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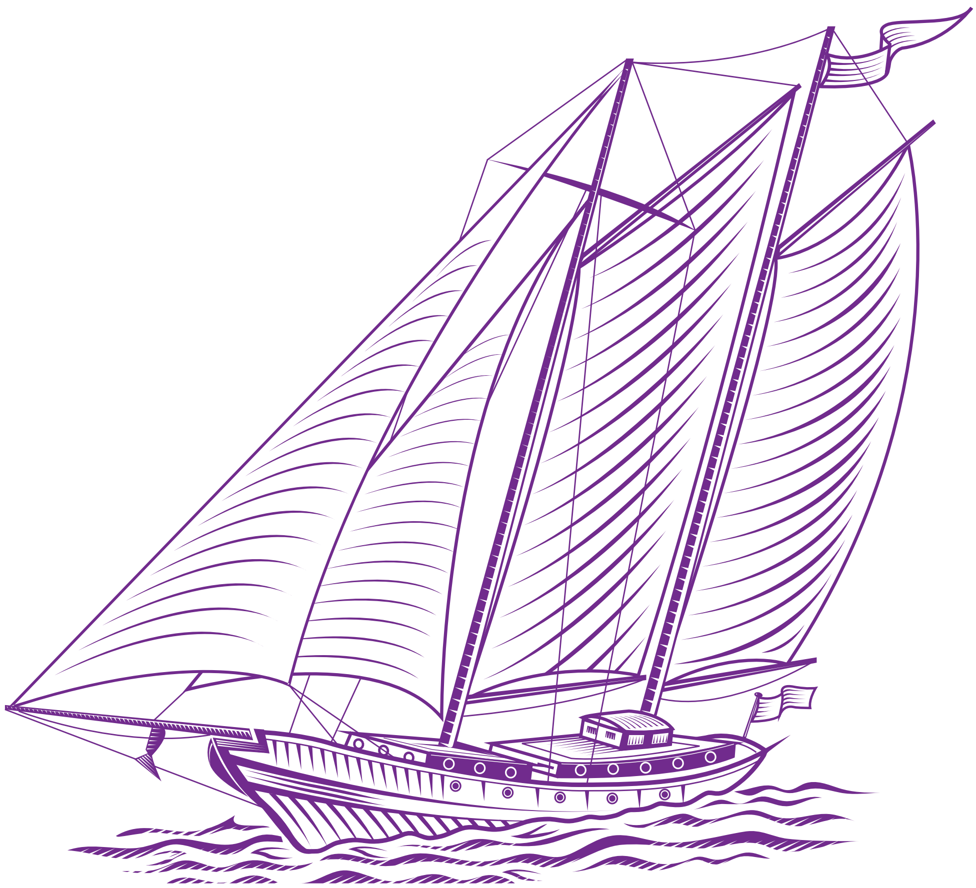

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# LINKING PERFORMANCE WITH SUSTAINABILITY IN PUBLIC UNIVERSITIES. THEORETICAL FRAMEWORK AND BIBLIOMETRIC ANALYSIS

**Mona Alexandra ORZA (VRAJA)[1], Cristina Silvia NISTOR[2]**

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**ABSTRACT.** Linking university performance to sustainability is possible through the university's third mission: environmental responsibility. To better understand the concepts, practices and challenges of sustainability, the role of literature is crucial; therefore, this paper reviews the existing literature on academic performance and sustainability using a bibliometric analysis for articles published in the Web of Science database between 2009 and 2023. This research intends to contribute to recent stream of research on sustainability implementation by identifying the relationship between performance and sustainability in university missions. To date, there have been only a few bibliometric analyses the relationship between performance and sustainability in the public higher education sector. However, no one has discussed the perspective of the link between performance and sustainability through the university mission, and this research intends to fill this gap. The results show that in the last three years, the interest in performance and sustainability has led to an increase of up to 66% in articles on sustainability and performance in the public university system. Spain appears to be the main contributor to the research articles related to the area of interest. Research in the public university system on concepts related to sustainability and performance is still at an early stage, yet has seen considerable progress over the past few years.

**Keywords:** performance, sustainability, public university, bibliometric analysis, theoretical framework

**JEL classification:** A11; O20; Q01.

[1] Ph.D. Student, Faculty of Economics and Business Administration, Babes-Bolyai University, Cluj-Napoca, Romania. E-mail: mona.orza@econ.ubbcluj.ro

[2] Assoc. Prof. Dr., Faculty of Economics and Business Administration, Babes-Bolyai University, Cluj-Napoca, Romania. E-mail: cristina.nistor@econ.ubbcluj.ro

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## Introduction

Public universities are an example of excellence and performance in the public sector. Sustainability education in public universities is crucial to educate future leaders with responsibility (Atstaja *et al.,* 2017; Nyerere *et al.,* 2021; Mohammadi *et al.,* 2023). Performance of a university depends on three key factors: effectiveness, efficiency and economy (Gebczynska & Brajer-Marczak, 2020; Geng & Zhao, 2020). Efficiency refers to the ability to achieve more with less within existing resources (Mikusová, 2017). Effectiveness refers to meeting stakeholder expectations while increasing the overall performance of the institution (Vo & Laking, 2020). Economy refers to achieving a decrease in the cost of resources and, at the same time, the consistency of quality standards applied. Strategic perspective, resource organization and the power to adapt to the ever-changing requirements of the university educational system are some of the important elements for universities to achieve these goals (Atstaja *et al.,* 2017). To ensure accountability and quality assessment universities are required to prioritize performance above all other assets by gaining good positions in international rankings. Fulfilling the expectations of all stakeholders (this includes the following categories: teachers, students, alumni, university leaders, local community and stakeholder groups) is vital to achieve this goal (Alarcón-del-Amo *et al.,* 2016). It is absolutely imperative that sustainability becomes a broad global priority, which can be seen in the 17 Sustainable Development Goals (SDGs) – visible as a cradle-to-grave approach to sustainability (Menon & Suresh, 2020).

The link between performance and sustainability can be observed by looking at the missions of higher education institutions (Secundo *et al.,* 2016). Teaching and research can be linked to the performance concept, while environmental responsibility can be linked to the sustainability concept. Despite this, few studies have been able to link performance and sustainability at the university level. According to Hamdan *et al.* (2023), sustainability is identified at the university level in a few academic areas. The study of Hamdan *et al.* (2023) assessed the sustainability performance of two universities in the United Arab Emirates using the DMAIC methodology. A link between academic performance and sustainability was found by Atici *et al.* (2020) using the Green Metric ranking system. The connection between university mission statements and sustainability practices of higher education institutions in 347 universities is examined by Lopez & Martin, (2018) through the investigation of link between the content of university mission statements and sustainability practices. Research results show that the higher the number of terms used in university mission statements, the more statistically likely these universities are to achieve higher sustainability ratings.

Aung & Hallinger (2023) suggest that universities can change their practices by refocusing on their mission and by strengthening the involvement of their stakeholders. Mohammadi *et al.* (2023) conducted a study that identified six critical factors leading to effective integration of sustainability in universities. These factors include culture of academia, leadership, education, attitude, and commitment. Blasco *et al.* (2019) found a positive correlation between the environmental and economic dimensions of sustainability in universities. This suggests a lack of an integrated approach to sustainability. Higher education institutions that integrate sustainability at all levels perform better. Therefore, the study aims to fill this gap and focuses on the detection of the advancement process of the research field through the application of bibliometric analysis tools. Consequently, the present study is an extension of previous bibliometric analyses of sustainability in specific fields such as management (Henehen *et al.,* 2019; Frizon & Eugénio, 2022; Blasco-Blasco *et al.,* 2021). The article aims to explore the trends and models of knowledge development in the public higher education area with respect to performance and sustainability, and their connection through university missions.

The originality of study lies in the fact that it attempts to establish a connection between performance and sustainability within the missions of universities (education, research and environmental responsibility). The results show that performance can be linked to sustainability through the third mission of the university (environmental responsibility), together with the implementation of sustainability practices at the university level, which bring great benefits to all stakeholders and favour the performance of the university.

The study has four parts: introduction, state-of-the-art related to performance and sustainability, results, conclusions. The empirical study examines the relationship between university performance and sustainability.

## State-of-the-art

The focus of the search has been on articles that are research on performance and sustainability in the university system. Sustainability requires an integrated approach (Michelsen, 2015). It depends on the interaction of economic development, social well-being and environmental protection, with the active involvement of society and the academic community (Asrar-Ul-Haq *et al.,* 2017). Higher education institutions are essential for enhancing students' comprehension of sustainability and converting that knowledge into impactful actions (Atstaja *et al.,* 2017; Bak & Cheba, 2017). In the past hundred years, there has been a notable rise in the study and implementation of sustainability (Lozano *et al.,* 2017; Filho *et al.,* 2016).

## Performance in public universities related to sustainability

University performance is understood as the ability to achieve predefined objectives and to respond to the diverse expectations of stakeholders, represented by groups of individuals and interests that have the power to influence or can be influenced by the achievement of the institution's objectives. The capacity to address the requirements and anticipations of the community, represented by various interest groups, is made possible by indicators (groups from the university's internal or external environment) (Bonaccorsi *et al.,* 2017).

The performance of public universities, especially with regard to sustainability, has multiple valences and can be assessed from different perspectives, including human resource management, governance, strategic implementation of sustainability initiatives and operational performance. Governance structures within public universities play an important role in achievement of sustainable performance (Asrar-Ul-Haq *et al.,* 2017). A direct link between sustainability strategies and the performance of public universities, and empirical evidence suggests that a strong sustainability strategy has a positive impact on the performance of public universities. Empirical studies have shown that a strong commitment to sustainability can lead to better institutional outcomes for the following reasons, as these strategies can provide a significant explanation for variations in academic performance. Public universities' sustainability performance is determined by the level at which higher education institutions incorporate sustainability methods into their personnel management, governance, policy implementation and operational processes (Lopez & Martin, 2018; Filho *et al.,* 2016). These elements are interrelated and each contributes to the institution's capacity to perform effectively according to sustainability standards and goals (Mohammadi *et al.,* 2023). Researchers have adopted a variety of approaches to the performance of universities, including traditional and competency-based assessment, innovative methods and performance indicators that are responsive to current educational requirements (Portela *et al.,* 2012). Performance measurement and reporting is considered a legitimate response to the demand for accountability in the public sector. However, there is no single set of criteria on this issue, and the approach and measurement of performance varies according to the institutional, cultural and historical context of each country (Nistor *et al.,* 2017) explained in the literature through the lens that university sustainability performance must be tailored to specific environments in order to improve implementation of sustainable practices (Schlickmann & Bortoluzzi, 2023). The public sector's sustainability is crucial because resources are finite and demands continue to grow, representing a major difference that must not be overlooked.

## Sustainability in a public university related to performance

Contemporary societies are concerned about sustainability due to an unbalanced relationship between human needs and natural resources (Borland *et al.,* 2019). Strategies and governance rules have been put in place to achieve sustainability - sustainable educational institutions are implementing concrete actions and aligning themselves with the third mission of universities (Lopez & Martin, 2018). Framing sustainability at the university level involves embodying a vision and practices modified for sustainability. Research domains in the field of sustainability in higher education include the university curriculum, teaching and research programmes, university partnerships (Scott, 2015; Paletta & Bonoli, 2019).

The sustainability practices of public universities affect their overall performance in several ways. They play a important role in the dissemination of sustainability knowledge and its integration into their core activities. The way universities approach sustainability education, training and student engagement has a significant impact on their contribution to the Sustainable Development Goals (SDGs) and their performance in this area. Increasingly, university performance is measured against sustainability initiatives and outcomes. Student assessment and participation in sustainability can improve the sustainability performance of academic institutions. Sustainability practices encompass not only environmental management, but also social responsibility and economic viability, which can affect the performance of public universities in different ways (Filho *et al.,* 2016). Sustainability is integrated into many aspects of university life, from operational efficiency and resource management to developing curricula and engaging with the community. A commitment to sustainability can therefore be seen both as a strategic priority and a performance indicator for public universities. Sustainability can enhance the accountability, transparency and credibility of universities, leading to better stakeholder engagement. Research shows a correlation between universities with higher sustainability indices and higher performance indices. Economic and social dimensions have a positive impact on performance. Focusing on sustainability within a university's strategic framework can yield beneficial effects on educational, research and third mission performance (Blasco *et al.,* 2019).

Sustainability reporting and performance are essential for public universities (Zorio-Grima *et al.,* 2018). It is a demonstration of social responsibility and a source of example for other institutions interested in the topic. The evaluation of sustainability performance ensures that universities have access to improve their practices and impacts at the university level, but also at the level of society. University education, reporting and performance are interdependent and promote a sustainable university and societal environment (Paletta & Bonoli, 2019). Universities are increasingly being recognised for the efforts they are making to integrate sustainability into the way they are organised and managed (León-Fernández & Domínguez-Vilches, 2015) Research has examined sustainability in universities. It has highlighted the commitment and responsibility of stakeholders to promote sustainable economic growth, ensure social equity and protect the environment (Lopez & Martin, 2018).

Universities are key players in the promotion of sustainable development. Financial and non-financial sustainability reporting also quantifies and communicates the sustainability performance of higher education institutions, including their contribution to environmental support measures, policy initiatives, technological innovation and social programmes. There is a clear direct link between these and the promotion of sound sustainability practices that improve both the reputation and financial results and performance of universities (Paletta & Bonoli, 2019).

It is worth noting that An internet-based questionnaire (Global Survey on Sustainable Publishing and Research in Higher Education) shared with participants of the European School of Sustainability Science and Research, which received 103 responses from researchers in more than 40 countries, highlighted three academic trends: in terms of research, it was observed that those conducting autonomous research outnumber those conducting research at university and departmental level; regarding the inherent worth of sustainability studies in tertiary education, it is not as developed as anticipated; the subjects discussed are extensive and span multiple disciplines. (Leal Filho *et al.,* 2023).

The mission of a university is a statement of its core values and purpose. It guides how it works and what it aims to achieve. When it comes to sustainability, the integration of this concept into the university mission can have a significant effect on the institution's performance in terms of environmental, social and economic sustainability. Research suggests that there is a link between the mission statements of the universities and their sustainability practices. (Hart *et al.,* 2016; Demele *et al.,* 2021) Institutions with explicit mission statements are more likely to implement comprehensive sustainability initiatives in areas such as education, research and community engagement (Lopez & Martin, 2018). For example, when a university's mission emphasises interdisciplinary sustainability education, this often leads to the development of academic programmes and research initiatives with a focus on sustainable development. Furthermore, a mission that includes sustainability can enhance the university's social responsibility and economic performance (Hart *et al.,* 2016).

To summarise, a university's engagement to sustainability in its mission statement can be a strong driver of its overall sustainability performance (Centobelli *et al.,* 2019; Demele *et al.,* 2021) By embedding this commitment at the heart of their strategic planning and institutional ethos, universities can ensure that their efforts to achieve sustainability are deeply rooted and aligned with their educational and societal goals and objectives.

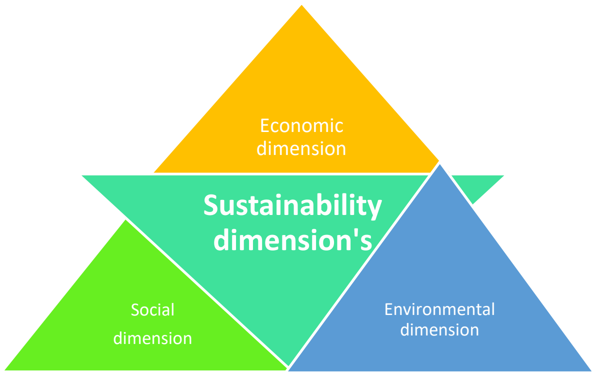


**Figure 1.** Sustainability Dimensions (source: Mohammadi *et al.,* 2023)

Sustainability is commonly described through three core dimensions, often known as the three pillars: environmental, economic, and social sustainability (Mohammadi *et al.,* 2023). Environmental sustainability refers to the obligation of preserving natural resources and safeguarding worldwide ecosystems to promote health and wellness, both now and in the future. Economic sustainability includes methods that promote enduring economic advancement while avoiding detrimental effects on the community's social, environmental, and cultural dimensions. Social sustainability is about identifying and managing the impact of activities on people and society (Murga-Menoyo, 2014). These dimensions are interconnected and balance each other to achieve sustainable development (Figure 1).

Sustainability in universities is also evident through the cross-cutting skills that students completing higher education programs acquire. institutions can acquire, regardless of the study programme they have chosen (Membrillo-Hernández *et al.,* 2021). This process (e.g. in the USA, 2361 academic programs on sustainability were recorded in 872 higher education institutions (Vincent, 2017)) was declassified in the study (Brundiers & Wiek, 2017) on teaching and learning of professional competencies in sustainability. Studies that have followed the transition of universities towards sustainability include Aleixo *et al.* (2018), which states that universities in Portugal have had a greater involvement of sustainability in its social dimension; that of Cebrián *et al.* (2019), which addressed existing theoretical frameworks on sustainability competences, while also identifying appropriate tools to be able to assess sustainability competences in the context of ESD. Aleixo *et al.* (2021) discussed universities' engagement with sustainability dimensions, guiding universities in transitioning to sustainability and contributing to understanding sustainability in universities. Similarly, Redman *et al.* (2021), through a systematic review of 75 studies presenting the use of an assessment tool, has provided a framework for the assessment of sustainability competencies by highlighting an overview of sustainability based on assessment tools. Furthermore, 12 core competencies for sustainability are presented by Pálsdóttir & Jóhannsdóttir (2021) who present the competencies that need to be promoted through teaching and learning in universities. Therefor, it can be concluded that sustainability competencies are not acquired by themselves in teaching and learning spaces and more involvement and attention are needed, as it is still unclear whether sustainability is a university competency or not (Membrillo-Hernández *et al.,* 2021).

