Logistics Command; National Institute of Aeronautical and Space Medicine "Gen. Dr. Aviator Victor Anastasiu" Bucharest; Communications and Information Command;

6)Most of the opinions expressed by the auditors of the Court of Accounts of Romania, who carried out missions in the last 3 years at the headquarters and at the entities of this ministry listed above, were opinions with reservations, in which paragraphs with various observations were included, which they were to be corrected after the period of carrying out such missions.

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## OPINIONS REGARDING EUROPEAN-FUNDED AND SCIENTIFIC RESEARCH PROJECTS IMPLEMENTED BY ENTITIES IN THE MINISTRY OF NATIONAL DEFENSE AND THEIR AUDITING BY QUALIFIED PROFESSIONALS

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### **Abstract:**

*The article is intended to bring to attention a series of current issues related to the projects with European funding and scientific research implemented or to be implemented by entities in the army and was structured on 4 issues: 1) types of projects with European funding implemented by operational and administrative entities from the Ministry of National Defense in the last 5 years; 2) types of projects with European funding and scientific research implemented by higher education and research institutions from the Ministry of National Defense and the mechanism of their auditing; 3) new requirements resulting from the writing, implementation and auditing of projects with European funding for the new programming period 2021 – 2027 for entities from the Ministry of National Defense; 4) conclusions.*

**Keywords:** *management authority; intermediate organism; audit authority; operational program; National Recovery and Resilience Plan - PNRR.*

**JEL Classification:** *M42*

## 1. Introduction

This article covers a very current and burning issue for a significant segment of the public administration in Romania, namely the one regarding the opinions about projects with European funding and scientific research implemented or to be implemented by entities from the Ministry of National Defense and the role of their auditing by authorized specialists (financial auditors).

The problem is very important for this component of the central public administration (Ministry of National Defence), because the entities that make it up are also subject to such projects and the management of the relevant ministry, in turn, is interested in finding additional financing solutions, which to partially relieve the defense budget.

In order to respond to the chosen research topic, we first investigated the projects implemented in recent years by operational and administrative structures in this ministry. Then we continued with the examination of the activity of higher education and scientific research institutions subordinated to the same ministry, which also in recent years, implemented various projects with European funding or completed various scientific research projects, similar to entities of the same profile in the civil environment and these projects were subject to financial audit.

In the final part, I brought to the fore the defining characteristics of the projects with European funding approved for the new programming period (2021-2027), which of them are also approachable by entities from the army and what demands are placed on the professionals who have to audit such projects.

The issue of this article is part of the broader research carried out by other specialists in the country and abroad regarding the implementation and auditing of projects with European funding in particular, only that we have focused on the characteristics of this effort made or that will be made by the responsible factors in the entities of the Ministry of National Defense to attract European funds more consistently for the benefit of this ministry.

## 2. Literature review

The issue of projects with European funding and their auditing is quite a focus of European and national profile bodies, starting with those at the European Union (EU) level, such as the European Commission ([https://commission.europa.eu/index\\_ro](https://commission.europa.eu/index_ro)), the European Court of Auditors (<https://www.eca.europa.eu/ro>), the European Anti-Fraud Office ([https://anti-fraud.ec.europa.eu/index\\_ro](https://anti-fraud.ec.europa.eu/index_ro)) and continuing with the national ones as are the Audit Authority attached to the Court of Accounts of Romania ([https://www.curteadeconturi.ro/contact -autoritatea-de](https://www.curteadeconturi.ro/contact-autoritatea-de)

audit), the Ministry of European Investments and Projects - MIPE (<https://mfe.gov.ro/29886-2/>), the Ministry of Finance (<https://mfinante.gov.ro/ro/web/site>) or the Anti-Fraud Department (<https://antifrauda.gov.ro/w/>).

A second series of bodies that deal this time with the audit of projects with European funding are those of a professional nature, which base the audit standards and procedures including for projects with European funding, and here we have in mind the International Auditing and Assurance Standards Board (IAASB) ([www.iaasb.org](http://www.iaasb.org)).

In Volume II of the Manual of International Regulations for Quality Control, Auditing, Review, Other Assurance and Related Services, 2020 Edition, a related services standard entitled ISRS 4400 – Engagements to perform agreed procedures regarding financial information has been updated (The former ISA 920), which applies to the auditing of projects with European funding (the manual was developed by the IAASB in 2020, translated by the Chamber of Financial Auditors from Romania - CAFR ([www.cafr.ro](http://www.cafr.ro)), in 2022 and also includes this standard ([https://www.ifac.org/\\_flysystem/azure-private/publications/files/IAASB-2020-Handbook-Volume-2.pdf](https://www.ifac.org/_flysystem/azure-private/publications/files/IAASB-2020-Handbook-Volume-2.pdf), pp.389 – 398).

In Romania, the national professional body that manages the types of audits in which ISRS 4400 is also found, which is applied in projects with European funding, is the Chamber of Financial Auditors from Romania - CAFR ([www.cafr.ro](http://www.cafr.ro)). This body has the mission of developing guidelines for the application of auditing standards (including the one that refers to auditing European projects), to organize training courses for trainee auditors and to improve the professional training for professional financial auditors, and to carry out periodic controls at profile firms and firms on how they perform all audit services, including the one on projects, with the exception of statutory financial audits.

CAFR also regularly publishes the *Financial Audit* magazine, which also publishes articles on auditing projects with European funding. One such example is *the Study on the financial audit activity for the verification of European projects in Romania* elaborated by the univ. Dr. Hațegan Camelia-Daniela (*Financial Audit magazine no. 6/2013, pp. 3-10*).

Another magazine also edited by CAFR is *Audit Practices* in which the article *Analysis of the legal basis of the research programs financed by the European Union for the period 2007-2020 from the audit perspective* was published, with Bocean Alexandru as the author (*Audit Practices magazine Year VI, No. 1(21)/2017, pp.23-38*).

We cannot even omit the elaboration of doctoral theses on projects with European funding, as is the case with the one entitled *Possibilities for improving the auditing and financial communication specific to non-reimbursable European funds invested in the agricultural sector*, with PhD student Vîrteiu Daniel Petru as author and PhD supervisor Prof. university dr. Todea Nicolae at the Doctoral School of the "1 Decembrie 1918" University in Alba Iulia, in 2018 ([http://doctorate.uab.ro/upload/63\\_1567\\_rezumat\\_romana.pdf](http://doctorate.uab.ro/upload/63_1567_rezumat_romana.pdf)).

Of course, there are other researches and studies on the issue of auditing projects with European funding by other Romanian and foreign specialists and by some firms and consulting firms and financial audit training (*examples: Academia de finanțe - <https://academiadefinantare.ro/importance-of-financial-audit-in-the-framework-of-projects-financed-from-european-funds/>; Ev-cont Audit - <https://www.audit-financiar.com/servicii-audit-fonduri-europene.html>*).

Through this article, we only want to bring attention to lesser-known aspects of the development of projects with European funding and their auditing within the entities of the Ministry of National Defense.

### **3.The theoretical foundation of the theme**

The problem of projects with European funding and their auditing in the army entities was analyzed by us, starting from the revelation of the scientific and normative foundations in the field of projects with European funding, but also from the need to make the decision-makers in the field of national defense aware of the importance of attracting as much more funds for this strategic sector and from sources other than the national budget.

The research tools we used were investigating the types of projects that military entities implemented, multidimensional and complex analysis of these, and drawing important conclusions from this analysis.

At the same time, we examined the major coordinates of the new projects with European funding for the period 2021-2027 and based on them we made correlations with the characteristics of the entities in the army in order to identify which projects can be approached in the process of writing and implementation by different structures in the army .

### **4.Opinions regarding european funded and scientific research projects implemented by entities in The Ministry of National Defense and their auditing by qualified professionals**

#### **4.1. Types of projects with European funding implemented by operational and administrative entities from the Ministry of National Defense in the last 5 years**

Before we refer to the issues of this first part of the article, I want to present *from a conceptual point of view the meaning of some terms with which we will operate along the way.*

Thus I wanted to bring to the fore *the following terms: management authority; intermediate organism; audit authority; operational program.*

*The management authority is the national or regional structure responsible for the management and implementation of one or more operational programs/national internal affairs programs and for the efficient, effective and transparent use of non-reimbursable external funds allocated to Romania (point b) from art. 2 of GD no. . 936/2020, MO of R no. 1048/2020).*

*The intermediary body is a body under public or private law that acts at national, regional and/or local level, under the responsibility of a management authority or that performs functions or tasks on behalf of such an authority and to which the management authority delegates functions, components and/or specific objectives of the operational program/national internal affairs program, based on the delegation agreement (point c) from art. 2 of GD no. 936/2020, MO of R no. 1048/2020).*

*Audit authority is the public authority/structure, functionally independent from the audited entities, responsible for carrying out system audits, operations audits and account audits, in order to provide the European Commission with independent assurance on the effective functioning of the management systems and control and regarding the legality and regularity of the expenses included in the accounts submitted to the European Commission (point f) from art. 2 of GD no. 936/2020, MO of R no. 1048/2020).*

*Operational program consists of a detailed multiannual plan developed by a member state and adopted by the European Commission by decision, which establishes the way in which non-reimbursable external funds are allocated for a specific region or for one or more areas of development throughout the country , corresponding to the policy objectives and investment priorities within the cohesion policy and the common fisheries policy (point g) from art. 2 of GD no. 936/2020, MO of R no. 1048/2020).*

*Following the clarification of these key terms, we would like to highlight a number of aspects related to the implementation of projects with European funding by entities from the Ministry of National Defense, highlighted synthetically in*

reports of the last 5 years (2018, 2019, 2020, 2021 and 2022) presented by the defense ministers, on the occasion of the balance sheets that were carried out in this ministry these years.

We will start with the situation of attracting European funds in the Ministry of National Defense in 2018. In the field of financing from European structural and investment funds, as well as from other non-reimbursable funds, in 2018, the following projects were carried out in the Ministry of National Defense:

a) *Restoration, rehabilitation, preservation and arrangement of an exhibition space within the Monument Cross commemorating the Romanian heroes of the First World War (Monument of Heroes "Crucea Caraiman" Monument of Heroes - Cross on Vârful Caraiman).*

The project is financed through the *Regional Operational Program 2014-2020, Priority Axis 5, Investment Priority 5.1 - Conservation, protection, promotion and development of natural and cultural heritage*, and its value is over 19,000,000 lei.

In 2018, 5 reimbursement requests, in the amount of 6,300,000 lei, were submitted to the South Muntenia Regional Development Agency.

b) *Thermal rehabilitation of pavilion 31 - education from barracks 329 Boboc through the Regional Operational Program 2014-2020 - Priority axis 3 - Supporting the transition to a low-carbon economy, investment priority 3.1 - Supporting energy efficiency, intelligent energy management and the use of energy from renewable sources in public infrastructures, including public buildings and the housing sector, operation B - public buildings.*

The project, worth over 18,000,000 lei, was in the pre-contracting stage at that time.

b1) *Thermal rehabilitation of pavilions D, D1, D2 and D5 from barracks 1369 Constanța;*

b2) *Thermal rehabilitation of pavilion C4 in barracks 3416 Constanța;*

b3) *The thermal rehabilitation of pavilions G, G1, G3 and G4 in barracks 540 Mangalia, through the Regional Operational Program 2014-2020 - Priority Axis 3 - Supporting the transition to a low-carbon economy, investment priority 3.1 - Supporting energy efficiency, of intelligent energy management and the use of energy from renewable sources in public infrastructures, including public buildings and in the housing sector, operation B - public buildings - SUERD.*

At the end of 2018, the projects were in the stage of verifying administrative compliance and eligibility. The value of the projects was over 77,000,000 lei.

c) *Restoration of the National Military Circle monument through the Regional Operational Program 2014-2020, Priority Axis 5, Investment Priority 5.1-*

*Conservation, protection, promotion and development of natural and cultural heritage - unfinished projects.* On December 28, 2018, the financing contract was signed (*Rap. MAP.N on 2018, published in the MO of R, no. 566/27.05.2019, p.15*).

We continue to present the situation of attracting European funds in the Ministry of National Defense for 2019. In the field of financing from European, structural and investment funds, as well as from other non-reimbursable funds, in 2019, the following projects were carried out in the Ministry of National Defense:

a) *Restoration, rehabilitation, preservation and arrangement of an exhibition space within the Memorial Cross of the Romanian Heroes of the First World War (Heroes' Monument "Crucea Caraiman Heroes' Monument - Crucea de pe Vârful Caraiman).*

The project is financed through *the Regional Operational Program 2014-2020, Priority Axis 5, Investment Priority 5.1 Conservation, protection, promotion and development of natural cultural heritage, and its value is over 19 million lei.*

Within the framework of this project, in 2019, 10 reimbursement requests in the amount of over 7.7 million lei were submitted to *the South Muntenia Regional Development Agency.*

b) *Thermal rehabilitation of pavilion 31 - education from barracks 329 Boboc through the Regional Operational Program 2014-2020 - Priority Axis 3, Investment Priority 3.1, Operation B - public buildings.*

The duration of the project implementation is 44 months, respectively March 1, 2017 - October 31, 2020, and the value of the project is 26.8 million lei, of which 8.9 million lei is financing from European funds, and 17.9 million lei represents the amount of co-financing provided by the Ministry of National Defense.