As a result of the theoretical framework, the research questions are:

*Research Question 1: Which are the trends of research publications on performance and sustainability in public higher education institutions?*

*Research Question 2: Which authors have emerged as the most productive contributors to the literature on performance and sustainability in public universities?*

*Research Question 3: Which are the most cited papers and which countries and journals have the most important publications in the field?*

*Research Question 4: Which are the main research topics related to performance and sustainability in public universities?*

## Methodology

The objective of the research is to address the inquiry by examining the organization of academic writings concerning performance and sustainability within public universities. The methodology used for this purpose is a bibliometric analysis, which allows a systematic review of the literature and the identification of the correlation between performance and sustainability in public universities (Merigó *et al.,* 2016; Secinaro, 2022; Pillai *et al.*, 2021). The ISI Web of Science database was used to obtain bibliographic data, as it is one of the most important databases of scientific information worldwide. The search focused for articles in English and used a selection of Web of Science categories, choosing SSCI. Other categories were excluded (e.g. A&HCI) from the search because there were targeted articles embedded in this specific category. In the search string below, the search was set based on the topic (title, abstract, keywords) attached to each article, as shown in Table 1.

In addition, it was decided to collect theoretical and empirical articles, as these were appreciated for their high level of academic, theoretical and methodological review. Therefore, conference papers, book citation index, book reviews and review articles (De Waele *et al.,* 2021; Stefanescu, 2021) were excluded, resulting in 99 published articles. The publications were then extracted from the Clarivate Analytics Web of Science database to perform an output analysis of the identified records and obtain the results (final sample of 99 articles). Bibliographic software was used to calculate the top-ranked records: countries, authors, institutions, institutions, journals, keywords and relevant topics.

The search is restricted in time to the years 2009-2023. It starts with 2009, since a search of the Web of Science database identified an article from 2007, but the content did not match. In 2008, no article was published that matched to the search key and the Web of Science SCCI category selected in the preparatory stage of the article extraction from the database. Of course, it seems interesting that no scientific article matching criteria was identified, and it was a surprise. One explanation for this may lie in the SSCI category chosen or perhaps in not including conference papers in search, and the citation index of books, book reviews, and review articles were excluded (of which there were 6 on a closer query of the database). Another explanation could lay in the SSCI category selected or perhaps in the fact that it was chosen not to include conference articles, book citation index, book reviews, and review articles. Consequently, the relevant period for analysis is between 2009 and 2023.

**Table 1.** Search protocol

| **Criteria** | **Details** |
|---|---|
| Timespan | 2009–2023 |
| Document Type | Article |
| Database | Social Science Citation Index (SSCI) |
| Fields | Topic (title, abstract, keywords) |
| Key-terms | Performance* AND Sustainability* AND Public Higher Education* |

Source: Authors' elaboration

Steps involved in conducting a bibliometric analysis are presented below:

- 1st step - general information to discover trends and geographical distribution (Fauzi *et al.*, 2024; Barrera-Rodríguez *et al.,* 2023);
- 2nd step - leading journals, authors and papers to investigate Top Journals, Authors and Papers - descriptive analysis and most productive/used developments to obtain an analysis and ranking of research journal productivity/productivity and relevance of cited articles; simultaneously displaying key elements/followed graph to determine how journals, authors, key article terms and reference journals are connected, three field Plot (Wang *et al.,* 2019);
- 3rd step- network analysis: Word Cloud, Trend topics, Co-occurrence network, Thematic map, Historical direct citation to highlight the connections between keywords, author diaries, thematic mapping and historical exposition (Stefanescu, 2021).

## Results and Discussions

The analysis performed using bibliometric methods provides important perspectives on the discussions regarding sustainability reporting, particularly in public sectors. This methodical approach enabled us to thoroughly investigate the area and create new insights that add to earlier conversations about nonfinancial reporting in public domains, grounded in a well-organized review of existing literature (Cebrián *et al.,* 2019; Lozano *et al.,* 2017; Menon & Suresh, 2020). Additionally, grasping the scientific production output within a specific area is essential for comprehending the development of the literature. By identifying historical patterns, avenues for future research can be suggested.

*Research Question 1: Which are the trends of research publications on performance and sustainability in public higher education institutions?*

The analysis of the registered articles was performed using R Studio and Bibliometrix, with the Shiny package used for its interactive features. A longitudinal approach encompassing 15 years, analyzing Web of Science articles and publication fluctuations on performance and sustainability in the public university system. Between 2009 and 2023, the number of related articles fluctuated, increasing from 1 in 2009 to 19 in 2020. The methodology focused only on academic articles and a part of the SSCI category, explaining the lack of publications in 2010 and 2011. The top year was 2020, highlighting significant potential for further research in this area.

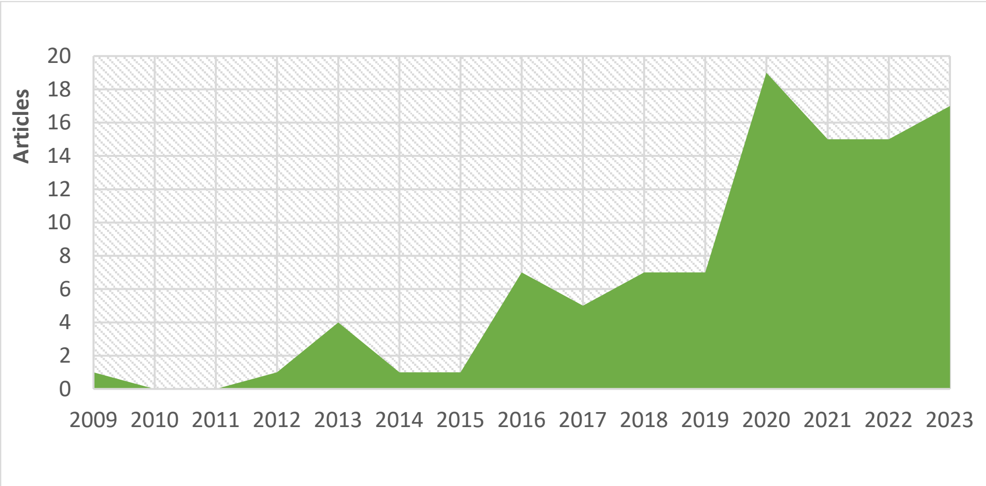


**Figure 2.** Anual scientific production (no. of papers)
Source: Authors' elaboration

In terms of authorship (see Figure 3), a total of 318 authors were identified as producers of the 99 articles. 9 articles (7.89%) were signed by a single author and 90 by two or more authors. The rate of coauthorship is thus an average of 3.36 authors per scientific or scholarly article. This reflects the importance of performance and sustainability in the public university system, a relatively high number per article and the growth of the literature community. Collaboration between researchers is necessary for the development of any field. It facilitates scientific progress because it encourages researchers to share knowledge and pool useful resources to develop successful collaborations.


**Figure 3.** Authorship
Source: Database Web of Science

The literature's geographical spread regarding sustainability reporting within the public sector is illustrated in Table 2, highlighting the ten leading nations that have conducted extensive research on this subject, with their findings being frequently referenced. The tally of publications and citations was determined by considering the participation of authors hailing from each nation. When authors represented multiple countries, each individual received a single point. Most of the contributions in the analyzed studies originated from Spain and Italy, comprising 20.20% of the total, whose researchers stand out in terms of research, performance and sustainability for their significant contributions in various fields, investing in research and development projects and achieving outstanding results in areas such as the social sciences. Both countries have demonstrated a strong commitment to innovation and sustainability, contributing to global progress in these areas. In terms of citations, the most cited country is Portugal (305), closely followed by the United Kingdom (297) and Malaysia (207).

**Table 2.** The most productive and cited countries (no. papers)

| **Country** | **Papers** | **Citation** | **Avg.** |
|---|---|---|---|
| Spain | 12 | 176 | 14.67 |
| Italy | 10 | 170 | 17.00 |
| Brazil | 8 | 21 | 2.62 |
| China | 7 | 107 | 113.37 |
| USA | 7 | 175 | 25.00 |
| Malaysia | 6 | 207 | 34.50 |
| UK | 6 | 297 | 49.50 |
| Portugal | 6 | 305 | 50.83 |
| Australia | 4 | 83 | 20.75 |
| Saudi Arabia | 4 | 103 | 25.75 |

Source: Authors' elaboration

The academic affiliation of the researchers is further presented in Table 3, which shows all universities with researchers who have released over two papers utilizing the fractional counting approach. It is also evident that most of these researchers are from Spain and Italy, which are the top two nations regarding productivity per country. The findings verify the national origins of the authors with the highest productivity.

Note that Table 2 and Table 3 have an interesting result to show: among the most productive countries there are also emerging economies, such as China, Brazil and Saudi Arabia. In conclusion, there is diversity in terms of the nationality of the authors, the focus of the literature analysed is on a relatively a small number of countries and the majority of the papers are collaborative papers with only a few single authors (9 papers).

**Table 3.** The most productive universities (number of authors)

| University affiliation | Country | No. | University affiliation | Country | No. |
|---|---|---|---|---|---|
| Columbia University | USA | 8 | Cranfield University | UK | 3 |
| University of Lisbon | Portugal | 5 | Colorado State University | USA | 3 |
| Polytech University Valencia | Spain | 5 | University Fed Rio Grande Du Sul | Brasilia | 3 |
| King Faisal University | Saudi Arabia | 4 | Rey Juan Carlos University | Portugal | 3 |
| University Salermo | Italy | 4 | University of Beira Interior | Spain | 3 |
| Jazan University | Saudi Arabia | 4 | University Extremadura | Spain | 3 |

Source: Authors' elaboration

## Main journals, authors and papers

The majority of the scientific research output (84.61%) in the top three journals comes from the top ten contributors, as shown in Table 4. The International Journal of Sustainability in Higher Education is the most cited journal with 429 citations. It should be noted that sustainability, which has been evaluated with a five-year impact factor since 2016, has the highest number of articles published. In terms of citations, the Journal of Cleaner Production leads with 429 citations, while the International Journal of Sustainability in Higher Education is in second place with 212 citations. The remaining nine journals contribute almost half of the total number of articles analysed and focus mainly on research on public higher education or sustainability issues. It is also worth noting that out of the 52 journals, 44 (84.61%) published only one paper on this topic. The remaining nine journals cover about half of the total papers analysed. Furthermore, these journals focus either on research in public higher education institutions or focus directly on sustainability issues.

**Table 4.** Top most productive journals.

| **Journals** | **Journal category** | **No. of articles** | **H-Index** | **Citations** |
|---|---|---|---|---|
| Sustainability | Env.St. | 26 | 136 | 212 |
| Internațional Journal of Sustainability în Higher Education | Education (Edu.) | 11 | 23 | 206 |
| Journal of Cleaner Production | Env.Sc. | 7 | 182 | 429 |
| Sustainable Development | Env.St. | 3 | 81 | 25 |
| Journal of Management Development | Env.St./Manag./ Bus./Fin. | 2 | 69 | 37 |
| Journal of Public Budgeting, Accounting & Financial Management | Pub./Fin. | 2 | 19 | 34 |
| Higher University Policy | Education | 2 | 47 | 25 |
| Administrative Sciences | Pub. | 2 | 28 | 16 |
| International Journal of Productivity and Performance Management | Manag. | 2 | 10 | 17 |
| Internațional Journal of Sustainable Management | Env.St. | 2 | 31 | 17 |

Note: Env.St. = Environmental Studies; Env.Sc. = Environmental Sciences; Manag = Management; Bus = Business; Fin = Finance; Pub. = Public administration
Source: Authors' elaboration

It is important to highlight the wide variety of journals that aim to publish research focused on performance and sustainability within the public sector (Table 5). A review of the Web of Science classifications reveals that, since a multidisciplinary journal can fit into various categories, the predominant one is "Green and Sustainable Science and Technology," which accounts for nearly all published articles. This is hardly surprising, as this category encompasses journals that concentrate specifically on the overall theme of sustainability, such as Sustainability, International Journal of Sustainability in Higher Education, Journal of Cleaner Production, Sustainability Accounting Management and Policy Journal, and Sustainable Development. Furthermore, one identified top three journals that feature the greatest number of published works. Regarding the other categories found in the Web of Science, there is an interesting distribution with relatively low percentages. This confirms that performance and sustainability in the public university system have a higher concentration in the first three journals, which deal exclusively with this type of approach, but also the fact that it appeared in other categories of journals it means that topic is treated multidisciplinary.

**Table 5.** More usual categories of Web of Science in the researched topic

| Web of Science Categories | Frequency | % |
|---|---|---|
| Green and Sustainable Science and Technology | 50 | 50.50 |
| Environmental Sciences | 35 | 35.35 |
| Environmental Studies | 27 | 27.27 |
| Education & Educational Research | 20 | 20.20 |
| Management | 17 | 17.17 |
| Business, Economics | 13 | 13.13 |
| Engineering environmental | 7 | 7.07 |
| Development studies | 4 | 4.04 |
| Public Environmental & Occupational health | 4 | 4.04 |
| Business Finance | 2 | 2.02 |

Source: Authors' elaboration

Although the subject matter may initially seem broad due to its focus on the complex concepts of performance and sustainability, the scope is actually quite narrow, as it pertains specifically to the public sector. However, there is a strong interest in addressing this topic, as evidenced by the presence of numerous articles on the subject in journals that are not specifically dedicated to either performance or sustainability. This suggests that the intersection of performance and sustainability in the public sector is an increasingly important topic that is being approached from a multidisciplinary perspective.

**Table 6.** Top cited journals

| Journals | Category | Citations |
|---|---|---|
| Journal of Cleaner Production | Env. St. | 429 |
| Sustainability | - | 212 |
| International Journal of Sustainability in Higher Education | Edu | 206 |
| Journal Business Ethics | Env Sc | 92 |
| Intellectual Capital | - | 55 |
| Higher Education | Edu | 44 |
| Meditari Account Res | - | 42 |
| Journal of Public Budgeting Accounting & Financial Management | Pub/fin. | 17 |
| International Journal of Sustainable Development | Env. St. | 17 |

Source: Authors' elaboration

*Research Question 2: Which authors have emerged as the most productive contributors to the literature on performance and sustainability in public universities?*

To analyse the main researchers who have impacted the research on performance and sustainability within public sector universities, one reviewed the count of published articles and their citations (Table 8). A total of 318 authors have made contributions to this area (averaging 3.36 authors for each paper) (Figure 2). The majority of the papers (over 90%) resulted from co-authorship, and nearly half of the collaborative works (42.42%) were created through partnerships among researchers from various countries. The highest level of collaboration (four papers) was observed between scholars from Italy and Australia. Additionally, there is notable diversity in the backgrounds of the authors, with contributors hailing from 30 different nations. Nonetheless, the existing literature is predominantly focused within a limited number of countries and authored by a small group of individuals.

Therefore, the leading researchers are primarily located in countries like Peru, Spain, Italy, Portugal, the United States, and China. The key figures adding to the research on performance and sustainability in public sector universities are Moussa and Nicolo, each having produced three papers, with Moussa associated with Peru and Nicolo with Italy. When it comes to author influence, Mousa holds the highest position as the researcher with the most significant H-Index of 17, closely followed by Nicolo and Leitao, who both have an H-Index of 16. As for the author Nicolo G., he continues to lead as the individual researcher boasting the highest H-Index at 17.