In the reference year, the technical project was developed which was validated by the Brăila South-East Regional Development Agency and 3 reimbursement requests were submitted, in the amount of 83.9 thousand lei, of which 63.9 thousand were settled lei.

c) *Intervention works on the facade of the National Military Circle - Barracks 954 Bucharest, through the Regional Operational Program 2014-2020, Priority Axis 5, Investment Priority 5.1/7 - Conservation, protection, promotion and development of natural and cultural heritage - unfinished projects.*

The financing contract was signed on December 28, 2018, the project implementation period is 92 months, i.e. May 28, 2014-December 31, 2021, and the value of the project is 9.4 million lei, of which 6.1 million lei represents financing from European funds, and 3.3 million lei represents the amount of co-financing provided by the Ministry of National Defense. In 2019, 4 reimbursement



requests were submitted, in the amount of 6.8 thousand. lei, of which 4.1 thousand were settled. lei.

d) *The thermal rehabilitation of pavilions D, D1, D2 and D5 of barracks 1369 Constanța.* The value of the project is 9.7 million lei, of which 8.3 million lei represents financing from European funds, and 1.4 million lei represents the amount of co-financing provided by the Ministry of National Defense.

e) *Thermal rehabilitation of pavilion C4 in barracks 3416 Constanța.*

The value of the project is 9.1 million lei, of which 7.8 million lei represents financing from European funds, and 1.3 million lei represents the amount of co-financing provided by the Ministry of National Defense.

f) *The thermal rehabilitation of pavilions G, G1, G3 and G4 in barracks 540 Mangalia.*

The value of the project is 7.6 million lei, of which 6.4 million lei represents financing from European funds, and 1.2 million lei represents the amount of co-financing provided by the Ministry of National Defense (*Rap.MAp.N on 2019, published in the MO of R, no. 415/29.06.2020, p.13*).

*We continue to present the situation of attracting European funds in the Ministry of National Defense for 2020.* In the field of financing from European, structural and investment funds, as well as from other non-reimbursable funds, in 2020 the following projects were carried out in the Ministry of National Defense:

a) *Continuation of the implementation of the project Restoration, rehabilitation, preservation and arrangement of an exhibition space within the Memorial Cross of the Romanian Heroes of the First World War - Monument of Heroes Caraiman Cross/Monument of Heroes - Cross on Caraiman Peak.*

b) *Thermal rehabilitation of pavilion 31 - education from barracks 329 Boboc", through the Regional Operational Program 2014-2020 - Priority axis 3, investment priority 3.1, operation B - Public buildings.*

c) *Intervention works on the facade of the National Military Circle barracks 954 Bucharest, through the Regional Operational Program 2014-2020, Priority Axis 5, Investment Priority 5.1/7 - Conservation, protection, promotion and development of natural and cultural heritage - unfinished projects.* The financing contract was signed on December 28, 2018, with the project to be completed on December 31, 2021.

d) *The thermal rehabilitation of pavilions D, D1, D2 and D5 of barracks 1369 Constanța.* The value of the project is 9.7 million lei, of which 8.3 million lei represents funding from European funds, and 1.4 million lei represents the amount of co-financing provided by the Ministry of National Defense.

e) *Thermal rehabilitation of pavilion C4 in barracks 3416 Constanța.* The value of the project is 9.1 million lei, of which 7.8 million lei represents financing from European funds, and 1.3 million lei represents the amount of co-financing provided by the Ministry of National Defense.

f) *The thermal rehabilitation of pavilions G, G1, G3 and G4 in barracks 540 Mangalia.* The value of the project was 7.3 million lei (*Rap.MAp.N on 2020, published in MO of R, no. 552/18.06.2021, p.14*).

*We present further the situation of attracting European funds in the Ministry of National Defense for the year 2021.* In the field of financing from European, structural and investment funds, as well as from other non-reimbursable funds, in the year 2021, the Ministry of National Defense continued the project *Restoration, rehabilitation, the preservation and arrangement of an exhibition space within the Memorial Cross Monument of the Romanian heroes from the First World War (Caraiman Cross Heroes' Monument Heroes' Monument - Caraiman Peak Cross)*. The service contract for the digitization of the monument was signed on 13.04.2021, and on this date the monument and the exhibition can be accessed virtually.

On 08.06.2021, the monograph titled *Cross of Romanian Heroes from Mount Caraiman, history, restoration, rehabilitation, conservation*, was launched at the National Military Circle.

According to the contractual commitments, the reception activity at the end of the project works was completed in November 2021 (*Rap.MAp.N on 2021, published in the MO of R, no. 965/28.07.2022, p.20*).

*The last report we will refer to is the one for 2022.* In the field of financing from European, structural and investment funds, as well as from other non-reimbursable funds, in the period 2017-2022, in the Ministry of National Defense, the project *Restoration, rehabilitation, preservation and arrangement of an exhibition space within the Memorial Cross Monument of the Romanian heroes of the First World War (Caraiman Cross Heroes Monument)*, its value being 19,159,031.29 lei.

*The General Secretariat of the Ministry, together with the Domains and Infrastructures Directorate, initiated and carried out the following projects financed from the Regional Operational Program, as follows:*

- *intervention works on the facade of the National Military Circle - barracks 954 Bucharest, project initiated in 2018, worth 31,605,181.00 lei;*

- *thermal rehabilitation of pavilion 31 - education in barracks 329 - Boboc, project initiated in 2018, worth 24,131,441.27 lei (completed in 2022);*

- *the thermal rehabilitation of pavilions D, D1, D2 and D5 of barracks 1369 Constanta*, project initiated in 2019, worth 9,783,292.03 lei;

- *the thermal rehabilitation of pavilion C4 in barracks 3416 Constanta*, project initiated in 2019, worth 10,675,914.46 lei.

Within the *Large Infrastructure Operational Program 2014-2020*, on March 29, 2022, the project entitled *Increasing patient safety in the ATI wards of the Central Military Emergency University Hospital "Dr. Carol Davila"*. The project went through the evaluation stages and got the maximum score, so on 05.09.2022 the financing contract was signed. The total valuation of the project is 9,336,760.30 lei.

As part of the *Competitiveness Operational Program 2014-2020*, on 20.06.2022, the Ministry of National Defense, in partnership with SUUMC and the Special Telecommunications Service (STS), initiated the necessary steps in order to develop the funding request for the project entitled *Efficiency and improving the quality of the services offered by the military medical network by creating at national level an integrated system of communications, archiving and processing of multimedia medical investigations (MILMACS), within the Defense Telemedicine Informatics System (SITA)*. The project went through the evaluation stages and obtained 82 points, being selected for funding. The total valuation of the project is 148,000,602.50 lei.

The unit for coordinating and monitoring projects with external funding from the Ministry of National Defense developed and submitted for approval *the System Procedure regarding the guidance, coordination and monitoring of the structures of the Ministry of National Defense in order to access non-reimbursable external funding, Code P.S.- 01150-60.00.-002*.

The purpose of *the procedure* is to establish a set of rules for the methodological guidance of the MApN structures for the purpose of accessing, implementing and managing projects financed from European structural and investment funds, as well as from other non-reimbursable funds, which ensure compliance with the requirements set out in the instructions, regulations, guidelines, contracts/decisions/funding orders or in other documents related to non-reimbursable funding and their monitoring.

For a unitary approach to the MApN structures in order to effectively attract European structural and investment funds, *the Order of the Minister of National Defense no. M. 17/2021 regarding the establishment of the Committee of the Ministry of National Defense for the organization and coordination of the process of attracting non-reimbursable European funds and the approval of its organization and operation regulation ("the Committee")*, directly subordinated to

the Minister of National Defense (*the order is not published in MO of R for national security and safety reasons*).

According to this order, *the Committee*, through its general coordinator, supervises the activity of the MAPN structures in the working groups established for the elaboration of *the Operational Programs and the National Recovery and Resilience Plan*, for the identification and access of external financing from other non-reimbursable sources.

16 projects were initiated and submitted within *the National Recovery and Resilience Plan*, on specific components, of interest to MAPN.

In the field of *intervention Health - Component 12 of the National Recovery and Resilience Plan (PNRR)* the following projects were submitted and accepted:

- *Equipment and materials intended to reduce the risk of nosocomial infections*
- the total value of the projects submitted for financing is 56,202,856.84 lei;

- *Reducing the risk of infections associated with medical care by providing specialized equipment and materials at the "Regina Maria" Military Emergency Hospital - Braşov;*

- *Preventing the risk of nosocomial infections by purchasing and putting into use an air purification system - sterilization of the air and evacuation of medical and non-medical gases, of a medical gas and oxygen installation, simultaneously with the necessary repair and rehabilitation works in the operating room and the A.T.I. section of the Military Emergency Hospital "Dr. Ion Jianu" - Pitesti;*

- *Reducing the risk of infections associated with medical assistance by providing specialized equipment and materials at the Military Emergency Clinical Hospital "Dr. Constantin Papilian" - Cluj-Napoca;*

- *Endowment of the Central Military Emergency University Hospital "Dr. Carol Davila" with equipment and materials intended to reduce the risk of infections associated with medical assistance;*

- *Prevention and control of healthcare-associated infections - a pillar for the safety of patients and staff in the Military Emergency Clinical Hospital "Dr. Iacob Czihaç" - cowards;*

Within *the call for projects PNRR/2022/C12/MS/11.3*, two projects were submitted:

- *Development of the pre-hospital medical infrastructure in the Integrated Outpatient Clinic of the Emergency Military Clinical Hospital "Dr. Constantin Papilian" - Cluj-Napoca;*

- *Development of the infrastructure of the Integrated Outpatient Clinic of the Military Emergency Hospital "Dr. Alexandru Augustin" - Sibiu.*

Following the actions of the Committee of the Ministry of National Defense for the organization and coordination of the process of attracting non-reimbursable European funds, they were included, for financing, in Government Decision no. 1.237/2022 regarding the approval of the National Health Infrastructure Investment Program, related to target 377, component 12 - Health from the annex to the Council's Implementation Decision of November 3, 2021 approving the evaluation of Romania's Recovery and Resilience Plan (*published in MO of R no. 996/13.10.2022*), as well as the methodology for approving investments financed under *the National Recovery and Resilience Plan of Romania, 4 public medical units, as follows:*

*-Construction of a new pavilion - polytrauma surgical block in barracks 1044 Sibiu;*

*-Realization of a new pavilion for operational medicine - polytrauma D + P + 4E, access road and networks in barracks 646 Braşov;*

*-Pavilion of operational medicine - polytrauma in barracks 1053 Craiova;*

*-Investment works and interventions in barracks 705 Pitesti.*

At the same time, the Committee Secretariat ensured the signing of the documents with the secure cryptographic device of the Minister of National Defense and their uploading to the specific platform of the PNRR. Within the *Renovation Wave Intervention Area, PNRR Component 5* - the total value of the projects submitted for financing is 43,251,245.11 euros.

Also 5 projects that are part of *the Moderate or in-depth energy renovation of public buildings* within the call for projects PNRR/2022/C5/2/B.2.1.B were submitted at the initiative of the Committee, with the support of the Domains and Infrastructures Directorate and refer to to:

*-intervention and modernization works at pavilion C in barracks 1091 Bucharest - premises no. 1. work code: 2019- C/I-1091;*

*-rehabilitation of pavilion K - Military unit dormitory and utilities in barracks 1211 Campulung Moldovenesc, work code: 2021-C/I-1211;*

*-intervention and modernization works at pavilion G in barracks 1099 Bucharest, work code: 2021-C/I-1099;*

*-intervention to the administrative pavilion and the external hydrant network in barracks 2579 Schitu, work code: 2020- C/I-2579;*

*- intervention works at pavilion A in barracks 2730 Târgovişte, work code: 2021-C/I-2730.*

Regarding *the Operational Programs* related to the 2021-2027 budget programming period, the Ministry of National Defense (MApN) submitted to the

Ministry of Investments and European Projects (MIPE) the proposals for their architecture, which was approved by the European Commission, to be submitted in consultation the Guidelines for each Operational Program (*Rap.MAp.N on 2022, published in MO of R, no. 220/24.05.2023, pp.19-22*).