**Table 7.** Top productive authors

| Author | Papers | Citations | H-Index | Period | Country |
|---|---|---|---|---|---|
| Mousa M. | 3 | 62 | 16 | 2020 - 2023 | Peru |
| Nicolo G. | 3 | 57 | 17 | 2020 - 2023 | Italy |
| Alves H. | 2 | 55 | n/a | 2020 - 2023 | Portugal |
| Alyoussef I.Y. | 2 | 55 | 6 | 2021 - 2021 | Saudi Arabia |
| Blasco N. | 2 | 45 | 7 | 2019 - 2021 | Spain |
| Brusca I. | 2 | 17 | 10 | 2019 - 2021 | Spain |
| Bucatea-Manea-Tonis R. | 2 | 29 | 9 | 2020 - 2020 | Romania |
| Dougherty KJ | 2 | 21 | 11 | 2012 - 2013 | USA |
| Klein LL | 2 | n/a | 6 | 2023 - 2023 | Brazil |
| Labrador M. | 2 | 28 | 5 | 2019 - 2021 | Spain |
| Leitao J. | 2 | 11 | 16 | 2020 - 2023 | Portugal |
| Natao RS | 2 | 29 | 7 | 2012 - 2013 | USA |
| Vega B. | 2 | 61 | 6 | 2012 - 2013 | USA |
| Yusliza MY | 2 | 16 | 16 | 2020 - 2023 | Malaysia |

Source: Authors' elaboration

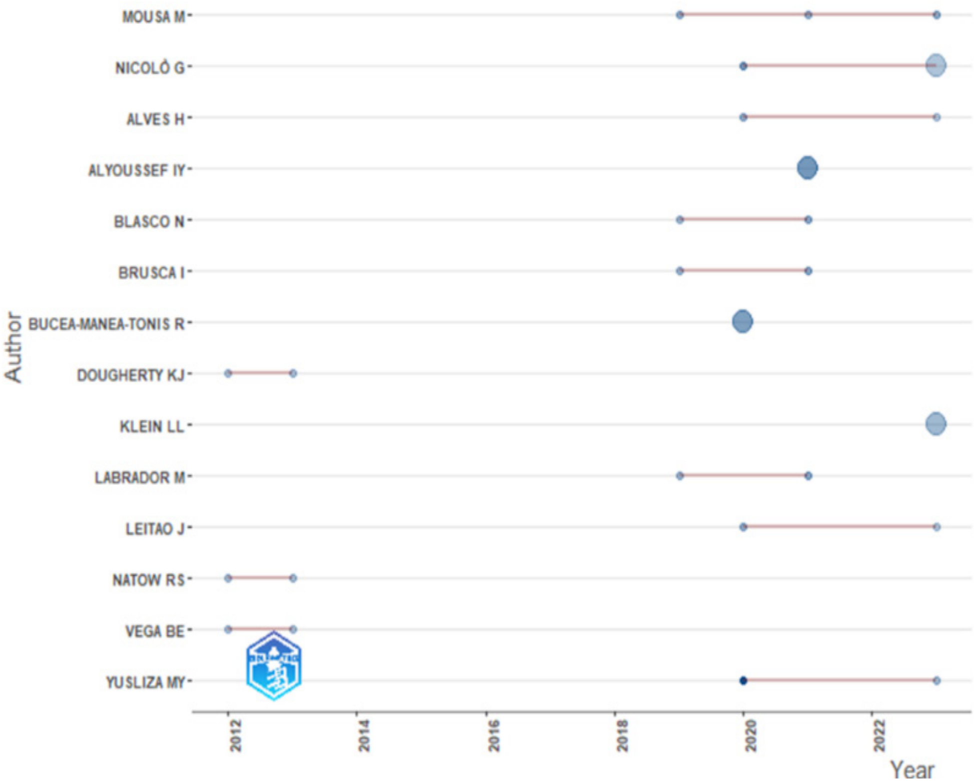


**Figure 4.** Top 10 authors' production over time
Source: Authors' elaboration

The examination of key articles in the field concerning performance and sustainability within public universities centered on the annual citation counts (Table 8), as this indicates the influence of the papers while considering the specific timing of citation reception. Findings reveal that the paper by Purcell *et al.* (2019), which received 110 citations across all databases, advocates for universities to act as leaders in sustainability. This perspective suggests that universities can further their efforts to meet the Sustainable Development Goals (SDGs) by collaborating with faculty, administrative personnel, students, as well as engaging with a broader group of stakeholders and alumni, who are essential in forging new pathways for society while fostering global citizenship and contributing knowledge and innovation. The Journal of Cleaner Production stands out as the most frequently cited and the third most prolific journal, having published the three leading cited papers.

*Research Question 3: Which are the most cited papers and which countries and journals have the most important publications in the field?*

Purcell *et al.* (2019), with 110 citations, with "Universities as the engine of transformational sustainability towards delivering the sustainable development goals: 'Living labs' for sustainability", published in the International Journal Sustainability in Higher Education, presents universities as promoters of societal transformation through sustainability, and university performance factors are an important component in aligning universities with sustainability and the SDGs.

Yuan *et al.* (2013), the second runner-up, collected 91 citations with the paper "Green Universities in China - What Matters?" published in the Journal of Cleaner Production, in which she approached Green University from the students' perspective and conducted a critical evaluation of the Green University from the perspective of teachers' performance, graduates' performance, and students' parents' educational achievement (educational attainment). The elements that affect the situation were classified into seven distinct groups: governance frameworks, ecological sustainability, responsible educational programs, innovation and research, personnel growth and incentives, opportunities for students, and community accountability. The findings establish a standard for enhancing the sustainability efforts of 'eco-friendly universities' both in China and globally.

Miotto *et al.* (2020), ranked third, collected 70 citations with the paper "Reputation and legitimacy: Key factors for Higher Education Institutions' sustained competitive advantage", published in the Journal of Business Research, in which university reputation has an impact on legitimacy, which is seen and measured through several pragmatic, moral and cognitive areas of legitimacy, as well as performance, innovation, services and university climate. The findings of this research indicate that both legitimacy and reputation play crucial roles in the success and sustainability of institutions of higher learning. and are actively categorised considering the organisational competitive environment. The advantage of legitimate and highly rated institutions with a good reputation is easier access to resources.

Caeiro *et al.* (2020), who collected 54 citations, with the paper "Sustainability Assessment and Benchmarking in Higher Education Institutions-A Critical Reflection" published in the journal Sustainability Basel, presents a critical analysis of sustainability assessment tools and their effective implementation, selecting two sustainability assessment tools namely Sustainability Tracking, Assessment & Rating System Reporting Tool and Green Metric for the two southern European universities at which the empirical analysis was conducted. The study contributes to encourage higher education institutions to increase their sustainability performance.

As posited by Manes-Rossi *et al.* (2020), who collected a further 54 citations, the paper "Nonfinancial reporting formats in public sector organisations: a structured literature review", published in the Journal of Public Budgeting, Accounting & Financial Management, conducted a literature review pertaining to sustainability reporting performance. This review presented the dimensions of internal and external performance, thus emphasising the importance of performance.

Wolff *et al.* (2017), who collected 51 citations with the article "High Performance Education fails in Sustainability?" - A reflection on Finnish primary teacher education, published in the journal Education Sciences, deals with the conflict between academic performance and sustainability in education. The overall conclusion of this article is that it is absolutely necessary to find a balance between academic performance and sustainable education.

In the paper "Higher education students' perceptions of sustainable development in Portugal", Aleixo *et al.* (2021) collected 36 citations. The paper was published in the Journal of Cleaner Production. Aleixo *et al.* (2021) study provides a complex view on students' perceptions of sustainability in higher education institutions. Social and environmental performance is an area of interest for students. The study concludes that the students surveyed stated that they adopt sustainability behaviours.

Gebreiter (2022) who collected 30 citations with the paper "A profession in peril? University corporatization, performance measurement and the sustainability of accounting academia", published in the journal Critical Perspectives on Accounting, treats performance from the point of view of the profession while emphasizing its role at the institutional level.

Sassen *et al.* (2018), who collected 20 citations with the paper "Characteristics of UK higher education institutions that disclose sustainability reports" published in the International Journal of Sustainability in Higher Education, addresses the issue of sustainability reporting by trying to determine the benefits of sustainability reporting for a higher education institution in terms of institutional performance and what determines it. The results of this study show us that sustainability reporting depends on institutional size, university finances, internal and external motivations and stakeholder concerns.

De Lima *et al.* (2016), who collected 14 citations with the paper "A sustainability evaluation framework for Science and Technology Institutes: An international comparative analysis", published in the Journal of Cleaner Production. The paper presents and develops a sustainability reporting framework that include social, economic and environmental concerns.

**Table 8.** Most influential publications by number of citations

| **Authors** | **Article title** | **Journal** | **Total citations** |
|---|---|---|---|
| Purcell *et al.* (2019) | "Universities as the engine of transformational sustainability to achieve sustainable development goals: 'Living labs' for sustainability" | International Journal Sustainability in Higher Education | 110 |
| Yuan *et al.* (2013) | "Green Universities in China – what matters?" | Journal of Cleaner Production | 91 |
| Miotto *et al.* (2020) | "Reputation and legitimacy: Key factors for sustained competitive advantage of higher education institutions" | Journal of Business Research | 70 |
| Caeiro *et al.* (2020) | "Sustainability Assessment and Benchmarking in Higher Education Institutions-A Critical Reflection" | Sustainability | 54 |
| Manes-Rossi *et al.* (2020) | "Non-financial reporting formats in public sector organizations: a structured literature review" | Journal of Public Budgeting, Accounting & Financial Management | 54 |
| Wolff *et al.* (2017) | "High performance education fails in sustainability?-A reflection on Finnish primary teacher education" | Education Sciences | 51 |
| Aleixo *et al.* (2021) | "Higher education students' perceptions of sustainable development in Portugal" | Journal of Cleaner Production | 36 |
| Gebreiter (2022) | "A profession in peril? University corporatization, performance measurement and the sustainability of accounting academia" | Critical Perspectives on Accounting | 30 |
| Sassen *et al.* (2018) | "Characteristics of UK higher education institutions that disclose sustainability reports" | International Journal of Sustainability in Higher Education | 20 |
| de Lima *et al.* (2016) | "A sustainability evaluation framework for Science and Technology Institutes: An international comparative analysis" | Journal of Cleaner Production | 14 |

Source: Authors' elaboration

Moreover, despite the existence of numerous public sector journals, the papers that received the highest citations predominantly came from publications in the "Education" category, whereas the journals that published the most cited articles were from the "Science/Environment" category. This situation emphasizes the significance and relevance of performance and sustainability within the public university system, indicating that these subjects are increasingly being discussed in journals that do not focus exclusively on a specific discipline.

Ultimately, the studies that received the most citations were predominantly focused on subjects concerning sustainability and effectiveness within the public higher education arena.

*Top journals, authors and keyword relations*

In order to investigate the links between the main scientific fields, it was visualised using Three Field Plots. These allowed us to simultaneously analyse the main elements in the selected fields (journals, authors, keywords of articles, cited journals) and interpret how they are connected. Figure 5 visualises the relationships between keywords (left side), authors (middle side) and journals (right side) to show the representative researchers in the field of performance and sustainability in public universities, the fields that are frequently explored and the fields in which the most articles are published.

The analysis shows that in addition to the theme of performance and sustainability in the public university system, which was the central theme of this study, the authors also paid attention to corporate responsibility, which, although specific to the private sector, is also integrated into the statutes of public institutions. Most of their academic work has been disseminated through leading production sources (Sustainability, International Journal of Sustainability in Higher Education, Journal of Cleaner Production and Meditari Accountancy Research), where universities have often been the subject of research.

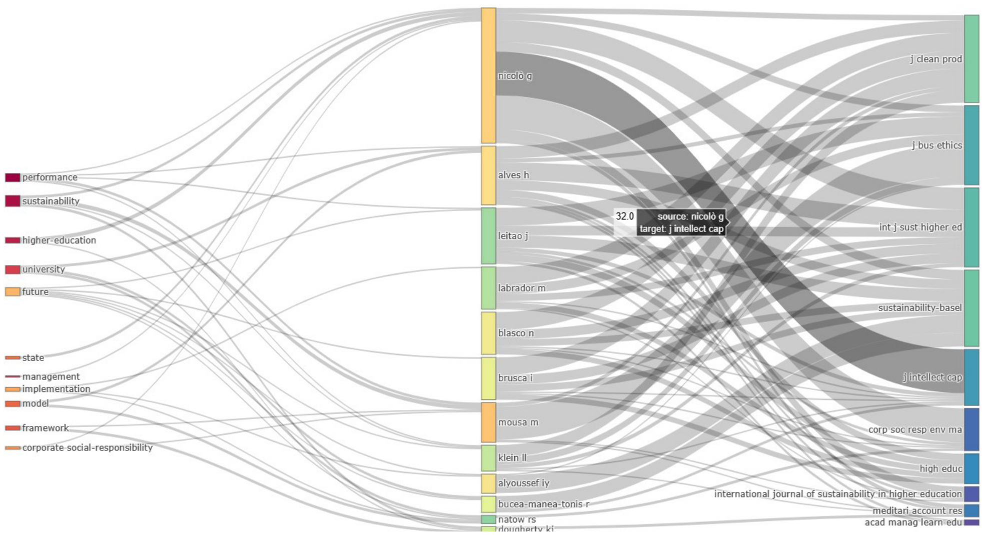


**Figure 5.** Three field plot: keywords_authors -journals' relations.
Source: Authors' elaboration

*Research Question 4: Which are the main research topics related to performance and sustainability in public universities*

The first step was to examine the words and keywords that were most frequently in use during the chosen time period. This helped to identify the thematic trends that were related to the topic at hand. Next, it was carried out a more detailed analysis by Grouping the most frequently used keywords. This allowed the examination of the co-occurrence networks that were created, and organised them thematically. Finally, it was analysed the intellectual structure of the topic. This was done by carrying out a co-citation analysis, including historiographical references Words, keywords analysis.

*Words and keywords analysis*

The "Word Cloud" emphasizes the frequently used terms in the analyzed literature by adjusting their size in the visual representation, illustrating how often specific words appear in the selected documents (Di Vaio *et al.*, 2021). The central terms for this bibliometric analysis include "performance," "sustainability," and "higher education." Additionally, terms like "framework," "impact," "implementation," and "management" were also prevalent in several papers (Figure 6).


**Figure 6.** Word Cloud
Source: Authors' elaboration

Following this, an analysis of the frequency of the word segment from the selected papers was conducted (Table 9). Keywords from the authors, words from the abstracts, and titles are viewed as key terms for the subjects under examination (Nájera-Sánchez, 2020).

**Table 9.** Top words

| **Keywords** | **No.** | **Words in Abstracts** | **No.** | **Words in Titles** | **No.** |
|---|---|---|---|---|---|
| performance | 39 | sustainability | 267 | sustainability | 44 |
| sustainability | 29 | education | 228 | education | 43 |
| higher education | 21 | study | 182 | sustainable | 23 |
| university | 19 | public | 167 | public | 19 |
| future | 12 | performance | 163 | universities | 17 |
| management | 11 | research | 144 | institutions | 15 |
| model | 9 | universities | 148 | performance | 15 |
| implementation | 9 | sustainable | 130 | university | 15 |
| framework | 9 | institution | 116 | development | 13 |
| corporate social responsibility | 9 | students | 110 | analysis | 11 |

Source: Authors' elaboration

As per Fauzi *et al.* (2024) findings, this study examines a limited yet significant selection of articles, with Figure 7 illustrating the gradual increase in the most commonly utilized keywords by writers throughout the years, derived from bibliometric analysis. These keywords emphasize crucial topics within the articles and are employed by authors, editors, and publishers. Performance and sustainability in the higher education system are increasingly evident, according to an analysis of academic papers. The study found that terms such as 'education', 'scholarship', 'development', 'research', 'institutions' and 'analysis' were frequently used in abstracts and titles. The importance of having as much knowledge as possible about university sustainability and how to implement it was also highlighted by the frequent use of the words 'research' and 'implementation'. The research shows that sustainability, together with performance in the university system, are becoming concepts that are revealed both theoretically and practically through the implementation of different strategies, as evidenced by the changes in the frequency of keywords over time. It is worth noting that the analysis was limited to a specific set of materials.

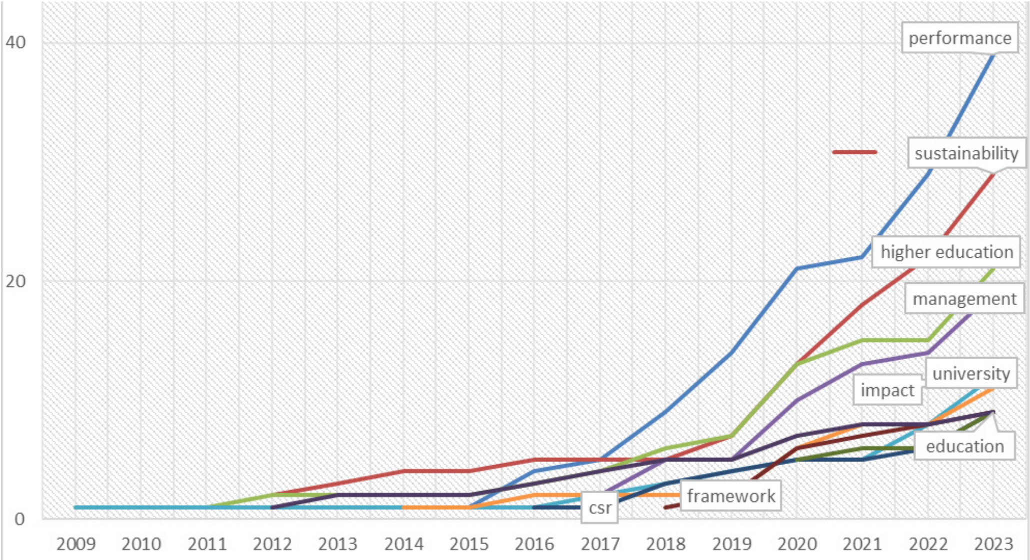


**Figure 7.** Word dinamics
Source: Authors' elaboration

Interestingly, the terms "performance" and "sustainability" have seen significant growth in popularity over the recent years. This could be attributed to the fact that universities that excel are those that effectively combine their three primary missions in their operations. Conversely, institutions are both encouraged and mandated to incorporate sustainability throughout all areas of their work (such as research, education, and, more recently, environmental stewardship), which has sparked interest among researchers, including those studying universities viewed as entities in the public sector. It is evident that the primary focus of the examined works revolves around performance and sustainability, two ideas that have been explored over time, either broadly within the public sector or, more recently, in higher education in particular. However, even if the approach of researchers to performance and sustainability in the higher education system has increased, it still leaves room for future studies. It's worth noting that the word "governance" appeared 20 times in 2023. This could be attributed to the importance of the sharing of responsibilities at the university level and to the positive impact that the principles of governance have on the formation of culture (Oliveira *et al.,* 2020).