*From what is presented in this first chapter, several conclusions can be drawn:*

1) *The projects implemented by the entities of the Ministry of National Defense until 2022 were part of the following programs or plans: Regional Operational Program 2014-2020; Large Infrastructure Operational Program 2014-2020; Competitiveness Operational Program 2014-2020; the National Recovery and Resilience Plan;*

2) *In the effort to obtain financing and the successful implementation of such projects, a very good cooperation was achieved between the beneficiaries of the financing and the decision-making structures within the Ministry of National Defense, and in the case of other projects, partners from other defense and law enforcement structures were identified public for winning such projects;*

3) *In order to better coordinate the activities of writing and implementing projects, a specific structure was established (the Committee of the Ministry of National Defense for the organization and coordination of the process of attracting non-reimbursable European funds) and a document was developed to facilitate this process of coordinating the writing and project implementation (System procedure regarding the guidance, coordination and monitoring of the structures of the Ministry of National Defense in order to access non-reimbursable external financing);*

4) *Despite all the preventive and operational measures taken by the beneficiaries and auditors, the full settlement of the amounts provided for in the project budgets was not achieved, which is why in some projects ineligible amounts were identified by the management or intermediary authorities.*

#### **4.2.Types of projects with European funding and scientific research implemented by higher education and research institutions in the Ministry of National Defense and their auditing mechanism**

*In this second part of the article, we present the educational and scientific research institutions in the army and which projects they have implemented with European or national funding.*

1) *The National University of Defense "Carol I" from Bucharest implemented the following projects: in the first programming period 2007 - 2013 - two*

*POSDRU projects: "Practical students-active and integrated students" and "Quality in higher education", in both having the role of partner in the project (the "Spiru Haret" University was the leader of the partnership).*

During the 2014-2020 programming period, this university also accessed European funds within the POCU through two other projects: 1) Project "START - Integrated innovative system for the transition of students to the labor market"; 2) The "PYTHIA - Predictive methodology for Technology Intelligence Analysis" project. The University also won and implemented important scientific research projects with funding from UEFISCDI and other research project coordinating authorities ([www.unap.ro](http://www.unap.ro));

2) The "Ferdinand I" Military Technical Academy from Bucharest has developed 3 projects with European funding at different stages: 1) The "Security of Explosives pan-European Specialists Network - EXERTER" project from the HORIZONT 2020 Program; 2) The project "Optimization, streamlining of the procedural framework and digitization of human resources management processes within the STS", SIPOCA project code, SMIS code 129502; 3) "Electronic service for the long-term storage and guarantee of electronic signatures - LTPS" project, Partnership agreement to financing contract no. A 5736/2020. This academy also won and implemented important scientific research projects with funding from UEFISCDI and other research project coordinating authorities (<https://mta.ro>);

3) The Academy of Land Forces "Nicolae Bălcescu" from Sibiu implemented the project "Let's protect our future better! Advanced Cybersecurity", co-financed from the European Social Fund through the Human Capital Operational Program (POCU) 2014 - 2020, with S.C. as the beneficiary. Euro-Testing Software Solutions SRL and as partners the Romanian-American University and the "Mircea cel Bătrân" Naval Academy. This academy has also managed to implement many scientific research projects with funding from UEFISCDI (<https://www.armyacademy>);

4) The "Henri Coandă" Air Force Academy from Braşov implemented the "Implementation of Digitalization in Defense Higher Education (DDHE)" project within the framework of the European ERASMUS+ program under the auspices of the European Commission, as project coordinator, and as partners are the University National Military "Vasil Levski" of Bulgaria, Air Force Academy of Greece and University of War Science in Poland. This academy also has several scientific research projects funded by UEFISCDI (<https://www.afahc.ro>);

5) The "Mircea cel Bătrân" Naval Academy from Constanţa implemented the project "Innovative internships for the acquisition of skills in economic sectors with competitive potential", co-financed by the European Social Fund through the

*Human Capital Operational Program (POCU) 2014 - 2020 Axis priority 6: Education and skills, as a partner in the project, and the beneficiary of the project is "Noul Val Association". And this academy has recorded notable achievements in the line of implementing scientific research projects with funding from UEFISCDI (<https://www.anmb.ro>);*

*6)The Medical-Military Institute, which is part of the University of Medicine, and "Carol Davila" Pharmacy did not separately manage to access European funds, but together and under the auspices of the university in which they are integrated, especially following the COVID-19 Pandemic in the last 2 years in the area of health. This institute was less successful in implementing scientific research projects with funding from the Ministry of Research, Innovation and Digitization, than to the extent that the university of which it is a part also involved this educational structure in such projects (<https://umfcd.ro>);*

*7)The Research Agency for Military Techniques and Technologies initiated some research projects on the occasion of the outbreak of the COVID-19 pandemic, which consisted in the discovery of disinfectants such as HIPOVID-1, HIPOVID-01, HIPOVID-005, DECOVID-EX1, DECOVID- 01. Instead this agency accessed and completed important research projects with funding from UEFISCDI (<https://www.acttm>);*

*8)The "Cantacuzino" National Institute of Medical-Military Research-Development was able to successfully get involved in the project "Antimicrobial nano-functionality of silk fiber matrices enriched with peptides to prevent bone infections and to enhance implant osseointegration in orthopedics and dentistry" (acronym ANNAFIB) with funding within the EuroNanoMed III Joint Translational Call research consortium, in Romania, by the following agencies: EuroNanoMed 3 and UEFISCDI.*

The project was carried out within a consortium made up of: IRCCS Istituto Ortopedico Galeazzi (Milan, Italy) – project coordinator; National Institute for Medical-Military Research and Development "Cantacuzino" - partner in the project; Silk Biomaterials S.r.l. (SME, Lomazzo (CO), Italy) – project partner; National Center for Scientific Research "Demokritos" (Athens, Greece) - partner in the project; Tel Aviv University (Tel Aviv, Israel) - project partner. *This representative institute of the army also managed to win and implement scientific research projects with funding from the Ministry of Research, Innovation and Digitalization (<https://cantacuzino.mapn.ro>).*

It can be noted with satisfaction that these entities listed above have managed to attract, in addition to European funds, through the projects and funds from the



Ministry of Education and Research (currently the Ministry of Research, Innovation and Digitization) in scientific research projects, in which the financier has been either the Executive Unit for the Financing of Education, Research Development and Innovation (UEFISCDI), or even the Ministry of National Defense.

Both European-funded projects and scientific research projects were audited by CAFR accredited financial auditors, and their contracting was done through the direct purchase procurement procedure, the values of these audits being below the threshold that would have required procurement through the SEAP platform and other more complex procurement procedures.

With very few exceptions, the amounts certified by the financial auditors in these projects were also validated by the funding authorities who settled, on reimbursement or payment requests, the amounts spent in these projects.

*Some conclusions can also be drawn regarding this subchapter:*

*1) It is necessary to reorganize the existing structure at the level of the Ministry of National Defense for the writing and implementation of projects in order to respond better to the new requirements contained in the programs initiated for the new programming period 2021-2027, but also for scientific research projects that can access universities and research institutes in the military;*

*2) Higher education institutions and military scientific research institutes to identify other financiers and project partners, in order to succeed in initiating and putting into practice new valuable scientific achievements for the benefit of the Ministry of National Defense;*

*3) Those responsible for the financial part of projects with European or national funding (such as those for scientific research) to keep in permanent contact with the financial auditors and their counterparts from the funding bodies, so that the projects are fully implemented, and the eligible expenses are fully returned, with no amounts not recognized as eligible when the reimbursement or payment requests for these projects are submitted (as unfortunately has happened before).*

#### **4.3. New requirements resulting from the writing, implementation and auditing of projects with European funding for the new programming period 2021 – 2027 for entities from the Ministry of National Defense**

Before referring to the programs that Romania will implement in the new programming period 2021-2027, we want to briefly point out the most representative normative acts that direct the entire process of implementing such projects in this new period.

*These normative acts are the following:*

1) Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Mechanism (*published in the OJ of the EU no. L57/18.02.2021*);

2) Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investments and amending Regulation (EU) 2019/2088 (*published in the OJ of the EU no. L198/22.06 .2020*);

3) Law no. 208/2022 for the amendment and completion of Law no. 98/2016 regarding public procurement, Law no. 99/2016 regarding sectoral acquisitions, Law no. 100/2016 regarding works concessions and service concessions, as well as Law no. 101/2016 regarding remedies and appeals in the matter of awarding public procurement contracts, sectoral contracts and works concession and service concession contracts, as well as for the organization and functioning of the National Council for the Resolution of Appeals (*published in the Official Gazette of R no. 697/12.07.2022*);

4) HG no. 829 of June 27, 2022 for the approval of the Methodological Norms for the application of GEO no. 133/2021 regarding the financial management of the European funds for the programming period 2021-2027 allocated to Romania from the European Regional Development Fund, the Cohesion Fund, the European Social Fund Plus, the Fund for a just transition (*published in MO of R no. 643 of 29.06 .2022*);

5) HG no. 936/2020 for the approval of the general framework necessary for the involvement of Romanian authorities and institutions in the programming and negotiation process of external non-reimbursable funds related to the 2021-2027 programming period and the institutional framework for coordination, management and control of these funds (*published in the Official Gazette of R no. 1048 of 09.11.2020*);

6) HG no. 348 of April 30, 2020 for the amendment and completion of HG no. 519/2014 regarding the establishment of rates related to percentage reductions/financial corrections applicable for the deviations provided for in the annex to GEO no. 66/2011 regarding the prevention, detection and sanctioning of irregularities arising in the obtaining and use of European funds and/or national public funds related to them (*published in the MO of R no. 363/06.05.2020*);

7) GEO no. 133/2021 regarding the financial management of the European funds for the programming period 2021-2027 allocated to Romania from the European Regional Development Fund, the Cohesion Fund, the European Social Fund Plus, the Fund for a just transition (*published in MO of R no. 1207 of 20.12 .2021*);

8) GEO no. 124/2021 regarding the establishment of the institutional and financial framework for the management of European funds allocated to Romania through the Recovery and Resilience Mechanism, as well as for the modification and completion of GEO no. 155/2020 regarding some measures for the elaboration of the National Recovery and Resilience Plan necessary for Romania to access repayable and non-repayable external funds within the Recovery and Resilience Mechanism (*published in MO of R no. 1178 of 14.12.2021*);

9) GEO no. 122/2020 regarding some measures to ensure the efficiency of the decision-making process of non-reimbursable external funds intended for regional development in Romania (*published in MO of R no. 686 of 31.07.2020*);

10) GEO no. 88/2020 regarding the establishment of measures, as well as the granting of financial support for the preparation of the portfolio of projects in strategic areas considered priority for the programming period 2021-2027, intended for financing through the Technical Assistance Operational Program 2014-2020 (POAT 2014-2020) and the Program Large Infrastructure Operational 2014-2020 - POIM (*published in the MO of R no. 458/29.05.2020*).

*Romania will benefit in the new programming period (2021-2027) from nine Operational Programs, to which is added the National Recovery and Resilience Plan, with the following estimated allocations, as they may undergo changes as a result of the negotiation process with the European Commission (COM), respectively:*

1. *Smart Growth, Digitization and Financial Instruments Program (PCIDIF): 2.143 billion euros (<https://mfe.gov.ro/pcidif-21-27/>, accessed on 05.09.2023);*

2. *Sustainable Development Program (PDD): 4.615 billion euros (<https://mfe.gov.ro/pdd-21-27/>, accessed on 05.09.2023);*

3. *Transport Program (PT): 8.3 billion euros (<https://mfe.gov.ro/pt>, accessed on 05.09.2023);*

4. *The Education and Employment Program (PEO) 2021-2027: 7.722 billion euros (<https://mfe.gov.ro/peo-21-27/>, accessed on 05.09.2023);*

5. *Social Inclusion and Dignity Program (PIDS) 2021-2027: 2.594 billion euros (<https://mfe.gov.ro/pids-21-27/>, accessed on 05.09.2023);*

6. *The Health Program (PS) 2021-2027: 4.73 billion euros (<https://mfe.gov.ro/minister/periodes-de-programare/periodada-2021-2027/autoritatea-de-managemnt-pentru-the-health-program/>, accessed on 05.09.2023);*

7. *Regional Programs (POR) - each development region in Romania has configured its own PR (<https://mfe.gov.ro/programe-regionale-21-27/>, accessed on 05.09.2023);*

8. *Technical Assistance Program (PAT) 2021-2027: 597 million euros*" (<https://mfe.gov.ro/pat>, accessed on 05.09.2023);

9. *The Just Transition Program (PTJ) 2021-2027: 1.76 billion euros* (<https://mfe.gov.ro/ptj>, accessed on 05.09.2023);

*The National Recovery and Resilience Plan - PNRR* (<https://mfe.gov.ro/wp-content/uploads/2021/06/0c2887df42dd06420c54c1b4304c5edf.pdf>, accessed on 05.09.2023).

PCIDIF is a European financing program created to support the development of economies. It focuses on four priority axes, each with specific objectives: 1) *improving the competitiveness of SMEs*; 2) *increasing the degree of digitization of society and the economy*; 3) *improving the business environment and entrepreneurial climate*; 4) *supporting sustainable regional development*.

PCIDIF targets measures at national level in Research, Development and Innovation and Digitization, including in the cultural sector, based on the analysis of development needs, funding priorities from the Partnership Agreement (PA), as well as relevant strategic documents at EU level and at national level (e.g. National Research, Innovation and Smart Specialization Strategy (SNCISI), Analysis of Factors Impeding the Dissemination of Innovation, including Digitization (AFIDI), Policy Support Facility (FPS), eGov Public Policy, Public Services Catalog (CSP), Barriers Digitization of the public and private environment in Romania (BDMPP RO)). (<https://mfe.gov.ro/wp-content/uploads/2023/01/9cf5726fa7062a9b0ca4fc8443ff0bf9.pdf>, p.7).

The PDD aims at an integrated and coherent approach to sustainable development, focusing on four priority areas: 1) *increasing economic competitiveness*; 2) *increasing the quality of life in the urban and rural environment*; 3) *environmental protection and adaptation to climate change*; 4) *increasing administrative and institutional capacity*.