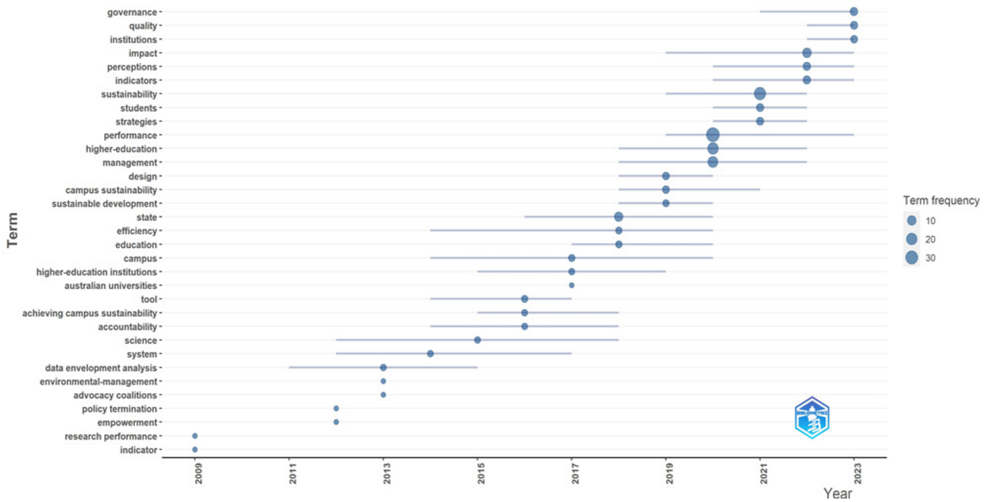


**Figure 8.** Trend topic
Source: Authors' elaboration

*Co-keywords analysis*

A network analysis of the keywords from authors was utilized to explore the primary research domains in the literature concerning performance and sustainability in public universities (Figure 9). This approach facilitated the identification of the links among concepts in a specific research area, allowing for an understanding of how academic work has progressed around certain subjects. In Figure 9, the dimensions of the circles illustrate their significance relative to the frequency of the keywords, which were determined using a centrality metric; therefore, bigger circles indicate associations with a greater number of papers.

The network of keyword co-occurrence emphasizes the strong connections among the topics explored in this study, illustrating how these connections manifest, and expanding the perspective on the ideas of "performance and sustainability within the public university framework.

To recognize the patterns in a particular research domain, the connections among these patterns and how central they are were investigated using word analysis techniques. To highlight the expansion of the pattern within the entire scientific discipline and its significance, the size reflects the total contribution of every keyword. The mapping considers the theme's significance in the research area (centrality) as well as its evolution (density) (Stefanescu, 2021).

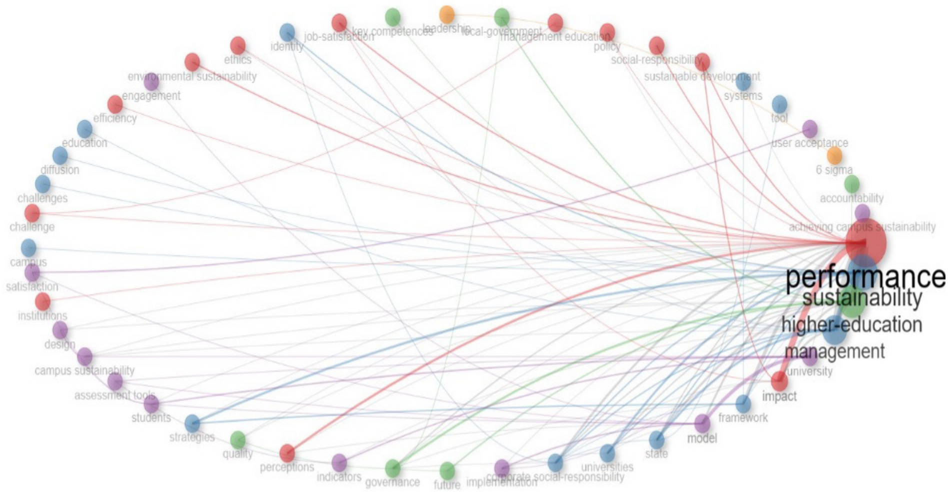


**Figure 9.** Keyword co-occurrence network
(clustering algorithm Louvarien, network layout -circle)
Source: Authors' elaboration

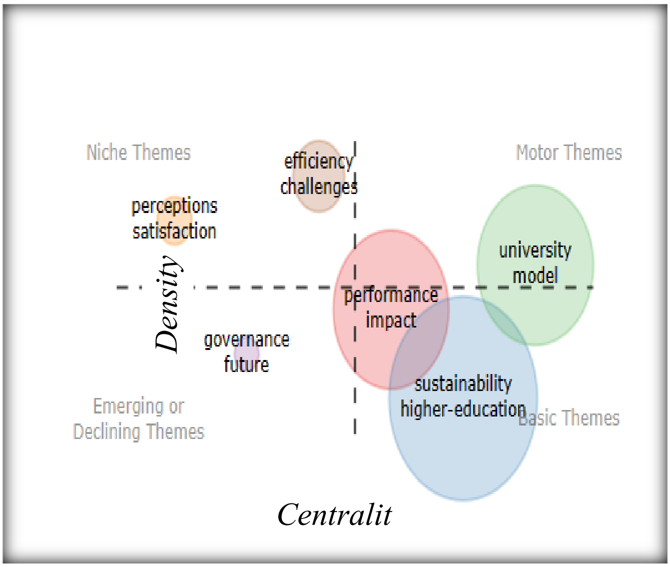


**Figure 10**. Thematic map
Source: Authors' elaboration

*Co-citation analysis*

The academic framework is constructed through a historical framework of direct references (Figure 11). It offers a timeline of significant studies by researchers concerning the chosen subject and outlines its historical evolution annually, relying on different connections. The points indicated by the referenced articles and the lines representing the direct references were arranged on a directed graph according to the year of publication, shown on the x-axis (Stefanescu, 2021).

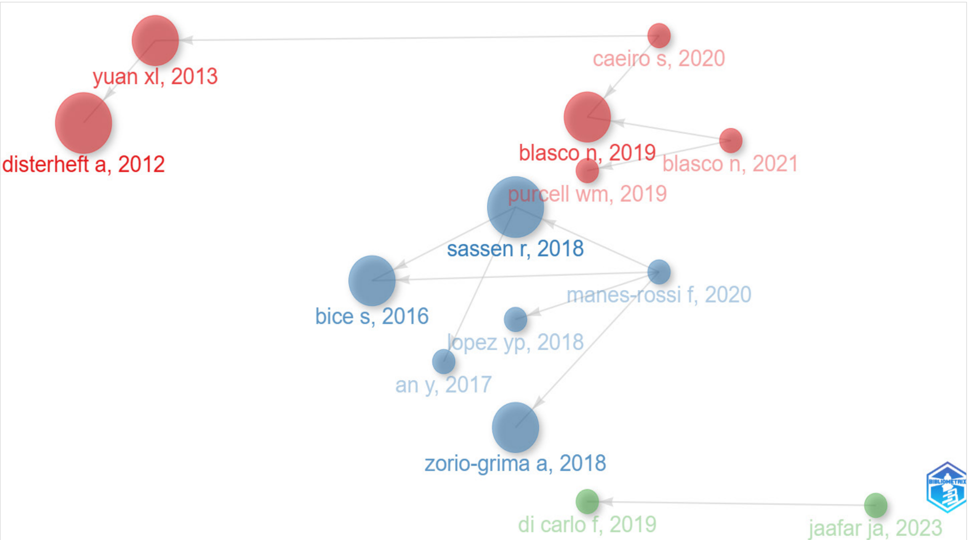


**Figure 11.** Historical direct citation
Source: Authors' elaboration

The papers represented on the map show the topicality of the sustainability and performance of the public university system; the map highlights, on the one hand, the names of the authors and, on the other hand, the themes addressed. Three lines of research have thus emerged:

(1) The first line of research attached to the first red cluster are the authors: Disterheft *et al.* (2012), Yuan *et al.* (2013), Blasco *et al*. (2019), Blasco-Blasco *et al.* (2021), Purcel *et al.* (2019), Caeiro *et al.* (2020). It was recognizable through the understanding that followed the primary elements of the "sustainability" subject, which examined the connections related to how universities contribute to promoting sustainability, efforts and practices aimed at sustainability within higher education establishments. This knowledge has

been acquired and has established the groundwork for changes within the educational framework. As a result, universities are now making efforts to contribute to the achievement of the sustainable development goals (Blasco *et al.,* 2019).

(2) The second line of research attached to blue cluster are the authors Lopez & Martin (2018), Zorio-Grima *et al.* (2018), Bice & Coates (2016), Sassen *et al.* (2018), Manes-Rossi *et al.* (2020) it was possible to identify it, knowing that traced the main foundations of the 'approaching performance and sustainability in public higher education' connecting with the mission statements and their impact on sustainability performance (Lopez & Martin, 2018).Academic performance is related to sustainability through learning about sustainability and adapting to technology, which can affect academic and research satisfaction and performance (Brusca *et al.,* 2019). Exploring the connection between performance, sustainability practices, and their impact on public universities (Zorio-Grima *et al.,* 2018).

(3) Third line of research attached to green cluster are the authors Di Carlo *et al.* (2019), Jaafar *et al.* (2023), approached the university public system which is subject to societal pressure to be efficient and sustainable. There is also the problem of financing the public university system and the connection with financial sustainability.

## Conclusions

The pressure of responsibility from the interested parties on public higher education is also determined by the primordial role of universities in society, also a growing need for responsibility included in the form of the university mission. Researchers in the field have begun to pay more and more focus to sustainability issues and how to implement them at the level of public higher education.

The research was carried out to investigate how performance correlates with sustainability within the public university framework. In contrast to earlier research that primarily examined a single concept or performed a regulated literature analysis, this document sought to present an all-encompassing understanding of performance and sustainability, concentrating specifically on the public university sector.

This research employs bibliometric analysis to explore the realm of science. It offers both factual information and conceptual examination of the topic at hand, minimizing the biases found in narrative or systematic reviews. Utilizing bibliometric analysis facilitates a clear review process grounded in quantitative measures like articles, contributors, publications, references, and scientific mapping.

This study concentrated on the progression of the ideas surrounding performance and sustainability within public higher education and pinpointed the key journals, the most active researchers, and the prominent articles in this field, enabling researchers to chart the frameworks of the conceptual and intellectual landscape of the research community. This has yielded important revelations regarding the prevalent themes and collaborative efforts, aiding the comprehension of the evolution of the subject. In summary, the analytical overview indicates that investigations into the public university system are still nascent, yet have shown considerable expansion over the past few years. The results show that in the last three years, the interest in performance and sustainability has led to an increase of up to 66% in articles on sustainability and performance in the public university system.

The descriptive analysis shows that, despite the current high level of interest in the concepts of performance and sustainability in the public university system, research is still at a relatively early stage, with fluctuating growth in recent years. The trend points to further efforts to explore new avenues of research or to deepen existing ones. The scientific landscape was completed by authors from different regions of the world, but mainly from Europe (e.g. Spain and Italy) and China or the USA. The work of these researchers has been published in a variety of journals, not only those directly concerned with issues of sustainability and performance in public higher education, educational studies and ethics, but also in other economic fields (finance, management). This indicates a broad interest in the topic of performance and sustainability in public higher education and underlines its importance.

The results of the leading authors during the period analysed show us the extent, quality, potential and active role in the knowledge and implementation of performance and sustainability at the higher public level and the promotion of sustainability reporting in the public sector. Although there was initially little interest in the topic, there has been an increase in the relevance of the issue over time. Lately, the attention given to the subject has resulted in a large number of articles.

The network analysis provides valuable information that paves the way for future research in the field. Academic literature has responded to the need for a better understanding of the concepts discussed and the role of educational and public institutions in achieving performance and implementing sustainability. Over time, this field of study has evolved, and there is a call for more research to focus on these concepts in the context of public higher education.

The framework illustrates three avenues of investigation, indicated by the key terms and associated topics recognized, centering on “sustainability,” “performance,” and “university system.” Additionally, the thematic diagram verifies that these avenues are pertinent to the area of study while also promoting potential future research on “isolated” and “emerging” topics, like corporate governance, which has yet to achieve significant importance in the examined domain.

All the outcomes referenced previously hold both theoretical and practical significance. These findings are pertinent for scholars who aim to further engage in critical discussions about sustainability reporting within the public sector. In this context, one can suggest that future studies focus on the quality, applicability, and effects of disclosed information that could facilitate the establishment of a suitable reporting structure for the public sector, alongside thorough investigations into the factors influencing sustainability reporting and their potential effects on establishing and achieving objectives. Additionally, the conclusions drawn from this paper are beneficial for policymakers in enhancing support for sustainability efforts and organizations involved in these initiatives.

The contribution to the development of the studied research field is as follow: first of all, by revealing the evolution of performance and sustainability concepts integrated into university missions. Secondly, synthesizing the most influential journals, the most cited and recognized authors and the most important articles in the specialized literature, the evolution of key -terms with the support of bibliometric analysis.

The limitations of the present study are: first, the analysed documents were limited to articles present in a single database Web of Science. As a result, it excluded some types of publications such as books, chapters, and articles that could have impacted the research results. However, this choice was made to ensure high-quality research standards, greater precision, and a lower degree of subjectivity, as justified in previous studies (Stefanescu, 2021).

The study’s focus was on descriptions and trends of the dataset, including work citations, author citations, relevant sources, domains, and affiliations. However, there were some characteristics of the bibliometric analysis did not examine (social structure of collaboration networks and world maps). Nonetheless, since the study aim was to identify the relationship between performance and sustainability in the public university system, both the selected sample and the scope of the bibliometric analysis objectively answered the research questions proposed in this study.

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# IMMERSIVE TECHNOLOGIES IN ITALIAN CULTURAL TOURISM: AN EXPLORATORY ANALYSIS OF VISITOR SATISFACTION AND PREDICTIVE MODELING

**Assia LIBERATORE[1], Ana Elisa SOUSA[2], Paula CARDOSO[3], Sónia PAIS[4]**

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**ABSTRACT.** This study explores the impact of Augmented Reality (AR) and Virtual Reality (VR) on cultural tourism in Italy. The methodology is twofold. By analyzing visitor satisfaction through a comprehensive survey conducted across 18 museums in northern, central and southern Italy, we aim to understand the role of these technologies in enhancing the tourism experience. An agent-based simulation using NetLogo was employed to predict visitor satisfaction based on various demographic and experiential factors, utilizing monthly seasonal data from the Italian National Institute of Statistics (ISTAT).

The findings indicate that immersive technologies significantly influence visitor satisfaction, with higher levels of engagement and positive experiences reported among users familiar with AR and VR. This study highlights the potential of immersive technologies to enhance cultural tourism and provides insights for cultural institutions aiming to adopt these innovations.

**Keywords**: augmenter reality (AR), virtual reality (VR), Italian heritage, tourism experience, agent-based simulation

**JEL Classification:** O39, R19, Z39

[1] CiTUR-Centre for Tourism Research, Development and Innovation, Polytechnic of Leiria, Portugal; e-mail: assia.liberatore@ipleiria.pt

[2] CiTUR-Centre for Tourism Research, Development and Innovation, Polytechnic of Leiria, Portugal; e-mail: ana.c.sousa@ipleiria.pt

[3] LE@D (Laboratory of Distance Education and eLearning) and CiTUR-Centre for Tourism Research, Development and Innovation, Polytechnic of Leiria, Portugal; e-mail: paula.cardoso@ipleiria.pt

[4] CIDMA - Center for Research and Development in Mathematics and Applications, University of Aveiro (PORTUGAL) and CiTUR-Centre for Tourism Research, Development and Innovation, Polytechnic of Leiria, Portugal; e-mail: sonia.i.pais@ipleiria.pt

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## Introduction

Cultural tourism is a significant segment of the tourism industry in Italy, renowned for its rich historical and cultural heritage. Italy's museums, galleries, and heritage sites attract millions of tourists annually, contributing substantially to the national economy. However, the sector faces challenges such as maintaining visitor engagement and adapting to technological advancements (Angeloni, 2013). Interest in immersive experiences in museums and heritage sites has grown in recent years, driven by sectoral challenges and the opportunities presented by emerging technologies. Arts and heritage institutions expect that immersive experiences will enhance visibility, foster innovation, attract new audiences, increase engagement, social sharing and generate additional revenue. Cultural institutions have served as early testing grounds for immersive approaches, benefiting from investment through various funding bodies (Dal Falco & Vassos, 2017; Jelinčić *et al.,* 2022; Kidd & Nieto McAvoy, 2019).