In developing the PDD, the European Semester, the relevant Country Specific Recommendations (CSR), the National Reform Program, the 2019 and 2020 Country Reports (RT), as well as national development needs, including rural areas, were taken into account. This program will address the challenges identified within the second policy objective of Regulation no. 1060/2021 (*published in the Official Journal of the European Union - JOUE no. L231/30.06.2021*), "a greener Europe".

The PDD contributes to the transformation of the EU economy into a modern, competitive and efficient economy, decoupled from the use of resources, according to the objectives of the European Green Deal (EGP) and the EU Zero Pollution

Action Plan, as an integral part of the EGP. PDD is based on Romania's National Strategy for Sustainable Development (SNDD) 2030, a document structured in accordance with the Sustainable Development Goals (SDGs) according to the 2030 Agenda of the UN for Sustainable Development and the Conclusions of the Council of the EU and contributes to the PVE objectives so that Europe becomes the first climate-neutral continent, and economic growth to be sustainable and not based on the use of resources. (<https://mfe.gov.ro/wp-content/uploads/2022/11/ccd9ae994ca747e93c52ec9c97fc4c39.pdf>, p.9).

*The general objective of PT 2021-2027 consists in making the investments that meet the development needs of Romania, identified in the Partnership Agreement 2021-2027, in accordance with the specific Country Recommendations, but also with the strategy developed by Romania for sustainably recovering the gaps of transport infrastructure development, respectively the Investment Program for the development of transport infrastructure for the period 2021-2030 (PI), which represents the updated implementation strategy of the General Master Plan for Transport of Romania (MPGT), attached to this document.*

The PT 2021-2027 strategy was developed taking into account the EU Strategy for sustainable and intelligent mobility, the European Ecological Pact (Green Deal-GD) and the national needs for the development of transport infrastructure and services, as well as road safety, as presented in P.I. At the same time, PT aims to align with the objectives of the Digital Europe Program by focusing on achieving the green transition and digital transformation in the transport sector (<https://mfe.gov.ro/wp-content/uploads/2022/12/5a5473623a985f032438b450a36c0395.pdf>, p.10).

*PEO* is an initiative of the European Union that aims to support the development of human resources through investment in education, training and employment. Through this programme, the EU aims to respond to current and future labor market challenges, including rapid changes in the economy and technology, as well as the consequences of the COVID-19 pandemic. The objectives of the program include, among others, improving the level of education and training of adults, increasing the level of employment, digitization and the acquisition of digital skills and support for the integration of people with disabilities, people from minority groups and those living in rural areas, in the labor market through investment in education, training and employment services.

Investments in people are the key to sustainable progress for society. The development of human capital aims at the workforce, which is required to be competent and sufficient to support progress and transformations, the education of

children and young people, the continuous training of adults, the activation of inactive labor resources, but also the population in general to enjoy benefits offered by new technologies and ways to consume services in digital form respectively with new lifestyles and work ([https://mfe.gov.ro/wp-content/uploads/2023/08/58c57356425\\_dd84e16a3c0a27de5\\_cf7e.pdf](https://mfe.gov.ro/wp-content/uploads/2023/08/58c57356425_dd84e16a3c0a27de5_cf7e.pdf), p.12).

*PIDS* represents an important initiative for the social development of Romania in the period 2021-2027, it is financed by the European Union and has as its main objective the reduction of social inequalities and the improvement of living conditions for vulnerable groups in Romania.

For Romania, this program was designed taking into account some very unfavorable realities in this area, in our country. Romania continues to be among the countries with high shares of the population exposed to the risk of poverty, far from the EU average.

Thus, according to EUROSTAT for 2020, Romania registers the highest rate of risk of poverty or social exclusion among EU countries, at 35.8% of the total population, up from 32.5% (2018). In this context, according to the 2020 Country Report on Romania, 1 in 3 Romanians is exposed to the risk of poverty or social exclusion, the most exposed to this phenomenon being the vulnerable groups, including the Roma minority ([https://mfe.gov.ro/wp-content/uploads/2022/12/8917b14349af013a8555f58\\_aeda30f07.pdf](https://mfe.gov.ro/wp-content/uploads/2022/12/8917b14349af013a8555f58_aeda30f07.pdf), p.17).

*PS* is a financing program through which the European Union supports the development of the Romanian health system for the period 2021-2027, it focuses on improving access to medical services, increasing the efficiency and quality of services, developing medical infrastructure and strengthening research capacity in the field of health.

The priorities of the Health Program are: *Priority 1: Increasing the quality of primary, community medical assistance services, services offered in the ambulatory regime and improving and strengthening preventive services - multi-fund priority; Priority 2: Rehabilitation, palliation and hospitalization services for chronic diseases adapted to the demographic phenomenon of population aging, the impact of disability and the morbidity profile - multi-fund priority; Priority 3: Increasing the effectiveness and resilience of the medical system in critical areas of strategic importance with cross-cutting impact on medical services and health status - multi-fund priority; Priority 4: Investments in new hospital infrastructures – monofund priority; Priority 5: Innovative approaches in medical research - monofund priority; Priority 6: Digitization of the medical system – monofund priority; Priority 7: Measures supporting the fields of oncology and*

*transplantation – multi-fund priority (<https://mfe.gov.ro/minister/periode-de-programare/perioada-2021-2027/autoritatea-de-management-pentru-programul-health/>, About the Health Program, pp.1-2).*

PR is an initiative of the European Union that aims to improve regional development through investments and structural reforms.

The programs will take place in each development region, are approved by the European Commission for each of these regional structures and have a wide range of financial and support instruments, including grants, credit instruments, support for public-private partnerships and other innovative financing mechanisms.

The program also has a number of eligibility and selection criteria that must be met in order to be considered for funding. Among the main areas of intervention of this program are the development of infrastructure, innovation and competitiveness of enterprises, development of human resources and social capital, protection of the environment and adaptation to climate change, development of tourism and culture, improvement of transport and connectivity ([https:// mfe.gov.ro/programe-regionale-21-27/](https://mfe.gov.ro/programe-regionale-21-27/), p.1).

PAT aims to support the technological development and administrative capacities of local and central public authorities in Romania and aims to support the development of administrative and technological capacities of local and central public authorities by providing technical assistance and consultancy.

The PAT is developed taking into account the architecture of the 2021-2027 fund coordination, management and control system, taking into account the need to reduce the administrative burden in terms of TA management at the level of the Ministry of European Investments and Projects (MIPE). From the perspective of the type of TA granted through PAT, the approach from 2014-2020 will be continued, namely the support of horizontal measures for the system of coordination, management and control of funds and for beneficiaries/potential beneficiaries, as well as the specific ones intended for the implementation of operational programs managed at MIPE level without AT priority. (<https://mfe.gov.ro/wp-content/uploads/2022/10/39167dfae713550b9c5ffa42555ea816.pdf>, p.5).

PTJ aims to support regions and communities that are most affected by the transition to a more sustainable and greener economy, and particularly targets regions that are dependent on polluting industries or fossil fuels and that need support to adapt to the new market and environmental requirements.

The program will support the development of new jobs and the professional training of employees in the affected sectors, so that they can adapt to the new market requirements.

The Just Transition Program (PTJ) responds to the investment needs defined at the level of territorial plans for a just transition (PTTJ), developed for the counties of Gorj, Hunedoara, Dolj, Galați, Prahova and Mureș, territories identified in annex D of the 2020 Country Report to be supported from the Fund for a Just Transition in the period 2021 – 2027 (<https://mfe.gov.ro/wp-content/uploads/2022/12/d98632d7357c5862cadee9e19b8392fb.pdf>, p.9).

Romania's PNRR is a strategic document that establishes the investment priorities and reforms necessary for recovery and sustainable growth, linked to the green and digital transition envisaged by the European Commission and as a result of the effects of the COVID-19 pandemic, to which added also the economic crisis generated by the war in Ukraine.

PNRR is based on 6 main pillars: 1) Green transition; 2) Digital transformation; 3) Smart, sustainable and inclusive growth; 4) Social and territorial cohesion; 5) Economic, social and institutional health and resilience; 6) Policies for the New Generation.

This plan foresees 507 milestones and targets related to the reforms and investments undertaken. A robust package of 107 investments and more than 50 reforms will help effectively address country-specific recommendations and strengthen the potential for economic growth. The Ministry of European Investments and Projects (MIPE) is the national coordinator of this plan (<https://proiecte.pnrr.gov.ro/#/home>).

On the basis of these programs and entities from the Ministry of National Defense can access projects from certain programs listed above, provided that in the process of writing and implementing the projects, the most appropriate ones are selected for the specific military, but also fall within the eligibility requirements of such projects.

We consider that they are an important part of the programs that are also accessible to military institutions and we have in mind: *the Intelligent Growth, Digitization and Financial Instruments Program (PCIDIF); Sustainable Development Program (SDP); Education and Employment Program (PEO); Social Inclusion and Dignity Program (PIDS); The Just Transition Program (PTJ); Regional Programs (PR); National Recovery and Resilience Plan - PNRR.*

In order for the projects that will be initiated by entities from the Ministry of National Defense to be successful in as many situations as possible, they must be



coordinated by the existing body, specially constituted at the level of this ministry, in a manner appropriate to the new requirements of the programming period 2021-2027, to be realized through the close cooperation between the companies that write projects and the beneficiaries in the army and to show maximum interest and responsibility in the implementation of the projects.

With regard to *the auditing of projects for the new programming period 2021-2027*, it must be mentioned that this action will continue for these projects as well, it is provided for in the European regulations in the field and in the guides configured by the Romanian authorities for these projects.

These audits are considered as an additional control filter for the management authorities designated for these projects as well as for the other European and national institutions (the European Court of Auditors, the Audit Authority attached to the Romanian Court of Auditors, DLAF or OLAF) that have the obligation to verify the correctness of the implementation of these projects and the way of spending the money allocated to them.

In this new programming period, the financial auditors accredited by the Chamber of Financial Auditors from Romania - CAFR must take into account in the audit missions of such projects several *new elements that have appeared for this stage*: 1) *the much greater variety of projects of the old programming periods*; 2) *the much greater demand that will be manifested by the control authorities designated by the specific legislation to verify such projects*; 3) *the eligibility conditions of the projects, which also include certain new elements, compared to the previous programming periods*; 4) *the specific and significantly amended legislation for public purchases of any kind that are made in such projects*; 5) *the predominance of many investments provided for in such projects, activities that are of particular complexity, with many people, rules and documents involved, which follow each other in a logical but well-established order*.

These particularities and others that we have not listed make this project auditing a much more complex and lasting action compared to previous periods, and the auditors must complete their professional training with such knowledge required by the specifics of the implementation the new programs.

In addition to those highlighted above, the financial auditors who have to audit projects that will be implemented by entities from the army will also need to document themselves with aspects related to the particularities of these entities that are part of a special public administration system- the national defense system.

*From what is presented in this last part of the article, we can draw some conclusions:*

1) *The programs that will be implemented in the next programming period (2021-2027) are much more numerous and more complex and are built more appropriately for our country, based on the conclusions and needs arising from the experiences of projects from previous periods, from different strategies configured for the following period and transmitted to the European Union authorities through the annual country reports and other reporting systems established by this continental authority;*

2) *The verification systems established on several levels in the project implementation process in the new programming period are much better correlated with each other compared to previous periods, and the auditing of projects implemented by beneficiaries by authorized professionals is a process that is required a greater demand and an added value that it must bring to the authorities responsible for the managerial act of all these programs;*

3) *Financially accredited CAFR auditors who have the mission to carry out such audits on these projects for the new programming period must attend courses to improve the training in order to carry out such missions at a high level of quality and deepen the content of all regulations, manuals, guidelines, lessons learned and other tools that are and will be made available by the management authorities of these programs.*

## 5. Conclusions

1) *The projects implemented by the entities of the Ministry of National Defense (regardless of whether they were operational, administrative or educational or scientific research units) until 2022 were with European funding and were part of the Regional Operational Program 2014-2020, Large Infrastructure Operational Program 2014-2020, Competitiveness Operational Program 2014-2020, Human Capital Operational Program (POCU) 2014 – 2-020, ERASMUS+ Program, HORIZONT 2020 Program, National Recovery and Resilience Plan or were nationally funded by the Ministry Research, Innovation and Digitization;*

2) *At the level of the Ministry of National Defense, for better coordination of project writing and implementation activities, a specific structure was established (the Committee of the Ministry of National Defense for the organization and coordination of the process of attracting non-reimbursable European funds) and a document was developed to facilitate this process of coordinating the writing and implementation of the projects (System procedure regarding the guidance, coordination and monitoring of the structures of the Ministry of National Defense in order to access non-reimbursable external financing);*

3) *Operational and administrative entities as well as higher education and scientific research institutions in the army must also identify other financiers and project partners, in order to succeed in initiating and implementing new projects with European funding and scientific research, which to significantly relieve the defense budget and increase the national and international competitiveness of the entities in this public structure;*

4) *Those responsible for the financial part of the projects with European or national funding (such as those for scientific research) from the entities in the army to keep in permanent contact with the financial auditors and their counterparts from the funding or control bodies, so that the projects be fully implemented, and the eligible expenses be fully returned, with no amounts not recognized as eligible when the reimbursement or payment requests for these projects are submitted (as was the case with some projects implemented until 2022).*

*We propose that the Committee of the Ministry of National Defense for the organization and coordination of the process of attracting non-reimbursable European funds should also target the coordination of scientific research projects in the army, not only those with European funding, and review its composition and attributions according to the project implementation requirements in the new programming period 2021 – 2027.*

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## OPPORTUNITY ASSESSMENT FOR ERP ENHANCEMENTS BASED ON ARTIFICIAL INTELLIGENCE, IOT AND BIG DATA

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### Abstract:

*In the context of Romania's development after joining the European Union, we note significant improvements in important areas, such as the business domain and public health. The economic progress is evident in the increasing number of local and foreign companies operating in the market. Complex business processes often rely on specialized software known as Enterprise Resource Planning (ERP) systems for efficient management. In general, ERP*

*software addresses various technical challenges faced by companies, including accounting, inventory management, production, sales, and human resources, through a comprehensive approach. Our study aims to explore the potential benefits that small to medium-sized Romanian companies could derive from utilizing an ERP solution enhanced with innovative technologies such as Artificial Intelligence (AI)-powered extensions, Internet of Things (IoT) integrations, and data-driven decision-making modules. To this end, we perform a quantitative study on 102 Romanian companies and present the key findings in the paper. We found that the three innovative modules are potentially attractive for the Romanian companies interviewed. Among the three modules, the Big Data module has the greatest probability of adoption and the highest perceived utility.*

**Keywords:** *ERP; Artificial Intelligence; IoT; Big Data; Digitalization; Romanian ERP*

**JEL Classification:** *O31,O33,O36*

## 1. Introduction

The Romanian economy has been growing steadily, especially during the last decade, since the country adhered to the European Union (EU) [1]. The country witnessed positive evolution in the main areas that define well-being, such as health or housing. The economic progress is mirrored in the number of local or foreign companies that activate on the market.

Complex business processes are best sustained by dedicated software systems, referred to as Enterprise Resource Planning software (ERP). Through a comprehensive approach, ERP software, in general, targets key issues in the activity of companies, integrating solutions for almost all the categories of technical challenges the company deals with, such as accounting, inventory, production, sales, and human resources. Each country has specific fiscal regulations, financial reporting requests or business processes, such that the development of custom made ERP systems for the Romanian is a must, for both Romanian and foreign companies' benefit.

In what concerns foreign companies that choose to do business in Romania, they have to adapt to the Romanian legislation. Using a centralized platform for managing business processes and data, such as an ERP system, can help ensure compliance with local regulations and reduce the risk of errors or penalties. The most recent example regarding the complex Romanian legislation is the new

Informative Declaration, D406, and the SAF-T (Standard Audit File for Tax). [2] SAF-T reporting is also mandatory for foreign legal entities operating through a permanent establishment/several permanent establishments in Romania. The Standard Audit File for Tax is an international standard for electronic exchange of reliable accounting data between taxpayers and tax authorities. More specifically put, the D406 informative Declaration is presented in the form of an XML file that contains accounting data and is used to report transactions to the tax authorities. SAF-T reporting allows a simplified relationship between taxpayers and ANAF, as the National Agency for Fiscal Administration will be able to perform electronic checks without the need for on-site tax inspections and thus can quickly clarify certain situations and uncertainties. By using an ERP system that supports SAF-T, foreign companies can ensure that they are able to generate the required files and submit them on time.

Romania is in full progress of implementing Industry 4.0 processes, by adopting specific digitalization solutions, with Industry 5.0 already at the horizon [3]. The purpose of our study is to investigate whether Romanian companies could benefit from using an ERP solution enhanced with innovations provided by Artificial Intelligence (AI) powered extensions, Internet of Things (IoT) integrations and Big Data informed decisions. According to [4] (pp. 1-10), on the Romanian market, “only 22% of companies use business software for sharing electronic information (compared to 34% EU average)”, yet 47% of the Romanian company managers interviewed in [5] have seen great positive influence from implementing digitalisation in their company.

An ERP solution enhanced with innovations provided by Artificial Intelligence (AI) powered extensions, Internet of Things (IoT) integrations and Big Data informed decisions, can be customized to meet the specific needs of a business and can include features such as tax management, financial reporting, inventory management, and more. By utilizing an enhanced ERP system, foreign companies have the ability to quickly adapt in ever-changing conditions dependent on market change and can streamline their operations and improve their overall efficiency.

We identified a gap in the current literature regarding the measurement of the willingness of managers of small to medium-sized companies in Romania to adopt a combination of Artificial Intelligence, Big Data and IoT based solutions in their companies' ERPs. The status quo of the adoption of AI in Romanian companies is surveyed in [6]: from the business perspective, the “top three business applications for which Romania has adopted AI are Process Automation, Process or Equipment Optimisation and Recommendation or Personalization Engines”. In our study, we



investigate the potential adoption of solutions that use AI techniques to automate document processing, as well as IoT extensions that deliver specific targeted information from production straight into the ERP, and, finally, Big Data components, for data consolidation, reporting and developing the analytics capabilities of the classical ERP.

The paper proceeds as follows. Section 2 reviews relevant literature on AI, IoT and Big Data applications in the ERP field. Section 3 presents the main features of the ERP system and the innovative component under scrutiny in our study: the Document Recognizer Module, the Iot-based Module and the Big Data Module. Section 4 presents the methodology employed in the quantitative study, followed by the presentation of the results in Section 5. Our conclusions end the paper, together with a review of the limitations of our study and directions for future work.

## 2. Related work

ERP software represents a mature preoccupation of significant actors in the software business, such as Oracle or SAS. Nevertheless, specific regulations and particularities in the business processes in each country makes out-of-the-box solutions rather hard to adopt. In this respect, custom-made implementations are developed to specifically fit the reality of a certain economy. The scientific literature in the field of ERP is vast, spanning from the economics and business sectors to the computer science literature. We review, in the following, relevant literature on the topic of our paper.

A rich literature review of ERP implementations in the private and humanitarian sectors is provided in [7], alongside an analysis with respect to the impact on the performance of companies exerted by the implementation of the ERP. A novelty brought by this study involves assessing companies preference of “custom-made” or “ready-to-use” ERP systems. Further, cloud based ERP systems are mentioned as a major part of Industry 4.0 [8] (p. 47), and have positive effects on the sustainability of business operations [9], increasing bottom line performance by a factor of three.

Processing of internal documents, be them in paper form or even in digital format, is a tedious, oftentimes repetitive process, taking up time and requiring increased attention from company staff. Companies benefit from the automation of tasks by means of integrated software systems, in general [10] (pp. 211-221). Document reading and processing by optical character recognition (OCR), followed by language detection, automatic data extraction, and automatic

classification of documents is an area where this automation proves its worth [11] (pp. 51-58).

Advantages such as a low degree of intrusiveness, or significant reduction of operational costs are achieved by using automatic processing of documents, according to [7].

A review of challenges and opportunities of Industry 4.0 adoption in production systems is presented in [12] (pp. 441-448). ERP system performance in the context of Industry 4.0 and Industry 5.0 challenges depend on leveraging intelligent innovations and automation of processes [13]. From the point of view of accounting and reporting features of ERPs, ERPs can benefit from integration with (at the moment) separate automation platforms, as reported in the market analysis from [13]. Furthermore, ERP systems can integrate their own automation modules, thus increasing the level of efficiency.

Automation of tasks requires heavy use of algorithms that pertain to the field of Artificial Intelligence. Object Character Recognition (OCR) is an avenue for such algorithms that are extensively used in the digitization process, for automatic parsing of documents and extraction of data. In [10] (pp. 211-221), a review on Robotic Process Automation tasks by means of OCR technology is provided, with an emphasis on document classification.

IoT enables communication with devices that serve a multitude of purposes in industrial scenarios [14] (p. 124). By means of IoT devices, data is captured and transferred in time, such that it is made use of rapidly, allowing for remote management and prompt decisions. Cyber-physical systems - the hallmark of Industry 4.0 - are made possible by the use of IoT technologies, which allow production businesses to “autonomously exchange information, trigger actions and monitor each other” [15] (pp. 4719-4742). IoT has had applications and tremendous effect in various areas of production, such as in agriculture [16] (pp. pp.19-24), energy management [17] (pp. 111-117), food industry [18] (pp. 6305-6324) and even food chain traceability [19] (pp. 129000-129017), [20] (pp. 905-916). Connecting IoT platforms to ERP systems that are already used in production facilities is a logical step, aimed at improving decision making.

A comprehensive review on challenges that lie ahead of the task of integrating IoT into ERP systems is presented in [21]. Companies may use the methodology in [22] (pp. 84-92) for identifying and resolving gaps in the implementation and functionalities offered by ERP systems, in order to optimally customize them to suit client needs. Often, other needs are met by systems that are complementary to ERP systems, as is the case for worker assistance systems used in industrial

production facilities [23]. Integration of such systems with ERP systems or extending ERP systems with capabilities of industrial worker assistance systems are ways to take advantage of all their functionalities.

Industry 4.0 greatly influences ERP systems in the way that they relate to data, in the “different levels of obtaining, analyzing and mining the data” [22] (pp. 84-92), with data moving into the Cloud as a trend that is here to stay [24] (pp. 178-185). Various devices and equipment used in production are connected via the internet and used as source of data and, in the scenario that they are integrated automatically in an ERP system, algorithms and techniques in the field of AI and Big Data can be used to infer new knowledge and inform decisions rapidly [25]. A specific study aimed to quantify “technical progress and efficiency change” induced by the use of “cloud based big data analytics software” [26]. The study found it did not impact the position of the firm in the industry directly, but it eased the job of managers, by providing insight into processes like “negotiating budgets, negotiating long-term contracts in better terms and in the decision process” [26]. In [27] (pp. 1-9), Big Data technology integrated in the ERP used in the banking system had a significant positive impact. Insights into the factors that influence ERP responsiveness to data are discovered in an empirical study in [28] (pp. 1-25). “Data contextualization” in order to avoid duplication and redundancy, or “poor data management” in terms of access rights or storage, are key factors that influence responsiveness of the ERP system.

### 3. Proposed solution

Working with business specific documents such as invoices, sales or acquisition papers, orders from clients, or financial documents is part of most businesses. Data entry takes time and is prone to human errors. Processing data is another issue, given that the data sources are very diverse and the volume of data tends to be very large. We propose the addition of extensions to a mature ERP software system - SeniorERP. Our system covers all possible workflows within companies, from the document processing stage, to the automation and planning of production activities, including data consolidation in intuitive reports, easy to use and interpret.

Specialized components are proposed to address special issues that are not covered by basic ERPs, making use of recent developments in AI (in particular in OCR and Machine Learning), IoT integration in software tools and, most importantly, Big Data techniques, to provide data driven analysis and decision making.

### 3.1. The SeniorERP software system

SeniorERP represents a modern ERP platform, developed with latest technologies, such as WindowsForms, .NET Framework, WCF, Angular, SQL Server, ASP.NET, WPF, CSS, HTML. SeniorERP helps companies engaged in distribution, manufacturing, services, and retail activities to streamline their business processes, by completely automating their internal workflows. The software is 100% adapted to Romanian accounting legislation, thus being able to perfectly support the financial operations of the companies that choose to implement it. It has a modular architecture, being composed of several modules, each tailored to a specific department or type of operation, such as Inventory, Accounting, Pricing, Sales, and Logistics.

Core modules of SeniorERP (Figure 1):

- Administration – that provides users with the capability to define diverse levels of information access within the application by defining specific groups, such as departmental groups. Additionally, the module enables customization of printed documents and configuration of backup actions;
- Controlling – provides the capability to plan the company’s financial parameters and offers proactive capabilities to timely alert the managers in case of negative deviations. It also includes complex analysis tools for determining influential factors;
- Accounting - is designed to automate general accounting operations, providing flexibility and utility for both small and medium-sized businesses as well as for large enterprises with complex activities (including multiple subsidiaries and locations, diverse currencies). SeniorERP is regularly updated to comply with the current Romanian legislation and is aligned with international accounting standards. The module ensures the recording of all primary documents and the generation of all financial accounting statements for financial periods, following European standards;
- Treasury - it integrates the financial flows within the company, meticulously tracking each type of transaction and allowing for logical structuring based on their nature: cash/bank, customers/suppliers, receipts/payments and so on;
- Fixed Assets - tracks the operations applied to fixed assets throughout their entire lifecycle, including the responsible persons and their location within the company. The module implements a configurable number of financial depreciation standards, automatically generates accounting entries, and allocates costs to cost centers based on pre-established criteria;

- Pricing – whether in local currency or foreign currency, expressed in fixed prices or percentage discounts/markups, specific to a point of sale or division, permanent or promotional, net or gross, price management has been designed in the ERP system to be intuitive and efficient even for tens of thousands of products connected to thousands of partners;
- Sales – it allows a company to efficiently (re)organize and track the sales process, thanks to multiple configuration options and tracking capabilities for covered sales channels, as well as functionalities for processing specific documents such as orders, invoices and so on;
- Procurement – this module can track the procurement process starting from estimating the procurement needs, going through the stages specific to a procurement order, handling fiscal documents, managing goods receipt, and concluding with connections to modules such as accounting, sales, inventory, etc.;
- Production - offers the responsible employees access to a wide range of tools that help them manage their activities: production recipes, input and consumption orders, automated document generation wizards, inventory reports based on product-specific recipes, etc. Each recipe can have one or multiple versions to avoid unnecessary overload in product catalogues, especially for small batch or custom production;
- Inventory Management – helps tracking expiration dates, warranties, assigning various properties corresponding to a wide range, real-time management of stocks located in geographically distributed warehouses, continuous knowledge of merchandise cost based on selected inventory discharge methods, lot tracking, proper management of returnable packaging or service activities associated with a product;
- Fleet Management – is an indispensable module for fleet managers to increase profitability, availability, and optimize the utilization of vehicles within a company. This module provides permanent records of each vehicle's activity, including routes, fuel consumption, accidents, and fines, thereby enhancing overall fleet management;
- Logistics – streamlines the processes of procurement, storage, redistribution of goods within a company, or delivery of goods to customers. The Logistics Module in SeniorERP plans the utilization of existing infrastructure resources to achieve optimal efficiency of logistics activities;
- Nomenclature – encompasses dedicated functionalities for locations, items, partners, personnel, treasury, fixed assets, accounting, documents,

geography, fleet management, controlling, containers, and enables the configuration of company information, workflow mapping, and association of various document types;

- Workspace – is designed to centralize the two major types of activities: current data operations and generating summary reports. Among the objectives of this component of the ERP system are the optimization and reduction of access time to relevant information for the user and its availability in one place.