This work is part of a broader project focused on cultural tourism and the impact of immersive technologies on visitors, analyzing not only the immersive experience itself but also the pre-visit and post-visit experiences (Casais *et al.,* 2025, Trunfio *et al*., 2022). Currently, the project concentrates on Italian museums and cultural sites, as Italy boasts the highest concentration of cultural offerings globally[5]. This richness is due to its complex historical evolution, marked by successive dominations that have shaped its archaeological and artistic heritage. The southern regions and islands were part of Magna Graecia from the 8th century BCE, with Greek settlers establishing thriving colonies that profoundly influenced local culture, architecture, and governance. The rise of Rome led to the unification of the Italian peninsula under the Roman Republic and later the Roman Empire, which dominated for centuries, leaving an unparalleled legacy in law, infrastructure, and the arts. Following the fall of the Western Roman Empire, Italy became a battleground for various powers: the Ostrogoths, Byzantines, Lombards, and later the Franks under Charlemagne, each contributing to the cultural mosaic of the region. The Middle Ages saw the emergence of powerful maritime republics like Venice, Genoa, and Pisa, alongside the Papal States, while southern Italy was successively ruled by the Normans, Swabians, Angevins, and

[5] Italy has the highest number of cultural sites in the world listed in the UNESCO World Heritage List, accounting for 54 out of 952 (5.67%), followed by Germany with 51 sites and France with 49.

Aragonesi. The Renaissance period, particularly strong in Florence and Rome, further enriched Italy's artistic and intellectual heritage. This layered history has endowed Italy with an unparalleled cultural legacy, making it a prime location for studies on cultural tourism.

By analyzing immersive experiences across all visitor journey phases, this study provides a more holistic perspective on how AR/VR influences engagement and satisfaction, adding originality to this study. Furthermore, the study also uses data from 18 museums across northern, central, southern Italy and the islands, bringing together a wide spectrum of institutions, from small regional sites to nationally significant museums.

This study aims to analyze the satisfaction of tourists with immersive experiences in Italian museums. A survey was conducted and agent-based modeling (ABM) was employed to understand the socio-demographic factors influencing satisfaction and predict future trends based on seasonal data. ABM has been increasingly recognized for its ability to simulate complex systems and predict outcomes based on individual behaviors and interactions (Wallinger *et al.,* 2023). Its application in tourism research provides valuable insights into visitor behaviors and the potential impacts of technological innovations (Ferreira *et al.,* 2015). For instance, Tieskens *et al.* (2017) utilized ABM to study landscape management scenarios, while Piliponyte *et al*. (2024) applied simulation models to analyze tourism promotion campaigns in South Tyrol, revealing significative insights into visitor distribution and sustainable tourism management. Other works, such as Brodeala (2020) and Capocchi *et al.* (2019), have explored recommender systems and overtourism dynamics, emphasizing the importance of predictive modeling in tourism strategies.

The paper is organized as follows: this section provides a literature review, including an overview of existing research on cultural tourism in Italy, the application of agent-based models in cultural tourism, and an analysis of cultural tourism in Italy based on ISTAT[6] data from 2015 to 2023. Section 2 details the methodology, including the survey and data collection process and the NetLogo simulation setup and parameters. Section 3 presents the results, followed by a discussion. Finally, Section 4 concludes the paper with key findings and recommendations for future research.

## Literature review

The study of cultural tourism in Italy is extensive and interdisciplinary, covering historical, socio-economic (Vita, 2018), and technological perspectives (Guccio *et al*., 2016). This subsection reviews key studies and theoretical frameworks

[6] ISTAT stands for "Istituto Nazionale di Statistica," the Italian National Institute of Statistics.

relevant to our analysis. First, an overview of existing research on cultural tourism is provided, outlining its evolution and significance in Italy. Then, the application of agent-based models (ABM) in tourism research is examined, with particular attention to their role in simulating visitor behavior and predicting trends. Finally, cultural tourism trends in Italy from 2015 to 2023 are analyzed, using data from Federculture and ISTAT to explore regional and municipal variations in tourist flows.

### *Overview of Existing Research*

Cultural tourism in Italy is a multifaceted phenomenon that encompasses a wide range of elements and perspectives (among other see Santoro *et al.* 2024). It is analyzed from various angles, including demand and supply, theoretical and operational approaches, and numerous study models (Csapo, 2012). The intrinsic link between tourism and culture is evident, as cultural sites, attractions, and events provide significant motivation for travel, while travel itself can generate and enhance cultural experiences (Petrotta 1957, Morazzoni 2003). Cultural tourism holds substantial potential for local development by attracting tourists and positively impacting income and employment. This perspective has driven numerous studies since the early 1980s, highlighting the role of culture in local development (OECD, 2005). Cultural and creative industries have been increasingly utilized to promote destinations and enhance their competitiveness and attractiveness. Many tourist destinations in Italy have leveraged cultural assets to develop comparative advantages in a competitive market and create distinctive local traits in the face of globalization (OECD, 2009). Recent research highlights the significant impact of cultural tourism in Italy. Cultural tourism is returning to and exceeding pre-pandemic levels, with culture and major events being the main drivers of growth. Santoro *et al.* (2024) proposes definitions, analysis indicators, and data integration methods to better understand and measure cultural tourism in Italy. Market research also indicates that Italy remains a top destination for its cultural heritage, attracting millions of visitors to both major cities and smaller villages.

Immersive experiences, such as Virtual Reality (VR) and Augmented Reality (AR), offer visitors a more interactive and engaging way to experience cultural artifacts and historical narratives. These technologies can enhance visitor satisfaction, increase museum attendance, and create new revenue streams. However, establishing direct links between investment in immersive technologies and measurable outcomes has been challenging, with inconclusive or contested findings (Dogan & Kan, 2020).

Institutions are increasingly focused on understanding the psychological responses of users to immersive programming. A common assumption is that immersive experiences enhance empathy, but this remains an area requiring further research. Iterative rounds of user testing, including qualitative investigations, can offer insights into their potential impact, though these effects are unlikely to be universal (Sterling, 2020).

The adoption of immersive technologies affects tourists' perceived value and engagement, leading to higher satisfaction and loyalty (Abou-Shouk *et al.,* 2024). Smart Tourism Technology has reshaped the tourism landscape by enhancing convenience, personalization, and engagement. However, the role of cultural value in shaping traveler satisfaction and destination loyalty remains underexplored. Research suggests that Smart Tourism Technology significantly influences traveler satisfaction, which subsequently enhances destination loyalty. However, its direct impact on loyalty appears weaker, indicating that satisfaction serves as a key mediating factor (Lemy *et al.,* 2025).

The integration of emerging technologies presents unique opportunities and challenges for cultural tourism in Italy (Duguleana *et al.,* 2016). Academic literature distinguishes between online and on-site applications of AR and VR in cultural heritage. Online initiatives enhance digital engagement, while on-site applications augment physical visits (Di Pietro *et al.,* 2018). While Italian cultural institutions have begun adopting these innovations, implementation remains inconsistent. Museums, galleries, and archaeological sites across the country are increasingly integrating immersive experiences to attract and engage audiences. Notable projects include the Hidden Florence app and the Smart City Living Lab in Syracuse, which demonstrate AR's potential to enhance visitor experiences while addressing concerns like overtourism and heritage conservation. However, financial constraints have hindered the long-term sustainability of such initiatives, as evidenced by the deactivation of AR totems in Syracuse due to funding shortages (Graziano & Privitera, 2020). Yet, as Nevola *et al.* (2022) observe, AR adoption in Italy has been gradual and requires long-term commitment from stakeholders.

### *Agent-Based Models in Cultural Tourism*

Agent-based modeling (ABM) is a computational approach that simulates the interactions of autonomous agents to assess their effects on the system as a whole. This method is particularly useful in tourism research due to its ability to represent complex, dynamic systems and capture the heterogeneity of individual behaviors (among others see Baktash *et al.,* 2022; Johnson *et al.,* 2016). ABM has been applied in various tourism contexts, including visitor flow management, sustainable tourism development, and the analysis of tourist decision-making processes. For instance, Wallinger *et al.* (2023) discuss the potential of ABM to simulate visitor flows in urban and rural destinations, providing insights for policy makers to enhance economic, social, and environmental resilience in tourism development. Similarly, Boavida-Portugal *et al.,* (2015) highlights the use of

ABM to model the decision-making processes of tourists, offering a deeper understanding of the complex relationships within the tourism system. Despite its advantages, ABM has received limited attention in mainstream tourism research Nicholls *et al.* (2017) identifies several challenges to the adoption of ABM, including technical difficulties, communication barriers, and the novelty of the approach. To address these challenges, Nicholls *et al.* (2017) suggest strategies such as education, raising awareness, and forming interdisciplinary teams. In the context of cultural tourism, ABM can be particularly valuable for simulating the adoption and impact of immersive technologies in museums. By modeling the behaviors and interactions of museum visitors, ABM can help researchers and practitioners understand how different factors, such as socio-demographic characteristics and familiarity with technology, influence visitor satisfaction and engagement.

### *Applications of Agent-Based Models Based on Survey Data*

ABMs have been increasingly used in various fields, including economics and psychology, to analyze complex systems and behaviors based on survey data. In economics, ABMs are employed to simulate market dynamics, consumer behavior, and policy impacts. For example, Pangallo & del Rio-Chanona (2024) discuss how data-driven economic ABMs, initialized from real-world micro-data, can track empirical time series and provide valuable insights for economic research and policymaking. In psychology, ABMs are used to study social interactions, cognitive processes, and behavioral patterns. Canessa *et al.* (2023) highlight the use of ABMs in psychological research to simulate cognitive dynamics and social phenomena, providing a bottom-up approach to understanding complex psychological systems. Eberlen *et al.* (2017) emphasize the potential of ABMs to complement traditional research practices in social psychology, particularly in addressing issues related to the replication crisis. By incorporating survey data, ABMs can enhance the accuracy and relevance of simulations, making them powerful tools for analyzing and predicting behaviors in various contexts. In your study, ABMs can be used to simulate the adoption and impact of immersive technologies in museums, based on survey data collected from visitors.

## Analysis on cultural tourism in Italy

This subsection analyzes cultural tourism trends in Italy during the period 2015–2023, drawing on ISTAT data to examine regional and municipal patterns.

Particular emphasis is placed on the year 2019, considered the last full year before the COVID-19 pandemic, which significantly affected tourism in 2020 and most of 2021. The data highlights shifts in tourist distribution, the impact of the pandemic, and the subsequent recovery, offering valuable insights into the resilience and transformation of the cultural tourism sector in Italy.

Based on ISTAT data, in 2019, cultural tourism in Italy accounted for about two-thirds of the total tourist presence (61.8%). This segment is mainly concentrated in three categories of municipalities:

- Municipalities with a cultural, historical, artistic, and landscape vocation: 431 municipalities.
- Municipalities with multiple vocations, including cultural: 583 municipalities.
- Large cities with multidimensional tourism: 12 municipalities.

The most significant category in terms of absolute presence is that of municipalities with multiple vocations (34.3%), followed by large cities (19.7%) and municipalities with an exclusively cultural vocation (7.8%). Among the municipalities with multiple vocations, those with both cultural and maritime vocations represent 57.7% of the presence, followed by municipalities with cultural and mountain vocations (24.2%). Large cities record the highest average presence per municipality, with over 7 million presences per municipality, highlighting a strong concentration of tourist flows in major centers.

In terms of presence per inhabitant, municipalities with a mountain vocation are in the first place with just over 26 presences per inhabitant, followed by lake tourism municipalities (23.7) and maritime vocation municipalities (19).

An analysis of data from 2015 to 2022 reveals that large cities experienced a notable increase in their share of presence, peaking at 19.7% in 2019. However, they also endured the steepest declines during the pandemic. By 2022, their share had nearly returned to pre-pandemic levels, reaching 16.9%. In contrast, municipalities with an exclusively cultural focus maintained a steady share of approximately 8% throughout the period. The recovery trend continued into 2023, with large cities regaining 18.5% of the total presence—signaling a strong rebound (Laratta, 2024).

Between 2015 and 2023, large cities experienced notable fluctuations in their share of tourist presence. This share grew steadily, reaching 19.7% in 2019, just before the COVID-19 pandemic. However, during the pandemic years, large cities experienced the sharpest decline. A gradual recovery began in the following years, with the share rising to 16.9% in 2022, approaching pre-pandemic levels. The rebound continued into 2023, when large cities accounted for 18.5% of total tourist presence, confirming a strong upward trend (Laratta, 2024). Throughout the period, municipalities with an exclusively cultural vocation maintained a stable presence share of around 8%

### *Tourist Trends from 2015 to 2023*

From 2015 to 2019, all categories characterized by cultural tourism saw positive variations in tourist presence. The largest increases were observed in large cities (+21.7%), followed by municipalities with a mountain vocation (+14.6%) and those with a cultural, historical, artistic, and landscape vocation (+13.7%), all exceeding the national average (+11.2%). Municipalities with multiple vocations, including cultural, saw a slightly lower increase (+8.7%).

In 2020, during the pandemic, large cities experienced the most significant decline in tourist presence, far exceeding the national average (-74.2% in large cities vs. -52.3% nationally). Municipalities with an exclusively cultural vocation saw a decline almost equal to the national average (-52.9%), while those with multiple vocations, including cultural, had a smaller decline (-44.1%). In 2021, there was a recovery in tourist flows across all categories, with some variations significantly exceeding the national average (+38.7%). Large cities saw a positive variation of 49.8% (+11.1 points above the national average), and municipalities with an exclusively cultural vocation saw a variation of 44.1% (+5.4 points above the national average). Municipalities with multiple vocations, including cultural and landscape, had a more contained variation (+29.4%), 9.4 points below the national average. During the same period, other types of municipalities also saw growth in tourist flows: lake municipalities (+82.3%), thermal municipalities (+65.8%), and maritime municipalities (+46.9%), all exceeding the national average. Mountain municipalities, although growing, recorded the lowest increase (+3.5%).

In 2022, the growth in tourist flows continued for all categories, with large cities showing a particularly notable increase (+104.4%), almost three times the national average (+39.3%). However, compared to 2019, the levels had not yet fully recovered (-21.0%). Municipalities with an exclusively cultural vocation and those with multiple vocations, including cultural and landscape, had variations in line with the national average (+39.3% and +33.3%, respectively), but still had not recovered pre-pandemic volumes (-5.4% and -3.7% vs. -7.8% nationally).

In 2023, tourism in Italy reached record levels, with over 134 million arrivals and 451 million presences. Large cities continued their recovery, achieving an 18.5% share of total presence, while municipalities with multiple vocations, including cultural, saw a 35.1% share. Municipalities with an exclusively cultural vocation maintained a stable share of around 8.2%. The data indicates a robust recovery and growth in cultural tourism, surpassing pre-pandemic levels in several categories.

### *Cultural Tourism Trends in 2023*

The year 2023 marked a significant recovery for cultural tourism in Italy, consolidating the positive trends observed in 2022 and leaving behind the crisis years. The following key insights highlight the main trends in cultural participation and tourism for 2023.

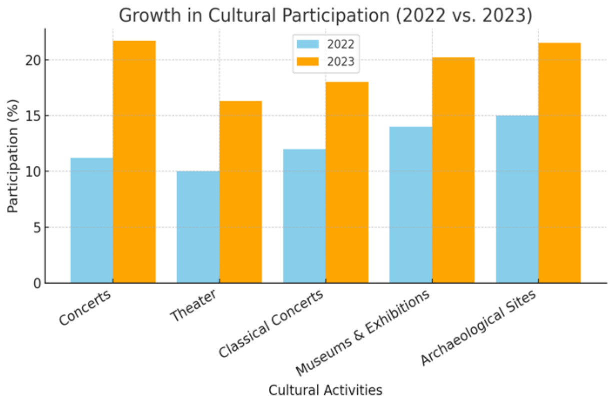


**Figure 1.** Growth in cultural participation in Italy (2022-2023).
Source: Authors' elaboration based on ISTAT data.

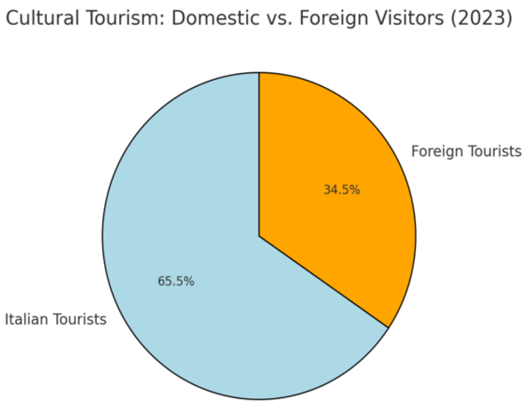


**Figure 2.** Domestic vs foreign visitors in Italy (2023).
Source: Authors' elaboration based on ISTAT data.

Regarding cultural participation, engagement in cultural activities outside the home increased substantially, with 35.2% of citizens participating in cultural events, reflecting a 12% rise compared to 2022. Notable growth was recorded in concert attendance (from 11.2% to 21.7%), theater visits (+63%), classical concerts (+50%), museum and exhibition attendance (+44%), and visits to archaeological sites and monuments (+43%).

There was a substantial growth of cultural tourism: 34.5% increase in foreign tourists visiting Italy's cities of art was recorded, reinforcing the crucial role of cultural heritage in the country's tourism sector. This segment accounted for over 50% of the total tourism market, underlining the economic significance of cultural tourism.