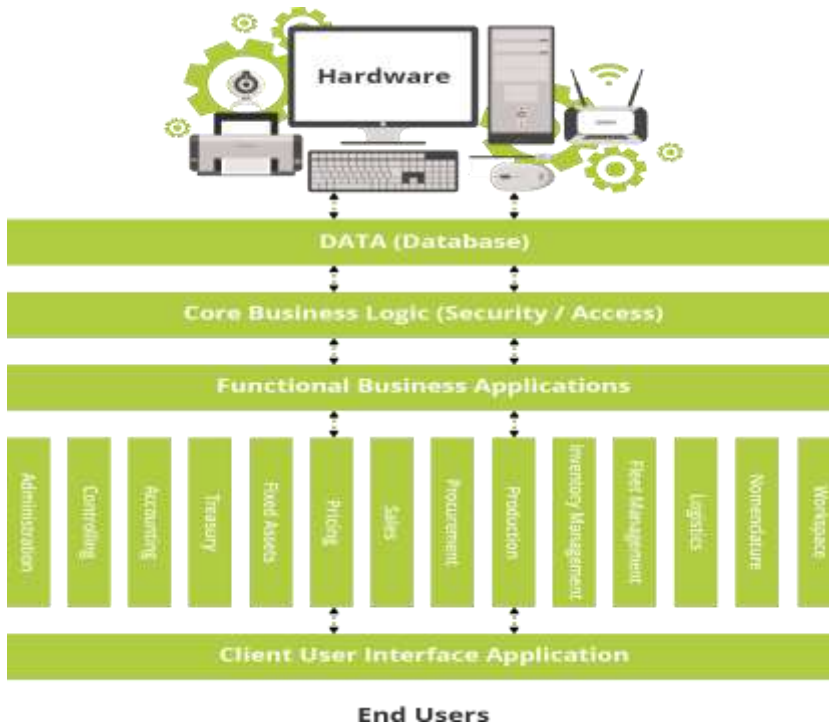
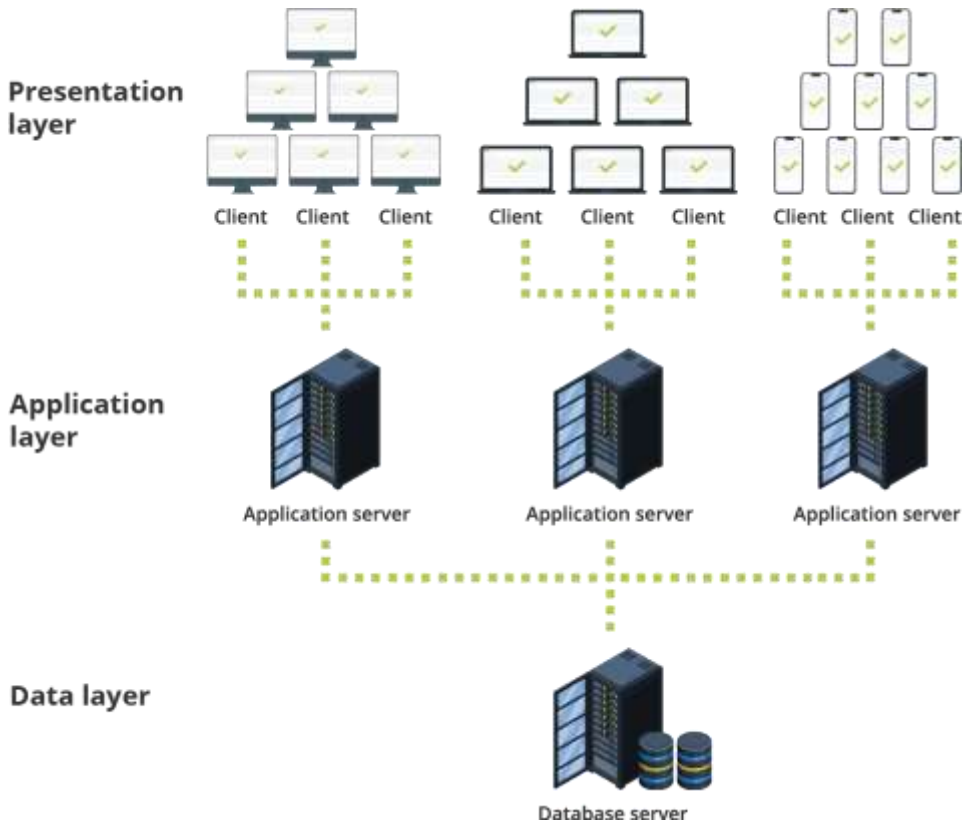


Figure 1. The Logical Architecture of the SeniorERP software.



**Figure 2. The physical client-server type architecture of the SeniorERP software.**

Some of the benefits that SeniorERP offers to SMEs:

- Cost Reduction
- Improved Sales Processes
- Increased Order Fulfillment
- Improved Cashflow
- Inventory Optimization
- Efficient Management of Production Activities
- Improved Decision-Making Process

**Table 1. An analysis on the strengths and weaknesses of the SeniorERP software system.**

	<b>Strengths</b>	<b>Weaknesses</b>
<b>Product</b>	<p>Specialization in various industries: distribution, production, retail and services.</p> <p>The first ERP (Enterprise Resource Planning) in Romania available as Software-as-a-Service (SaaS).</p> <p>The first ERP in Romania available on Azure, Microsoft's cloud solution.</p> <p>Professional services offered, including business process analysis and customized support based on client needs.</p> <p>Highly customizable capabilities.</p>	<p>The increasing number of legislative changes that require rapid integration into the system disrupts the development and delivery cycles of new versions/functionalities.</p> <p>The very low adoption rate of new technologies in the market necessitates allocating significant resources to maintain product compatibility with older technologies, hindering the utilization of cutting-edge technologies in product development, necessary for its performance improvement.</p>
<b>People</b>	<p>Low staff turnover.</p> <p>Long-tenured, experienced employees.</p> <p>Detailed integration processes specialized for different departments/responsibilities.</p> <p>Work environment and professional/personal development tools appreciated by employees.</p>	<p>Difficulties in recruitment caused by the decrease in the number of qualified individuals available in the market.</p> <p>Long training/learning period for new employees.</p>
<b>Price</b>	<p>Multiple licensing options, ranging from On-Premise to SaaS (monthly subscription), Buy-Back.</p> <p>Flexibility in pricing policy as a manufacturer.</p>	<p>High price for companies that lack the necessary ERP education</p> <p>Increasing costs with personnel that hinder the adjustment of pricing policies for all customer categories and current economic conditions.</p>
<b>Placement (Geographical Distribution)</b>	<p>Implementation available anywhere in Romania.</p> <p>Regional office network,</p>	<p>Lack of an extensive network of distributors/resellers.</p>

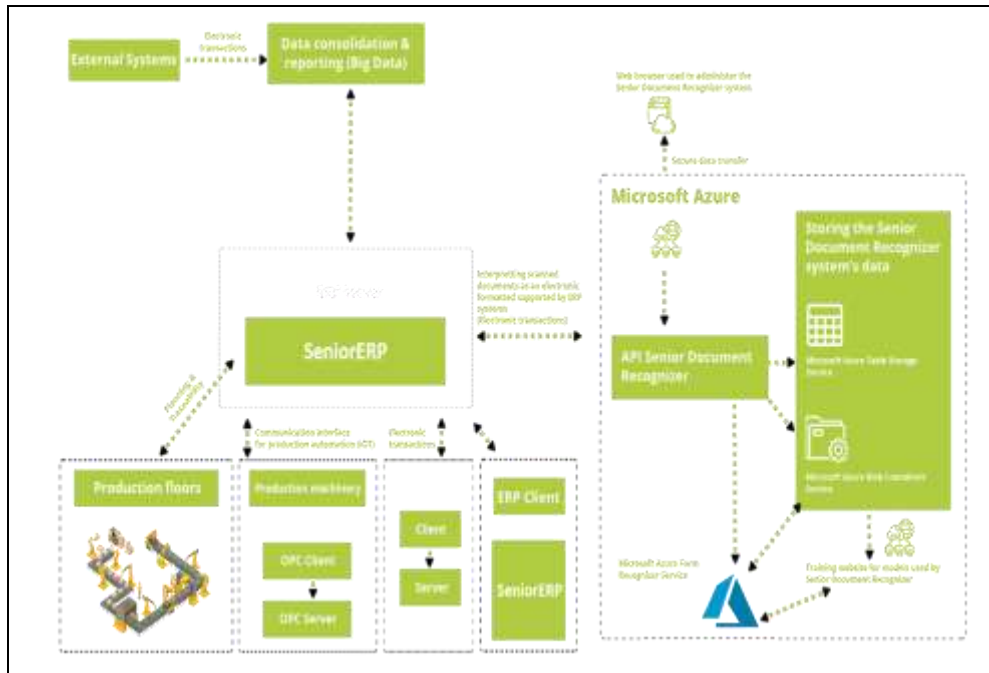


	Strengths	Weaknesses
	expanding continuously. Ongoing process of partnering with top players.	
<b>Promotion</b>	SeniorERP is positioned as a medium-high ERP system. It is placed in the first page of the most popular search engine, with 2 or more links. Trendsetter image in the market. Many positive references in the market.	Comparatively smaller promotional budgets compared to major players in the market (Oracle, Microsoft, SAP, etc.). Low market response rate to marketing campaigns due to undifferentiated offers practiced by unstructured players, causing confusion among targeted companies.
<b>Process</b>	Highly developed technologies and infrastructure for integration with other software systems. Mechanisms for automatic user feedback/customer recommendations capture through the application. Continuous physical contact with clients ensured by dedicated departments. Support and development department with well-established procedures.	Being a relatively new product on the market, sustained effort is required to develop the necessary functionalities to catch up with competitors with a longer market presence. Being an ERP system, it involves a large number of customizations and integrations to create and manage, requiring significant development, implementation, and support resources. The previous point leads to a complex and time-consuming upgrade process.

### 3.2. Innovative extensions for the SeniorERP software system

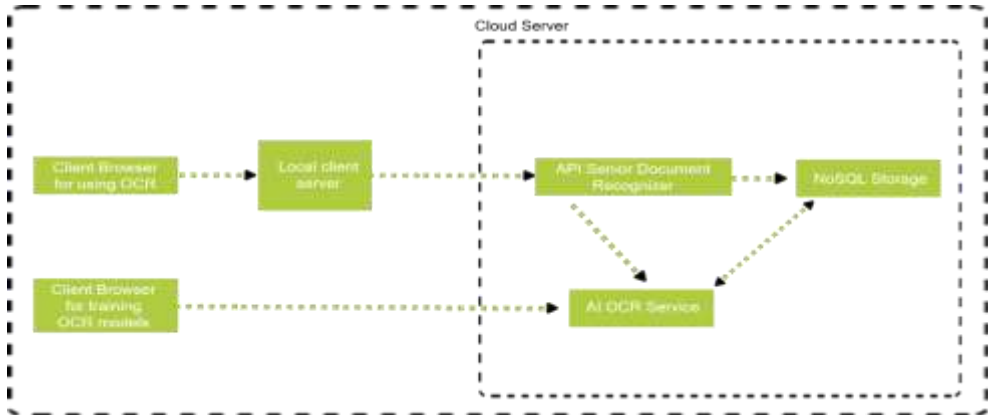
The aim of this paper is to assess the plausibility of adoption and the perceived utility of several extensions for the SeniorERP software system. Proposed are specialized components aimed at tackling specific challenges that fall outside the scope of basic ERPs (Figure 3). These components leverage advancements in AI, particularly in OCR and Machine Learning, as well as integrate IoT into software tools. Finally, a significant aspect lies in the utilization of Big Data techniques in a

specialized module, enabling the ERP with data-driven analysis and facilitating informed decision-making.