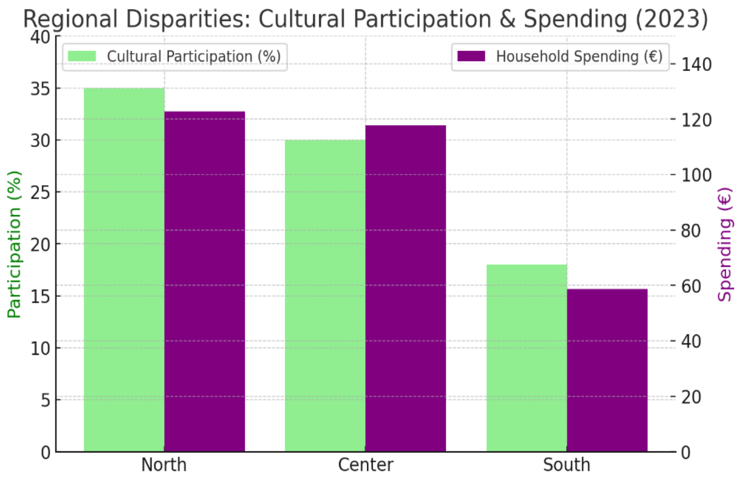


**Figure 3.** Italian regional disparities in cultural participation and spending (2023). Source: Authors' elaboration based on survey data.

Despite the overall positive trends, significant regional disparities persisted in cultural participation and spending. The North and Center reported higher engagement compared to the South. For instance, in Trentino Alto Adige, 30-40% of residents attended cultural events, whereas in Calabria, Sicily, and Basilicata, participation ranged from 15-20%. Similarly, household spending on culture remained higher in the North (€122.8) and Center (€117.8) compared to the South (€58.7), reflecting a continued geographical divide in cultural accessibility and investment.

These findings reinforce the resilience and ongoing transformation of cultural tourism in Italy, positioning it as a key driver of economic and social revitalization in the post-pandemic era.

## Methodology

### *Survey and Data Collection Process*

This study is among the first to combine large-scale survey data on immersive museum experiences in Italy with agent-based modeling (ABM). While both methods have been used independently in tourism research, their integration to model visitor satisfaction in the context of AR/VR in cultural heritage is innovative.

The survey was designed to collect data on visitors' immersive experiences in Italian museums and cultural sites. It consists of two sections: a socio-demographic section and a section evaluating the one-time immersive experience of the visitor. The survey is completed immediately after the physical visit to the museum or cultural site. The survey is anonymous and voluntary, with assistance provided by museum staff if needed. Visitors access the survey by scanning a QR code displayed on a bilingual (Italian and English) poster. The questions, although consistent across all surveys, were tailored to the specific offerings of each cultural site (e.g., whether both VR and AR were available or only one of the two). Data collection is ongoing, and this study is based on survey responses collected from 18 museums across northern, central, and southern Italy. A total of 216 responses were gathered between late November 2024 and early March 2025, during the low seasonal period.

The cultural sites from which responses have been collected so far are:

- Northern Italy: Lumen Museum, Cles Palace, SASS, Rodari Museum, Forte Bard
- Central Italy: Villae, Appia Park
- Southern Italy: Villa Frigerj, La Civitella Museum, Castello Svevo, Castel del Monte, Castello Melfi, Siritide Archaeological Museum, Sannio Caudino Archaeological Museum, Libero d'Orsi Archaelogical Museum, G. Vallet Museum
- Islands: Turritano Archaeological Museum, Bellini Museum

The survey collects information on the following variables:

- Age
- Gender
- Level of education
- Country of origin
- Familiarity with immersive technologies (e.g., VR, AR, virtual tours)
- Overall satisfaction with the visit

The familiarity with immersive technologies and the satisfaction with the immersive experience are measured using a Likert scale from 1 (strongly disagree) to 5 (strongly agree), with 3 indicating a neutral opinion. The satisfaction with the immersive experience is assessed through a total of 9 questions, as follows:

Pre-visit experience:

- "Before the visit, the virtual tour sparked my surprise and interest in the museum."

During the visit (5 questions):

- "The use of augmented/virtual reality has improved my visit to the museum."
- "The information provided through augmented/virtual reality was clear and useful."
- "I found the use of AR/VR technology at the museum interesting."
- "Virtual reality has enriched my geographical and cultural understanding."
- "I experienced positive emotions and a sense of connection during the AR/VR experience."

Post-visit experience:

- "After the visit, augmented/virtual reality helps me better understand the museum's information."

Expectations:

- "I would like to use AR/VR again during future visits."

Concluding question:

- "I would recommend using AR/VR to other visitors."

### *NetLogo Simulation Setup and Parameters*

The agent-based simulation conducted using NetLogo is designed to predict visitor satisfaction based on various demographic and experiential factors. The simulation utilizes monthly seasonal data from ISTAT and analyzes the following variables:

- Age range
- Gender

- Provenance (Italian or foreign)
- Education level: Categorized as Low, Medium, and High.
- Familiarity with immersive technologies: Categorized as Low, Medium, and High.
- Satisfaction with the immersive experience: Categorized as Low, Medium, and High.

The simulation models the interactions and behaviors of visitors within the museum environment, taking into account these factors to reflect the actual conditions observed in the participating museums. The parameters were set based on the survey data collected, and the model was calibrated to ensure accuracy in predicting visitor satisfaction.

***Simulation Code Analysis***

The simulation setup involves the following key steps:

***Global Variables***

- season: Represents the current season, initially set to "spring".
- adoption-rate: Represents the adoption rate of immersive technology, set to 0.15.

***Turtle Variables***

- age: Age of the visitor.
- gender: Gender of the visitor ("male" or "female").
- education: Education level of the visitor ("low", "medium", "high").
- origin: Origin of the visitor ("Italy" or "Outside").
- tech-familiarity: Familiarity with immersive technology, measured on a Likert scale from 1 to 5.
- satisfaction: Satisfaction with the immersive experience, measured on a Likert scale from 1 to 5.

***Setup Procedure***

Clears the environment and sets initial values for season and adoption-rate.

Creates 290 turtles (representing tourists) and assigns random positions.

Assigns demographic and experiential attributes to each turtle based on weighted distributions.

Sets visual attributes (color and size) based on technological familiarity and satisfaction levels.

### *Helper Functions*

- weighted-age: Assigns age based on a weighted distribution.
- weighted-education: Assigns education level based on a weighted distribution.
- weighted-tech-familiarity: Assigns technology familiarity based on a weighted distribution.
- weighted-satisfaction: Assigns satisfaction level based on a weighted distribution.

The simulation uses these weighted distributions to create a realistic representation of the visitor population and their interactions with immersive technologies. The model is calibrated to reflect the actual survey data, ensuring accurate predictions of visitor satisfaction. The detailed code for the NetLogo simulation is provided in the appendix.

## Results

This section presents the key findings of our study. First, the results of a visitor survey conducted in 18 Italian museums are analyzed, focusing on demographic characteristics, familiarity with immersive technologies, and satisfaction levels during the low-season period. Then, based on the survey data, an agent-based model (ABM) is implemented in NetLogo to simulate and predict visitor behaviors during the spring season.

### *Survey Findings*

Southern Italy hosts the highest number of museums in the survey (50%), while Central Italy, despite having only 11% of the museums, records a disproportionately high number of visitors. This reflects national trends, where Lazio—particularly Rome—attracts the largest share of cultural tourists. Northern Italy (22%) and the Islands (11%) form distinct museum clusters, with visitor numbers varying significantly, indicating different regional tourism dynamics.

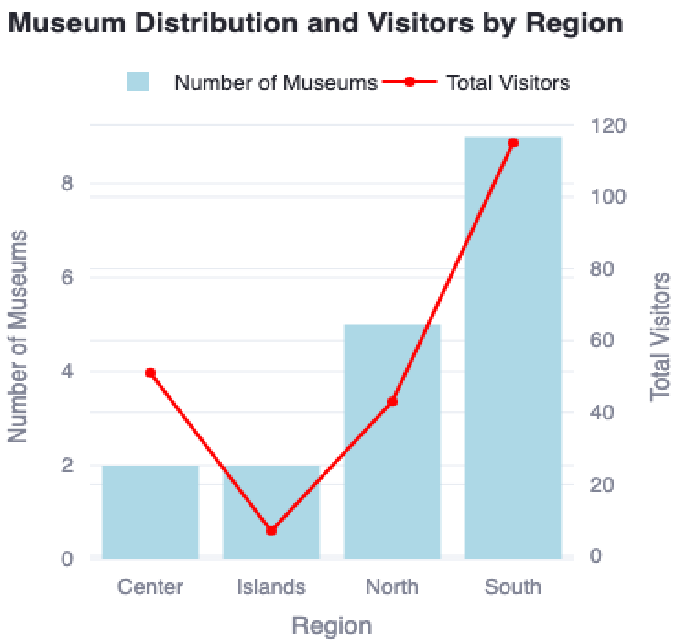


**Figure 4.** Museum Distribution and Visitors by Region (2025).
Source: Authors' elaboration based on survey data.

The vast majority of visitors (82.1%) were Italian, while 17.9% were international tourists. Gender distribution follows general museum trends (Hill, 2016; Lacoe et al., 2020), with female visitors predominating (57.4%) over male visitors (42.6%) in most institutions. However, exceptions include Villae and Vallet museums, where male visitors were more frequent. The most balanced gender distribution was observed in medium-sized museums.

### *Visitor demographics per Museum*

The highest visitor counts were recorded at Villae (14.8% of total visitors) and Montesarchio (14.4%). Several museums showed moderate attendance (7-11.6%), while smaller institutions such as SASS and Bellini had minimal attendance (0.5-0.9%). These variations suggest significant differences in museum popularity and accessibility.

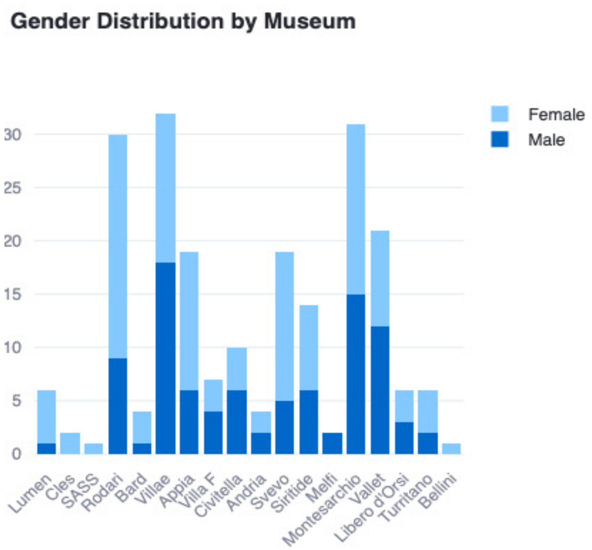


**Figure 5.** Gender Distribution by Museum.
Source: Authors' elaboration based on survey data.

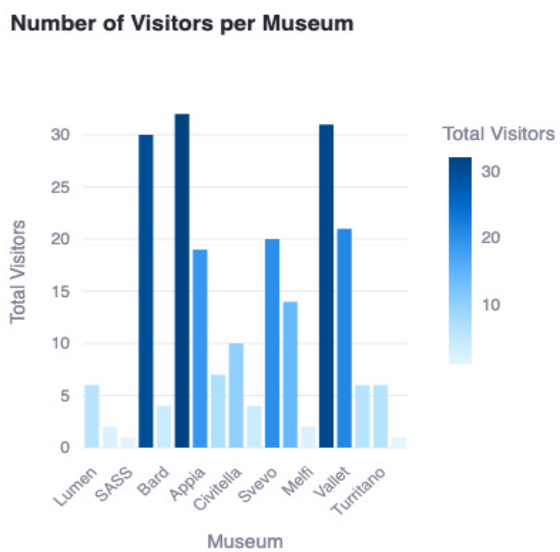


**Figure 6.** Number of Visitors per Museum.
Source: Authors' elaboration based on survey data.

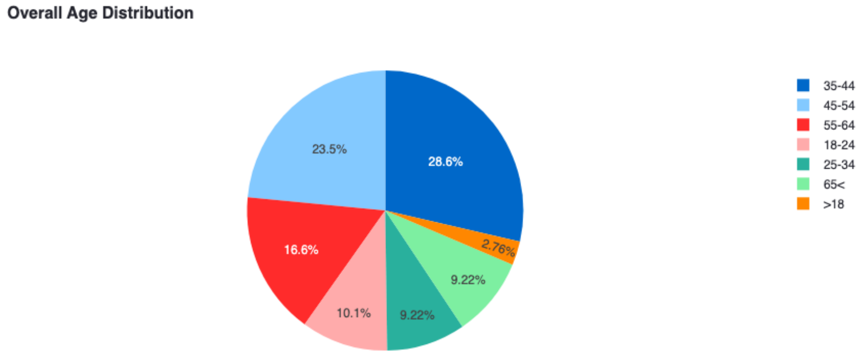


**Figure 7.** Overall Age Distribution of Visitors.
Source: Authors' elaboration based on survey data.

The most represented age groups were middle-aged visitors: 35-44 (28.6%) and 45-54 (23.5%), making up a substantial proportion of the total. Young adults (18-24: 10.1%) and seniors (65+: 9.2%) accounted for smaller but notable shares, while visitors under 18 constituted the smallest segment (2.8%). These trends suggest that museums primarily attract adult audiences, indicating opportunities to enhance engagement with younger visitors.

Higher education levels were dominant among visitors, with 63.7% holding complete university degrees. Medium education levels represented a substantial secondary segment (25.9%), while lower education levels had minimal representation (10.5%). These findings suggest that museums primarily attract individuals with higher educational backgrounds.

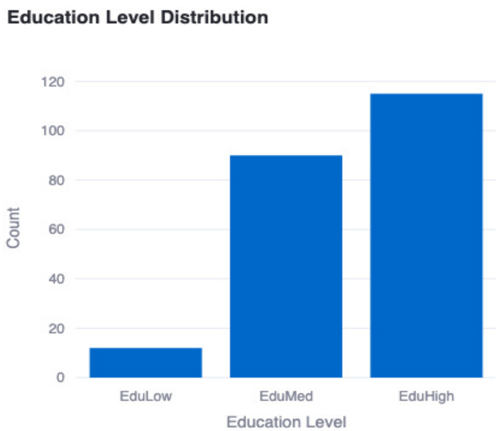


**Figure 8.** Education Level Distribution of Visitors
Source: Authors' elaboration based on survey data.

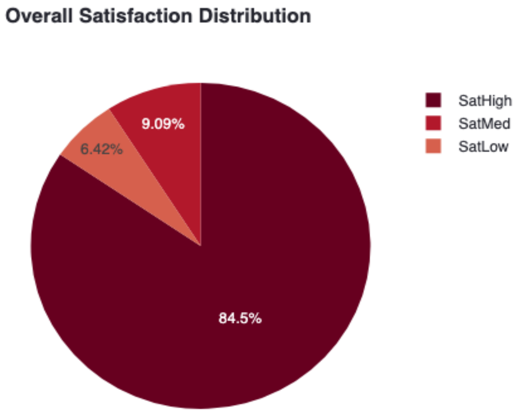


**Figure 9.** Overall Visitor Satisfaction Distribution
Source: Authors' elaboration based on survey data.

### *Visitor Satisfaction*

Overall, visitor satisfaction levels were high across all surveyed museums. A significant portion (84.5%) of visitors reported high satisfaction, while medium satisfaction was noted in 9.1% of cases. Only 6.4% of visitors expressed low satisfaction, suggesting generally positive visitor experiences.

Visitors with high technology familiarity (62.2% of respondents) tended to report higher satisfaction levels, with 80.7% of respondents in this group reporting high satisfaction. In contrast, visitors with medium technology familiarity (16.2%) showed a more balanced satisfaction distribution, with 53.6% reporting high satisfaction and 26.8% medium satisfaction. Those with lower technology familiarity (21.6%) exhibited more varied satisfaction ratings, with 62.5% high satisfaction, 23.4% medium satisfaction, and 14.1% low satisfaction. This pattern suggests that comfort with technology may influence overall museum experience satisfaction (see figure 10).

## Relationship between technology familiarity and visitor satisfaction

This relationship is depicted by Figure 10, below.

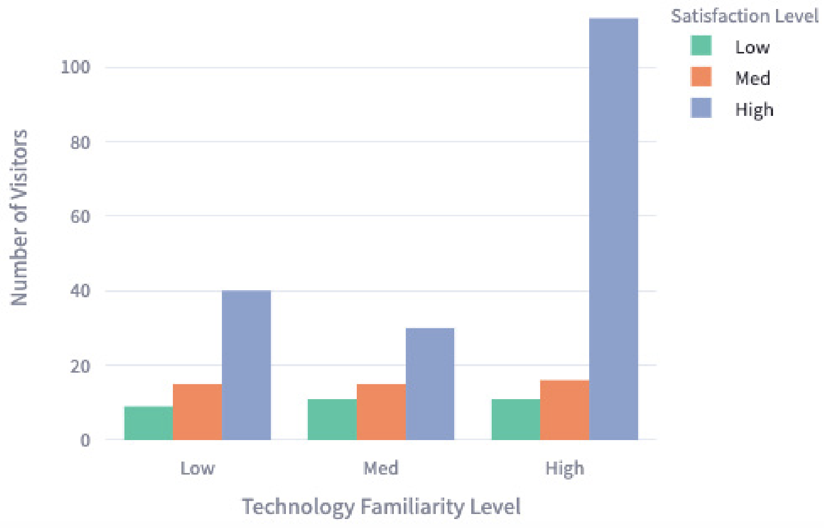


**Figure 10.** Relationship between technology familiarity and visitor satisfaction.
Source: Authors' elaboration based on survey data.

### *Correlation Analysis*

There is a statistically significant positive correlation (0.62) between higher education levels (EduHigh) and overall visitor numbers, suggesting that museums with educational content attract more educated visitors. Visitor demographics exhibit interesting patterns: museums with higher male attendance also tend to have higher international visitors (correlation 0.58), indicating potential gender differences in international tourism. The 35-44 age group shows the strongest correlation (0.71) with high technology familiarity (FamHigh), suggesting this demographic is most comfortable with digital museum technologies. Museums with visitors reporting high satisfaction (SatHigh) show positive correlation with both high education levels (0.57) and high technology familiarity (0.49), highlighting the potential influence of these factors on visitor experience quality.

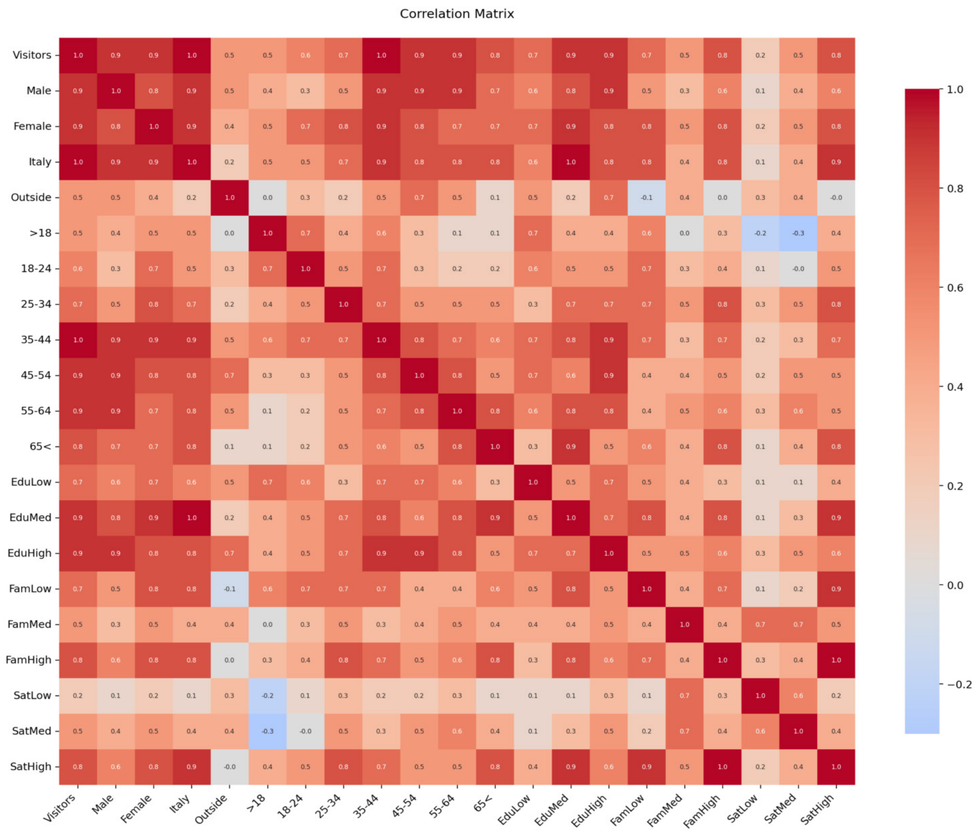


**Figure 11.** Correlation matrix of visitor characteristics and museum experience. Source: Authors' elaboration based on survey data.

### *Statistical Insights*

Mean visitor counts vary significantly across museums, with a high standard deviation reflecting attendance variability. Demographic distributions confirm clear patterns across different visitor segments, reinforcing the trends observed in graphical representations.

The summary statistics reveal significant variations in museum visitation patterns, with a mean of 12.0 visitors per museum but a substantial standard deviation of 10.5, indicating a highly uneven distribution of visitors across institutions. Demographic analysis shows that Italian visitors (mean: 9.9) substantially outnumber international visitors (mean: 2.1), with an 82.5% to 17.5% split, suggesting primarily domestic interest in these cultural institutions.

Gender distribution analysis shows a slight female predominance (mean: 6.6) compared to male visitors (mean: 5.4), representing a 55% to 45% split, consistent with broader cultural visitation patterns. Education level statistics confirm the prominence of visitors with high educational attainment (mean: 6.4), representing 53.3% of all visitors, compared to medium (mean: 5.0, 41.7%) and low education levels (mean: 0.7, 5.0%), highlighting museums' appeal to educated audiences. For details see Table 1 in Appendix.

## Agent-Based Model (ABM) Simulation Results

The NetLogo simulation was used to analyze visitor satisfaction under different conditions, considering seasonal trends, demographics, and familiarity with immersive technologies. The simulation complements our survey data by modeling potential changes in visitor satisfaction under different technology adoption scenarios, providing predictive insights that cannot be directly derived from static survey responses.

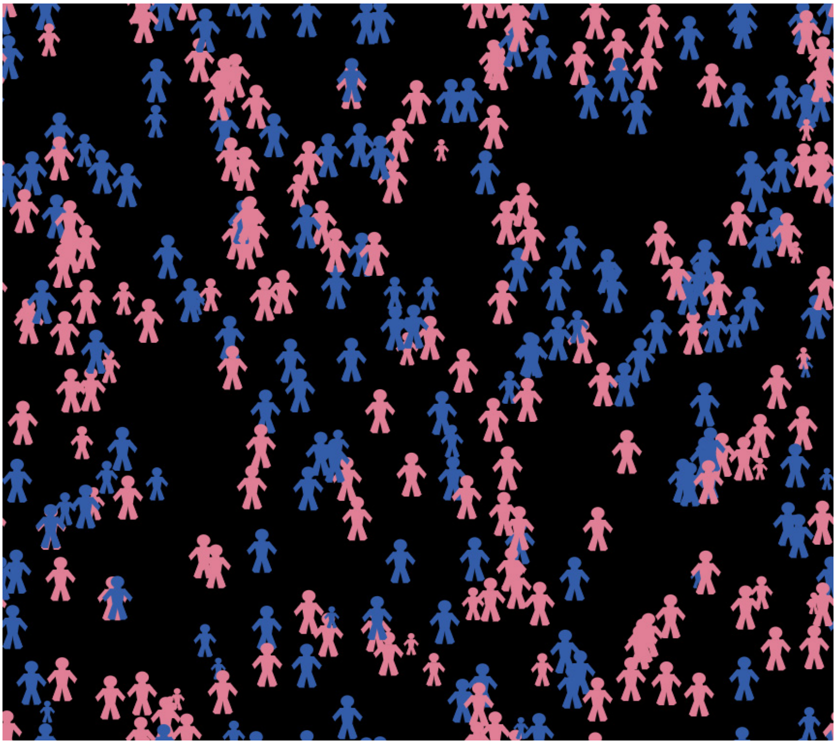

**Figure 12.** Netlogo Simulation: Spring 2025.
Source: Authors' elaboration based on simulation data.

### ***Visual Representation of Agents***

Tourists are visually encoded within the simulation for intuitive observation:

- *Shape*: Each agent is depicted as a "person" shape.
- *Color Coding*: Gender is differentiated through color—blue for male, pink for female.
- *Size Encoding*: Satisfaction levels are visually emphasized through size: agents with high satisfaction are largest, followed by medium, and then low satisfaction levels.

The simulation replicates the behaviors and demographic characteristics of 290 tourists visiting a diverse set of museums during the spring season. The initial adoption rate for immersive technologies among tourists is set at 15%, in alignment with empirical estimations from preliminary survey data.

### ***Tourist Demographics***

The virtual population was constructed to mirror real-world distributions based on survey inputs:

- *Age Distribution*: The tourists' ages span from under 18 to over 65, with the most significant concentration found within the 35–54 age range. This segment comprises a pivotal demographic for cultural engagement and technology adoption.
- *Gender Distribution*: A slight majority of tourists are female (57.4%), compared to 42.6% male, indicating a gendered nuance in museum visitation patterns.
- *Educational Attainment*: High educational levels predominate among the tourists, suggesting a correlation between academic background and cultural tourism.
- *Geographic Origin*: Most tourists originate from Italy (82.1%), with the remaining portion representing international visitors. This underscores the domestic appeal of the museum network in the analyzed region.

### ***Museum Allocation***

Tourists are algorithmically distributed across various museums based on historical attendance data. The simulation includes diverse institutional types—such as Villae, Montesarchio, Medium-sized museum, Small museum, SASS, and Bellini—thereby allowing for the observation of heterogeneous visitor dynamics across museum typologies.

### *Familiarity with Immersive Technology*

Familiarity levels with immersive technologies were also integrated into the simulation. Most tourists exhibit a high level of familiarity, followed by medium and low levels, reflecting the growing pervasiveness of digital interfaces in cultural experiences.

### *Tourist Satisfaction*

The simulation reveals notable satisfaction outcomes:

- *High Satisfaction*: 84.5% of tourists report high satisfaction, reflecting strong engagement levels with the museum offerings.
- *Medium Satisfaction*: 9.1% of tourists express a moderate level of satisfaction.
- *Low Satisfaction*: Only 6.4% of tourists report low satisfaction, indicating a marginal discontent that warrants further investigation, particularly in relation to museum assignment and technological familiarity.

## Discussion

Cultural tourism trends from ISTAT are examined to assess their alignment with visitor demographics and behaviors identified through the survey and the simulation.

Domestic tourism remains prevalent in both our data and ISTAT trends, with a growing portion of international tourism, particularly in the post-pandemic period. Our simulation also predicts a slight increase in foreign tourists in the coming months. Considering the location of museums, those centrally situated in Lazio and the Museo Rodari in Lombardia recorded the highest levels of responses. This is partially consistent with Figure 3, which highlights greater cultural engagement in central-northern Italy compared to the south. However, the situation in the north is still evolving; for example, museums in Trentino currently show low participation rates, likely due to closures affecting some of these institutions, a part of which was therefore not included in this initial survey. Significant deviations or emerging patterns may indicate shifts in visitor preferences, such as increased interest in immersive and interactive experiences. Similar studies have highlighted the growing role of immersive technologies in enhancing visitor experiences and promoting cultural heritage (Pratisto *et al.,* 2022; Colamatteo *et al.,* 2024)

According to De Luca *et al.* (2022), VR technology can significantly enhance visitor engagement with cultural heritage, as demonstrated by their VR360 application for the city of Bari. Their user experience (UX) evaluation revealed high satisfaction levels in terms of usability, immersion, and the sense of presence. Similarly, Li & Huang (2022) emphasize how the virtual Palace Museum leverages immersive storytelling, interactive learning, and peer sharing to transform passive tourists into active explorers. These findings align with Guttentag's (2010) argument that VR can provide alternative heritage experiences, supporting both visitor engagement and heritage preservation. Furthermore, Bekele *et al.* (2018) highlight the role of augmented reality (AR) in enhancing historical education and cultural visualization. Our findings contribute to this ongoing discussion, examining the nuanced impact of digital tools in cultural heritage settings, including both their benefits and potential drawbacks.

Immersive technologies present significant potential benefits, as they can greatly enhance visitor engagement, learning, and overall satisfaction. By offering interactive and multisensory experiences, they appeal to a broader audience, particularly younger generations and international visitors, which is essential for the future of cultural tourism. Additionally, the ability to virtually recreate historical settings and artifacts provides new opportunities for education and accessibility, allowing a wider range of users to engage with cultural heritage in innovative ways.

The findings from the NetLogo simulation reinforce these theoretical considerations. The simulated population, calibrated on the demographic characteristics from survey data, showed high levels of satisfaction among tourists—especially those with a high familiarity with immersive technologies. Notably, 84.5% of virtual visitors reported high satisfaction, with only 6.4% expressing dissatisfaction. This suggests a strong alignment between technological familiarity and positive user experience. Moreover, the simulation revealed that increasing the adoption rate of immersive technologies (from 15% to 30%) can potentially amplify satisfaction levels across the visitor base. The visual encoding of agents in the simulation further supports this pattern: tourists with higher technological familiarity appeared larger and were more prevalent in high-satisfaction categories. This outcome highlights not only the importance of increasing access to immersive experiences but also the value of digital literacy initiatives in museums to reduce exclusionary effects. In terms of museum typologies, the simulation allowed for comparative analysis across different institutions (e.g., Villae, SASS, Bellini, Montesarchio), suggesting heterogeneous responses that could be further investigated in future research to assess context-specific effects of immersive technology deployment.

However, these advancements also introduce challenges and critical reflections. The increasing reliance on digital content raises concerns about the potential dilution of authenticity in traditional museum experiences. While virtual environments can offer deeper engagement, they might also shift the focus away from the tangible, physical aspects of heritage. Furthermore, the integration of these technologies requires substantial investment, not only in digital infrastructure but also in staff training to ensure effective implementation. Museum management must carefully balance technological innovation with heritage conservation, ensuring that digital enhancements complement rather than overshadow traditional cultural narratives.

Despite these insights, it is important to acknowledge the survey's limitations. As the study is still ongoing, the findings remain preliminary and subject to updates as data collection progresses. The voluntary nature of participation may introduce selection bias, as some visitors may have opted not to take part. Additionally, while the use of a QR code aimed to facilitate quick and easy access to the survey, it may have inadvertently discouraged participation among visitors with lower digital literacy. Regarding representation and data scope, the participating museums are geographically distributed across northern, central, and southern Italy. However, they may not fully capture the diversity of immersive technology applications nationwide. Some major museums with high tourist flows have yet to join the study, potentially limiting the generalizability of the findings. Looking ahead, future improvements and research directions will focus on expanding the dataset to enhance the accuracy of predictive models, such as the NetLogo simulation. As data collection continues, a more comprehensive analysis will provide deeper insights into the evolving role of immersive technologies in cultural heritage. Integrating longitudinal data and cross-institutional comparisons could also help refine strategic planning in museum management, ensuring inclusive, impactful, and sustainable adoption of immersive tools.

## Conclusions

This study highlights the continued predominance of domestic tourism in Italy, with a gradual increase in international visitors, particularly in the post-pandemic period. The findings underscore significant regional disparities in museum participation, with central institutions experiencing higher engagement than their northern and southern counterparts. Moreover, immersive technologies are emerging as powerful tools for enhancing visitor engagement, learning, and satisfaction, aligning with trends observed in ISTAT data and existing academic research.

While immersive and interactive experiences hold great potential for attracting diverse audiences, including younger and international visitors, their implementation requires careful consideration. The integration of digital tools must strike a balance between innovation and heritage conservation, ensuring that technological advancements enhance rather than diminish the authenticity of museum experiences. In our project, the survey is still ongoing; therefore, we aim to verify the ABM predictions and refine our findings after the conclusion of the spring 2025.

Additionally, future research should explore the differential impact of immersive technologies across various demographic groups, particularly focusing on their influence on younger visitors and international tourists. We are specifically aiming to focus on student groups.

Finally, future studies should investigate the long-term effects of digital tools on visitor engagement, retention, and museum attendance. Given that immersive and interactive experiences are still in their early stages, further data collection is needed. More specifically, museums should leverage immersive technologies to enhance visitor experiences, making cultural heritage more accessible and engaging. This can only be achieved after the allocation of PNRR funds in Italy, which are currently enabling the digitalization of many museums, so the work is still ongoing. It could also be valuable to disseminate surveys and other data-driven strategies in museums to optimize marketing efforts and tailor exhibits to meet evolving visitor expectations. Museums must ensure that technological innovations complement traditional museum narratives, preserving the authenticity and integrity of cultural heritage.

As digital transformations continue to reshape cultural tourism, museums must adopt a strategic approach that embraces innovation while preserving the richness of historical and artistic heritage. Ongoing research will be essential in guiding these developments and ensuring that immersive technologies serve as a bridge—rather than a barrier—to cultural appreciation.