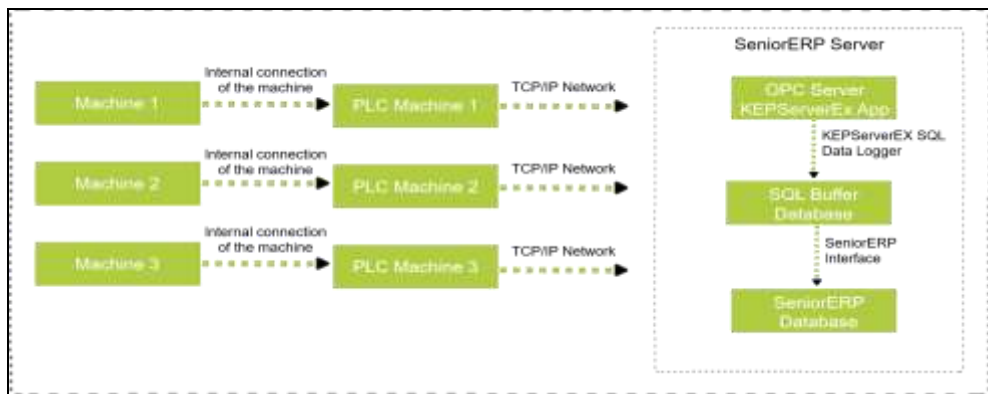
**Figure 3. Schematic description of the enhanced ERP platform. The innovative modules investigated in this paper are: AI powered Document Recognizer Module, IoT based Production Module and data-driven decision enhancing Big Data Module.**

**Document Recognizer** - is designed to read documents from PDF or image files from the client (Figure 4). The documents may be received by email or using a mobile device with the ERP mobile application. Based on the text generated from the received images, it will be possible to create associations with the characteristic elements of the documents, such as: fiscal code, name of the customer, date, document series/number, total amount, as well as information about the details of the document.



**Figure 4. Detailed schematic description of the Document Recognizer Module.**

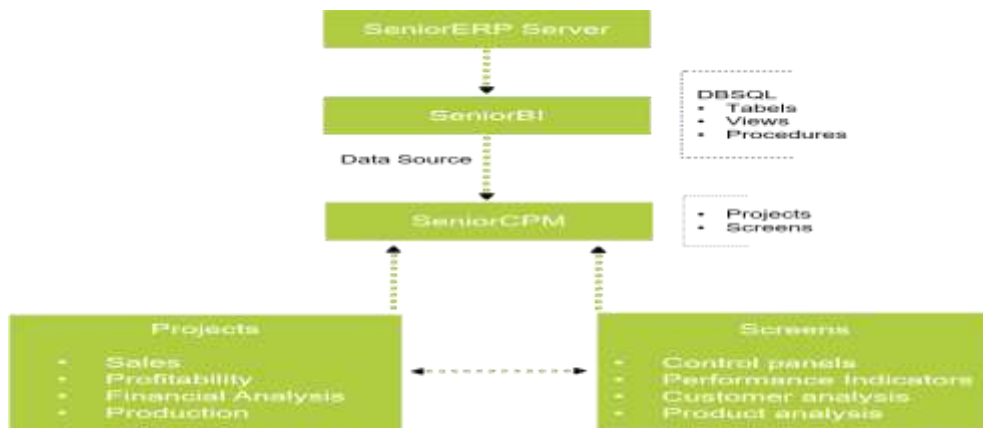
**Production Module** - includes a number of essential functionalities for the automation and planning of production activities, such as: retrieving data from machines with OPC Server [29] (pp. 1-6), calculating and generating the supply requirement (MRP), generating production documents based on MRP, optimization of stock input/output flows using mobile terminals, generation of production plans and the option to compare them with the results obtained, the generation of complex reports and dashboards for the analysis of the efficiency and productivity of the production lines (Figure 5).



**Figure 5. Detailed schematic description of the Production Module.**

The Senior ERP application will be installed on the server, and it will retrieve the information inserted in the buffer base with the help of an interface. The interface reads the new values entered in the buffer base and writes them in the corresponding tables of Senior ERP. Thus, the values taken from the machines will reach the ERP where they will be used to create new production reports and to record information about the status of production orders and machines in real time.

**Big Data Module** - facilitates data consolidation and reporting, enhancing the ERP with analytical capabilities (Figure 6). Large volumes of data originating from various business processes will thus be available to decision-makers in the company in the form of intuitive reports, easy to interpret. Based on having all the information in one place, companies will be able to make informed decisions for the good management of the business. We presented participants with some business scenarios for each module. Only participants from companies in the Production field were presented and inquired about the Production Module.



**Figure 6. Detailed schematic description of the Big Data Analysis Module.**

The Big Data Module targets various types of projects, according to the types of business areas covered by the decision-making platform. In this module, a project may consist of many screens, each screen containing objects such as spreadsheets, diagrams, text notes, images, dashboards and pre-calculated business indicators. Accessing the screens would allow the end user to view indicators, select comparative or historical periods, and manipulate data through typical

multidimensional analysis functions, such as drill-down. The available screens will include buttons or tabs that allow navigation from one screen to another, offering the user a logical flow of data visualization and filtering through different analyzes and simulation models. The data will be displayed in the form of tables and different types of relevant graphs. The module's database is designed to ensure maximum efficiency in managing very large volumes of data and to provide superior performance.

Prior to implementing such a complex solution, an opportunity assessment is performed to get a clear picture of the impact that this solution may have on the business environment. This assessment is the main focus of the current study.

#### **4. Methodology**

The goal of this study is to gather opinions of managers or other decisional roles in the business sector regarding the possible adherence and the perceived utility of using software extensions to an ERP, based on AI, IoT and Big Data, in particular the SeniorERP software system. We carried out a quantitative study, using online and telephone opinion surveys to collect data. Participants to the study were selected among business managers in Romania that already use SeniorERP software in their companies, from key economic sectors such as agriculture, pharmaceuticals, furniture industry, services, logistics and others.

##### ***4.1. Data collection protocol***

The interviewees were provided with the same presentation of the capabilities of the proposed innovative software components. The survey was administered either online (Computer Assisted Web Interview, for 51 participants) or by phone (Computer Assisted Telephonic Interview, for 51 participants).

All participants were presented with the same questions, thus ensuring the reliability of our study. There was no interaction between the participants of our study. They were all from different companies, independent of each other, hence no influence has been shared among them and their answers are not biased.

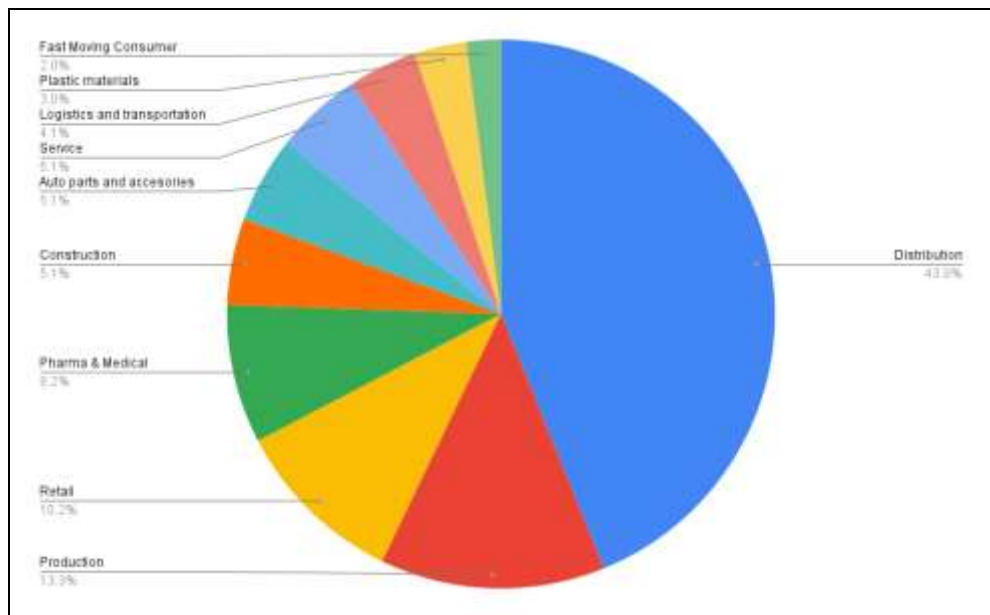
The survey consisted of two parts. In the first part, we were interested in forming a general impression on the process of digitalization in the companies that participate in the study. The questions in the second part of the survey form the backbone of our study. These questions regarded the assessment of the suitability of the implementation in the company of new components to their ERP, that make use of innovations from the field of AI, Big Data and IoT.

**4.2. Demographic information**

The sample of participants in our study was 102 representatives of companies, selected mostly as key decision makers in their companies, with respect to the contracting and management of software services. The specific roles of the participants in their companies are summarized in Table 2.

**Table 2. The positions of the participants in their companies.**

Administrator / founder	35%	Chief Operations Officer	8%
Mergers and Acquisitions		Chief Executive Officer	18%
Director	5%	Chief Financial Officer	11%
Other	23%		



**Figure 7. Classification of companies by business field.**

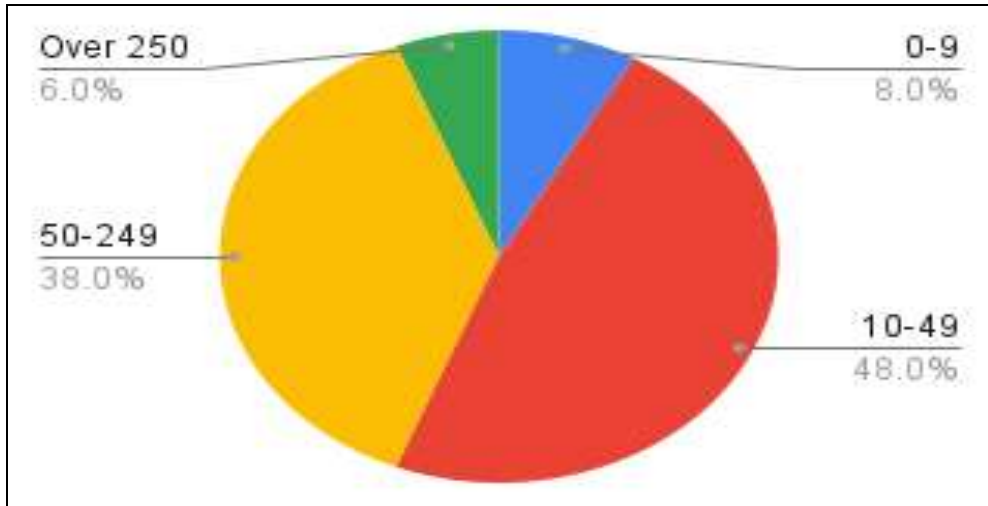


Figure 8. The number of employees in the interviewed companies.

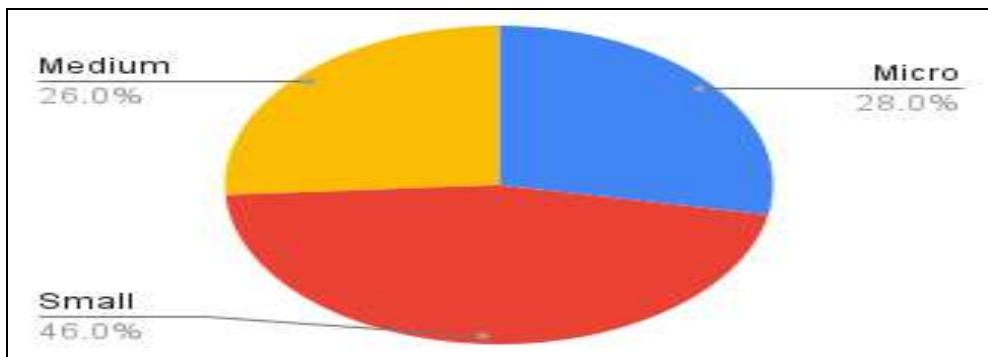


Figure 9. Companies classification according to their turnover.

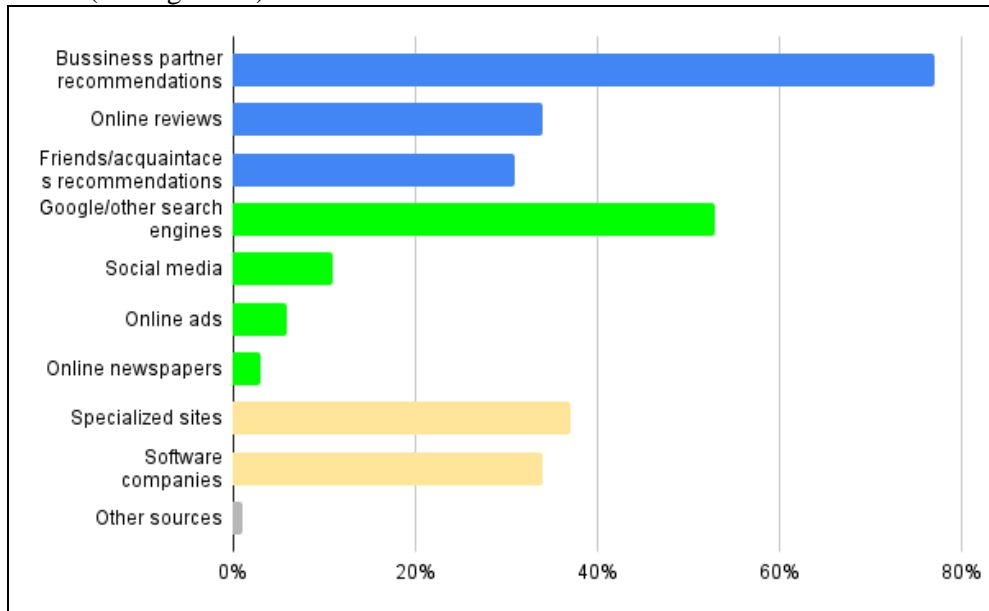
The company profiles were diverse, with most companies coming from the Distribution area (43%), followed by Production (13%) and Retail (10%) (Figure 7). We worked with companies of various sizes, in terms of number of employees (see Figure 8) or their turnover (see Figure 9).

## 5. Results

We present the results of our study, following the structure of the administered survey. Prior to the opportunity assessment for the specialized ERP modules, we extracted data on the adoption of digital instruments in companies.

### 5.1. Digitalisation aspects in the participant companies

First, we inquired participants on the avenues they use to inform themselves on digital aspects. We found that decision makers access multiple sources to learn details about software solutions suitable for their company. Most turn to recommendations, especially from business partners, or search for information online (see Figure 10). The mean number of information sources consulted is 2.9.



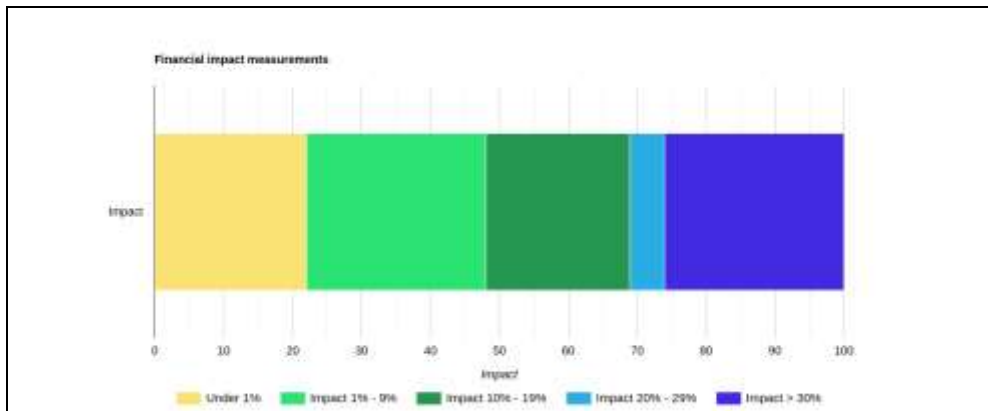
**Figure 10. Answers to the question “Where do you look for information when you are interested to know more about a software solution for your business?”. Information sources: ■ Recommendations/reviews, ■ General online sources, ■ Online specialized sources.**

We were also interested in identifying the aspects that are most important for businesses from a digitalisation point of view. We found out that companies seek



software solutions for optimizing processes and workflows (67% of the respondents), data management (51%), warehouse management (47%), customer relationship management (44%), document management (42%), making the decision-making process more efficient (40%), and only 28% of the interviewed companies seek software solutions for budget management and even less for human resources management (20%). The key information we derive from this is that intelligent solutions for data management and for the optimisation of processes within companies are most likely to be sought and successfully adopted.

Benefits Management (BM) is not incorporated in standard ERP systems design and implementation [30] (p. 5738). Our users were questioned on the evaluation of the benefits of using the ERP system from a financial point of view. More than half of the companies that have implemented digitalization solutions monitor the financial performance of these investments (see Figure 11). The impact of digitalization on turnover is usually below 20%, and for a quarter of organizations the estimated impact is over 30%. However, 4 out of 10 decision-makers either do not measure the impact of the adopted systems in the turnover of the company they represent, or do not know it.



**Figure 11. Financial impact monitoring of digital solutions adopted in companies.**

### **5.2. Opportunity assessment**

We were interested in estimating the market opportunity of the software components based on AI, IoT and Big Data technologies. To this end, we assessed the perceived utility and the adoption potential of the described software

functionalities. We asked each participant to provide a score, from 1 to 10, to the degree of usefulness of each solution. We grouped answers in categories: Low utility (scores between 1 and 4), Medium utility (scores between 5 and 6) and High utility (scores in the range 7 to 10). The same goes for the potential for adoption of the solutions proposed: Low (1-4), Medium (5-6), High (7-10).

The Document Recognizer module is generally perceived as useful (Figure 12). 6 out of 10 decision makers interviewed believe that such a document management system would be very useful for the company it represents. More than half of companies considered it very likely to adopt such a solution in the future. Especially micro-enterprises (with a turnover of less than 2 million euros), medium-sized companies (over 10 million euro) and those active in production and distribution particularly appreciate such a solution as being useful, both from the utility and the potential of adoption point of view. The mean perceived utility score is 7.2 and the mean score for the potential of adoption is 6.6 (on the scale from 1 to 10).

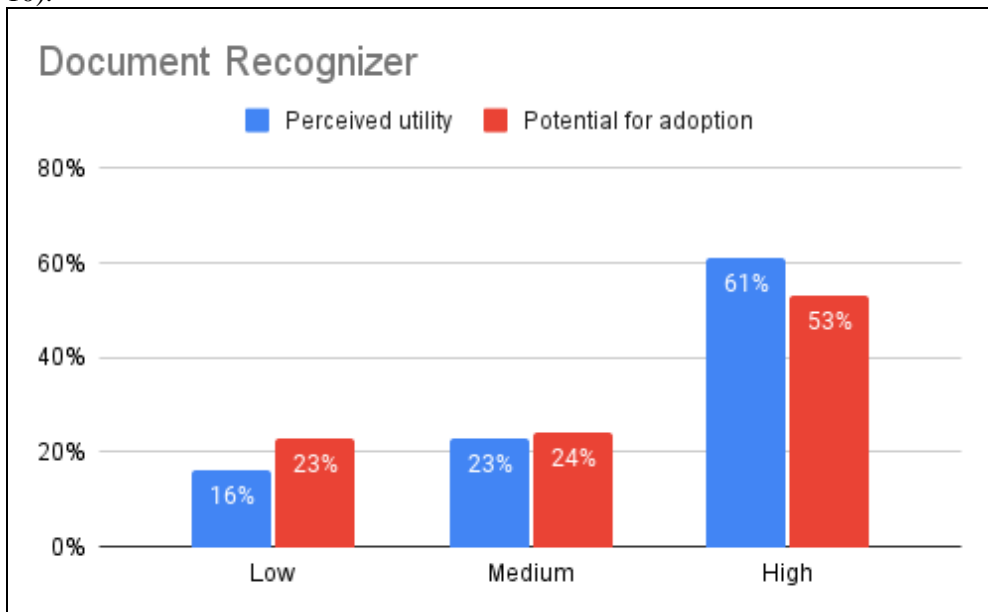
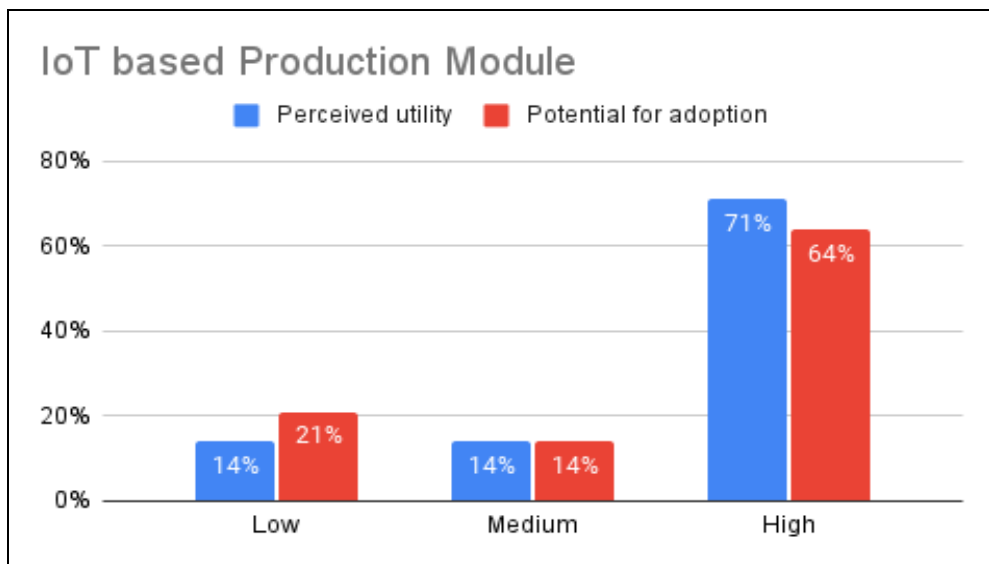


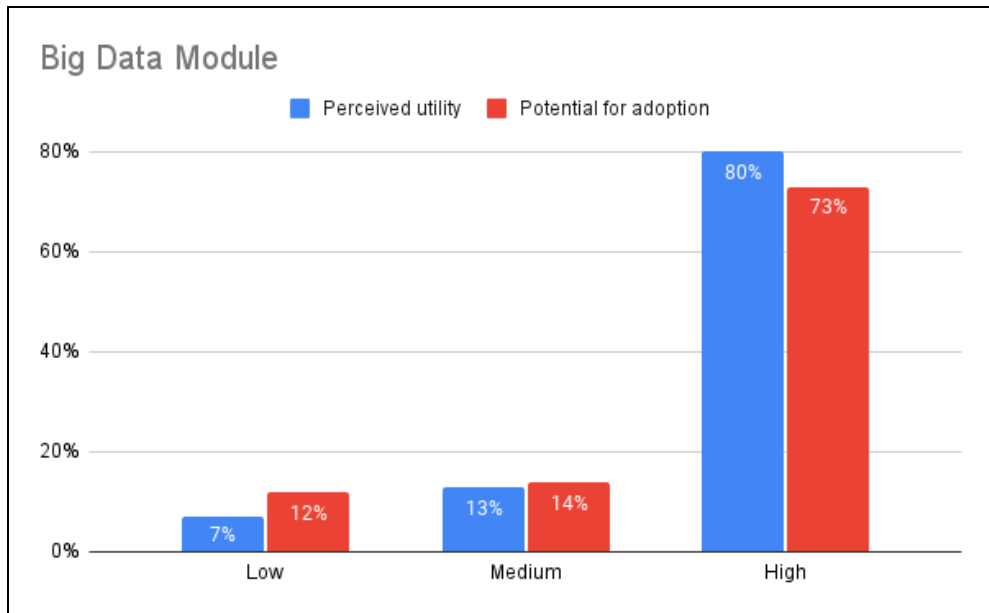
Figure 12. Perceived utility and probability of adoption for the Document Recognizer Module.

The SeniorERP Production Module is perceived as very useful by most decision-makers in companies operating in the Production sector (13 companies in our sample). The mean anticipated utility score is 8.2, while the mean score for the potential of adoption is 7.4, on a scale from 1 to 10 (see Figure 13). 6 out of 10 decision-makers consider the adoption of the IoT based Production Module very likely in the company they represent.



**Figure 13. Perceived utility and probability of adoption for the IoT based Production Module.**

The Big Data module for the ERP is considered the most useful solution among the three presented to the study participants, with an 8.2 (out of 10) and a possibility for adoption rated to 7.5 out of 10 (see Figure 14 for a more detailed view on the scores). Small companies (with a turnover between 2 and 10 million euros) and those active in the field of distribution and production consider the expansion of the analysis capacity of the ERP solution as a very useful functionality for their business. Also, the adoption potential is higher in the case of small companies and businesses in the production area.



**Figure 14.** Perceived utility and probability of adoption for the Big Data Module.

## 5. Conclusions

ERP software use may be considered to be still in its infancy in the Romanian economy. The country has experienced enhanced improvements in the economic sector, especially since joining the EU. Specialized software companies, both global and local, strive to offer complex ERP solutions, custom tailored to the particularities of the Romanian economy. In this study, we present the results of an opportunity assessment conducted by means of a quantitative study, regarding the integration of AI, IoT and Big Data features in a complex ERP solution. The data was collected by means of a data collection tool using online and telephone opinion surveys carried out on the basis of customers already using an ERP system provided by the Senior Software company.

Compiling the data, we conclude that the Big Data module has both the highest potential of being adopted, and the highest perceived utility. Three quarters of the interviewed decision-makers declare that they are very likely to adopt such a functionality in their company. The AI powered Document Recognizer and the IoT based Production Module are both promising in the eyes of the customers, with a noteworthy perceived utility. Given that these two modules respond to more

specific needs, their adoption potential can be influenced by the specifics of the activity.

We acknowledge that our study is limited by the focus on the companies that already have experience in using a certain ERP. We aim to expand our study by targeting new customers from which to extract future needs that we can further address in our ERP software to enable businesses to take full advantage of the latest in technology research.

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