## Acknowledgements

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**Table 1. Statistical insights. Descriptive statistics per museum (n = 18 museums, total respondents = 216)**
**Note:** ***Each row summarizes per-museum visitor distributions (mean, std dev, etc.) based on survey data.***

| Statistic | Visitors | Male | Female | Italy | Foreign | >18 | 18-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65< | EduLow | EduMed | EduHigh | FamLow | FamMed | FamHigh | SatLow | SatMed | SatHigh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Count | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Mean | 12 | 5.11 | 6.83 | 9.89 | 2.11 | 0.33 | 1.22 | 1.11 | 3.44 | 2.83 | 2 | 1.11 | 0.67 | 5 | 6.39 | 2.22 | 1.67 | 6.39 | 0.67 | 0.94 | 8.78 |
| Std Dev | 10.82 | 5.29 | 6.21 | 9.71 | 3.07 | 0.69 | 1.06 | 1.28 | 3.42 | 2.33 | 2.54 | 1.97 | 0.97 | 5.48 | 5.62 | 2.41 | 1.85 | 6.49 | 1.03 | 0.99 | 9.05 |
| Min | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 25% | 4 | 1.25 | 2.25 | 2 | 0 | 0 | 1 | 0 | 1 | 1.25 | 0 | 0 | 0 | 2 | 2.25 | 0 | 0 | 2 | 0 | 0 | 2 |
| 50% | 6.5 | 3.5 | 4 | 6 | 1 | 0 | 1 | 1 | 2.5 | 2 | 1 | 0 | 0 | 2 | 4 | 2 | 1 | 4 | 0 | 1 | 5 |
| 75% | 19.75 | 6 | 12 | 14.75 | 2.75 | 0 | 1.75 | 2 | 5.75 | 4.75 | 3 | 1.75 | 1 | 6.75 | 11 | 3 | 2.75 | 9 | 1 | 1 | 13.75 |
| Max | 32 | 18 | 21 | 31 | 11 | 2 | 4 | 4 | 11 | 9 | 9 | 8 | 3 | 19 | 19 | 8 | 7 | 20 | 4 | 3 | 30 |

Source: Authors' calculation

**NetLogo code**

```
globals [season adoption-rate]

turtles-own [
 age
 gender   ;; “male” or “female”
 education-level ;; “low”, “medium”, “high”
 origin   ;; “Italy”, “Outside”
 tech-familiarity-level ;; “low”, “medium”, “high”
 satisfaction-level  ;; “low”, “medium”, “high”
 museum ;; Museum assignment based on attendance data
]

;; SETUP PROCEDURE

to setup
 clear-all
 set season “spring”  ;; Seasonal setting
 set adoption-rate 0.15 ;; Initial adoption rate of immersive technology

 create-turtles 290 [  ;; Number of tourists
  setxy random-xcor random-ycor  ;; Random positioning
  set age weighted-age  ;; Assign age based on survey data
  set gender weighted-gender  ;; Assign gender distribution
  set education-level weighted-education ;; Assign education level
  set origin weighted-origin  ;; Assign visitor origin
  set museum weighted-museum ;; Assign museum based on attendance
  set tech-familiarity-level weighted-tech-familiarity ;; Assign familiarity level
  set satisfaction-level weighted-satisfaction ;; Assign satisfaction level
  set shape “person” ;; Default shape
  ;; Debug print per controllare i valori assegnati
  show (word “Satisfaction: “ satisfaction-level)

  set shape “person” ;; Default shape


  ;; Assign colors based on satisfaction level
  ifelse satisfaction-level = “low” [set color red]
   [ ifelse satisfaction-level = “medium” [set color yellow]
    [set color green] ]
```

```
    ;; Adjust colors for gender to prevent overlap
    if gender = “male” [set color blue]
    if gender = “female” [set color pink]

    ;; Set size based on satisfaction level
    ifelse satisfaction-level = “high” [set size 2]
      [ ifelse satisfaction-level = “medium” [set size 1.5]
        [set size 1] ]
  ]
  reset-ticks
end

;; Function to assign age based on survey data
to-report weighted-age
  let r random-float 1
  if r < 0.028 [report 17]  ;; Under 18 (2.8%)
  if r < 0.129 [report random 7 + 18]  ;; 18-24 (10.1%)
  if r < 0.415 [report random 10 + 35]  ;; 35-44 (28.6%)
  if r < 0.650 [report random 10 + 45]  ;; 45-54 (23.5%)
  if r < 0.742 [report random 10 + 55]  ;; 55-64 (9.2%)
  report random 10 + 65  ;; 65+ (9.2%)
end

;; Function to assign gender based on survey data
to-report weighted-gender
  let r random-float 1
  if r < 0.574 [report “female”]
  report “male”
end

;; Function to assign visitor origin
to-report weighted-origin
  let r random-float 1
  if r < 0.821 [report “Italy”]
  report “Outside”
end

;; Function to assign museum based on attendance distribution
to-report weighted-museum
  let r random-float 1
  if r < 0.148 [report “Villae”]
  if r < 0.292 [report “Montesarchio”]
  if r < 0.408 [report “Medium-sized museum”]
  if r < 0.524 [report “Small museum”]
```

```
  if r < 0.633 [report "SASS"]
  report "Bellini"
end

;; Function to assign education level based on survey data
to-report weighted-education
  let r random-float 1
  if r < 0.105 [report "low"]
  if r < 0.364 [report "medium"]
  report "high"
end

;; Function to assign technology familiarity level
to-report weighted-tech-familiarity
  let r random-float 1
  if r < 0.10 [report "low"]   ;; Likert 1-2
  if r < 0.50 [report "medium"]   ;; Likert 3
  report "high"   ;; Likert 4-5
end

;; Function to assign satisfaction level based on survey data
to-report weighted-satisfaction
  let r random-float 1
  if r < 0.064 [report "low"]  ;; 6.4% Likert 1-2
  if r < 0.155 [report "medium"]  ;; 9.1% Likert 3
  report "high"  ;; 84.5% Likert 4-5
end
```

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# AN EVALUATION OF TAX AUTHORITIES' RESPONSE TO TAX NONCOMPLIANCE: EVIDENCE FROM BOTSWANA

**Edmore MUNJEYI**[1], **Daniel SCHUTTE**[2]

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**ABSTRACT.** This study critically examines the reforms implemented by the Botswana Unified Revenue Service in addressing tax noncompliance, focusing on their influence on taxpayer behaviour. Tax noncompliance, encompassing both evasion and avoidance, poses a significant challenge globally, particularly in terms of impacting revenue collection in developing nations and necessitating an analysis of international responses. Employing a qualitative approach, this research utilised face-to-face interviews and focus group discussions with taxpayers and educators to gauge perceptions of compliance strategies and their effects on voluntary compliance. The findings indicate that reforms by the Botswana Unified Revenue Service have substantially increased tax revenue and increased voluntary compliance, reflecting a shift in taxpayer attitudes from justifying noncompliance to viewing tax payments as moral obligations. The findings underscore the importance of perceived government efficacy and transparency in shaping taxpayer attitudes. This approach highlights the critical role of effective public service delivery in promoting responsible taxpaying behaviour and enhancing overall tax compliance.

This study elucidated the multifaceted strategies employed in addressing tax noncompliance and their resultant impact on taxpayer behaviour. While substantial progress has been made in promoting tax compliance, adopting digital tools presents a promising avenue for further advancing tax compliance.

**Keywords:** tax noncompliance, tax compliance, taxpayer, revenue service response, revenue yield, Botswana

**JEL classification:** H20, H25, H71

[1] School of Accounting Sciences, North-West University, South Africa. Corresponding author. Email: eddiemunjeyi@gmail.com
[2] School of Accounting Sciences, North-West University, South Africa.
E-mail: danie.schutte@nwu.ac.za

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## Introduction

Taxation plays a crucial role in financing public goods and services globally (Holz *et al.,* 2023). Effective tax policy requires robust compliance from economic agents to ensure tax revenue sufficiency (Alm & Barreto, 2024). The scholarship literature shows that to raise sufficient and reasonable revenue to finance public expenditure, all economic players must collectively adhere to the parameters and dictates of tax policy (Santoro *et al.,* 2022). Theoretically, tax policy assumes that economic players (or agents) are homogeneous, that is, risk-neutral (Mishi & Tshabalala, 2023). However, empirical evidence suggests that economic agents portray heterogeneous tax paying behaviour (Farrar *et al.,* 2022) influenced by factors such as tax morale, social norms and perceptions of fairness (Munjeyi & Schutte, 2024). The extant literature suggests that an effective tax policy embraces the heterogeneous nature of economic agents. Accordingly, this research is underdeveloped yet very critical for obtaining a comprehensive understanding of tax compliance and the efficacy of policy interventions (Mishi & Tshabalala, 2023).

The performance of revenue authorities is often measured by the amount of tax revenue collected; however, the collection of tax revenue is a function of various factors, including tax compliance mechanisms and certain taxpayers (Kischler, 2007). Tax compliance, encompassing activities such as tax evasion, tax fraud and avoidance, is particularly detrimental in developing countries, where it exacerbates the tax revenue gap and hampers the provision of public services (Lawan, 2017; Alm & Liu, 2023). The degree of tax noncompliance, especially in developing countries, worsens the performance of the tax revenue yield (Alm & Kasper, 2023), leading to failure to finance public goods and services (Mishi & Tshabalala, 2023). Researchers warn that if this goes unchecked or uncontrolled, tax noncompliance can threaten the integrity and ability of the tax regime to raise much-needed tax revenue. Addressing this challenge requires effective policy interventions tailored to local contexts (Monyake *et al.*, 2023).

Recent global efforts emphasise the need for targeted tax reforms to alleviate noncompliance and restore public trust in tax systems (OECD/AUC/ATAF, 2023; Ali *et al*., 2021; Alm & Liu, 2023). However, the literature, specifically to responses in developing countries such as Botswana, remains limited (Syamsudin *et al*., 2023; Acedo *et al.,* 2022). Understanding these responses is critical in formulating effective enforcement strategies against tax noncompliance (Dabla-

Norris *et al*., 2019). Arguably, the literature is silent about how these developing countries have responded to tax noncompliance challenges (Duhoon & Singh, 2023).

Considering the level of tax noncompliance in Botswana, a comprehensive evaluation of the implications of different reforms deployed by the Botswana Unified Revenue Service (BURS) in response to tax noncompliance, using both a theoretical framework and empirical evidence, is therefore needed (Monyake *et al*., 2023). Lawan (2017) argues that several reforms or methods have been developed and developed by different tax jurisdictions, including Botswana, to alleviate or combat tax noncompliance worldwide, including tax audits, fines and penalties, among others, with varying degrees of achievement; nevertheless, the expected tax revenue yield is yet to be attained as tax revenue increases remain very low (BURS, 2020). The majority of previous studies have focused only on the factors influencing tax compliance in developing countries (Marandu *et al.*, 2015; Stam & Verbeeten, 2015) rather than analysing and evaluating the implications of tax jurisdiction reforms for tax noncompliance (Alm & Liu, 2023). Tilahun (2019) studied the determinants of tax compliance, and Monyake *et al.* (2023) examined the challenges of ensuring tax compliance in developing countries. All these researchers concur that tax noncompliance is pervasive and that tax authorities should use strategies to encourage voluntary tax compliance, especially in developing countries. Bornman (2014) postulates that strategies adopted by tax authorities to promote voluntary tax compliance should be critically examined to identify loopholes within the existing tax system. However, the lacuna of the above studies is that none have attempted to examine the implications of tax jurisdiction reforms in response to tax compliance. Thus, the primary goal of this study is to critically analyse and evaluate the impact of BURS' response to tax noncompliance in Botswana on the basis of both theoretical foundations and empirical evidence. The central research question is: How do BURS tax reforms influence voluntary tax compliance behaviour among taxpayers in Botswana? To answer this central question, this research reviews the literature on tax compliance and compliance theory. The implications of the response of tax revenue services to tax noncompliance, with a focus specifically on tax compliance behaviour/level, are evaluated and discussed in this study. This study appears to be the first to use qualitative research approaches to examine the implications of tax reforms for tax compliance.

## Theoretical framework

There is a bourgeon of scholarship literature on the drivers of tax compliance (Slemrod *et al.*, 2022; Adhikari *et al.,* 2021). The study draws on theoretical frameworks such as the Australian Taxation Office compliance model, Fischer tax compliance model and the Deterrence tax model to analyse taxpayer behaviour and compliance factors (Kirchler, 2021; Hartmann *et al.*, 2020; Farrar *et al.*, 2022; Fischer *et al.*,1992).

### *The Australian Tax Office compliance model*

The Australian Tax Office Compliance Model was introduced and developed by the Australian government to support comprehensive appreciating taxpayer behaviour and develop strategies aimed at enhancing tax compliance (Braithwaite, 2003). Also, to enforce tax law and other relevant actions or strategies that can be pursued to influence taxpayers to comply with tax legislation (Bornman, 2014). Thus, an in-depth understanding of the factors that influence taxpayers' behaviour and developing effective strategies to solve them is of paramount importance for finding lasting solutions to alleviate tax noncompliance (The Parliament of the Commonwealth of Australia, 2014). Premised in behavioural economics and psychology, the theory consolidates insights from social norms theory and decision-making psychology to illuminate the factors that influence taxpayer compliance (Bornman, 2014). Central to the Australian Taxation Office model is the recognition of the interaction between deterrence mechanisms, such as penalties for noncompliance, and supportive strategies that substitute voluntary compliance through education, taxpayer assistance programs, and transparent communication. By accentuating the importance of trust in tax administration and the perceived fairness of tax policies, the Australian Taxation Office model underlines the role of compliance as a social norm or duty, which is prejudiced by insights into procedural justice and the legitimacy of tax authorities. The compliance tax model recognises that taxpayer behaviour is influenced by the business profile, industry, and sociological, economic and psychological factors (Bornman, 2014; The Parliament of the Commonwealth of Australia, 2014). These factors, together with taxpayer values, beliefs and attitudes, may influence the decision to either comply or not comply with taxation obligations and systems.

More recent studies have argued that taxpayers' compliance behaviour is influenced by multiple factors and that tax authorities must spend time understanding key behavioural drivers and other external influences (Adhikari *et al.,* 2021).

### *Fischer tax compliance model*

The model was proposed by Erich H. Fischer in 1992 and includes economic, social and psychological factors as determinants of tax compliance (Fischer *et al.*, 1992). These factors were then integrated into one comprehensive conceptual framework (Fischer, 1993). The model assumes that tax compliance is influenced by the following four major constructs: attitude and perception (related to ethics, procedural fairness (or equity), and peer influence) (Kirchler, 2021); tax structure (such as penalty, tax rate and possibility of detection (Lawan, 2017), and complexity of the tax system; societal influence); noncompliance opportunity (which comprises sources and income levels and occupation) (Fischer, 1993) and demographic factors (such as age, gender and education level) (Saeed *et al.*, 2020). Generally, the model provides a theoretical framework that explains tax compliance behaviour among taxpayers through the perspectives of deterrence theory and economic rationality (Lawan & Salisu, 2017). The theory is premised on the expected utility concept, in which taxpayers weigh the expected returns (or benefits) accrued from compliance against the associated tax compliance costs (Chau & Leung, 2009). This model assumes that factors such as the probability of detection, fines and sternness of penalties influence taxpayer compliance behaviour (Alm, 1999).

The Fischer model provides the merits of deterrence measures in tax systems and further outlines the challenges associated with balancing compliance enforcement measures and revenue authorities' efforts to encourage and foster a culture of voluntary tax compliance through various initiatives and economic incentives.

### *The deterrence tax model*

The deterrence tax model, proposed by Allingham & Sandmo (1972), is embedded in criminology and behavioural economics (Thurman, 1991). The model posits that tax compliance is influenced by three key factors, namely, the perceived certainty, severity, and swiftness of sanctions imposed on noncompliant behaviour (Alm,1999). Central to the deterrence tax model is a rational choice theory, wherein taxpayer tax noncompliance behaviour is a result of weighing the expected or potential benefits of violating tax laws and the probability of detection, conviction and/or the severity of penalties (Thomas *et al.,* 2016). If the expected benefits outweigh the costs of detection, the severity of penalties or conviction, then taxpayers are likely to evade taxes and vice versa (Devos, 2014). Thus, tax compliance is attained only when taxpayers believe that the probability of detection, conviction and penalties is high (Antonides & Robben, 1995). Broadly, behavioural intentions such as attitudes, perceived behavioural control and subjective norms (Thomas *et al.,* 2016) are critical factors of tax compliance. The model has been helpful in shaping tax policy and enforcement strategies globally, guiding policymakers in designing regulatory frameworks that strike a balance between deterrence and incentives for voluntary compliance (Slemrod, 2007). However, empirical evidence reveals that new factors influence taxpayer compliance behaviour, namely, social factors, cultural factors and psychological factors (Misra, 2019).

The ATO, Fischer tax compliance model and the deterrence tax model inform this study. These theories are built on how tax authorities can influence tax compliance behaviour, in a manner that optimises tax administration. These theories underscore that taxpayers are inherently noncompliance hence the need for enforcement strategies to promote tax paying culture. The models show that there is no single variable or critical factor that influence voluntary tax compliance but multiple factors including social, cultural, economic, psychological and political among others.

From this perspective, the study considers voluntary tax compliance as a special ingredient to ensuring optimised tax administration within digital economy (Strauss, 2021). This study, therefore, like Munjeyi & Schutte (2024), deploys the ATO, Fischer tax compliance model and the deterrence tax model to taxation landscape. Furthermore, the study, voluntary tax compliance as a solution to sustainable domestic resource mobilisation in the context of developing countries.

## Research method and design

### *Research design and sampling*

To understand the implications of BURS' response to tax noncompliance, the researchers employed a constructivist paradigm because people's views and meanings can be derived through interactions with society or the environment. The study employed a qualitative research approach involving focus group discussions (FGDs) and interviews. The researchers used a purposive sampling technique to select key informants, comprising 20 taxpayers and five tax consultants, who were interviewed via an interview guide. A purposive sampling technique was utilised in this study because the researchers wanted to select participants with expert knowledge of taxation and up-to-date tax-related information in Botswana, and the chosen population met the outlined criteria. In the recruitment process used in this study, the interviewed participants had to have a clean tax compliance record with the tax authority. The researchers relied on self-reported compliance behaviour to invite individuals to participate in the study (Rawlings, 2011).

### *Data collection instrument*

The key observations and findings were derived from 25 face-to-face interviews with taxpayers and tax consultants in Gaborone, the capital city of Botswana. The interview guides were developed from a literature review, and the same guide was used for both the interview sessions and the two FGDs. These questions were centred on BURS tax reforms or compliance enforcement strategies, their impact on tax compliance behaviour and, ultimately, interviewees' positions or comments on the whole process of compliance enforcement. Importantly, key informants were selected because of their perceived rich and in-depth understanding of taxation and tax compliance issues affecting BURS. All the interviews were conducted in person and at the workstation of the participant in Gaborone (Table 1). The in-depth interviews used "open-ended questions and conversational style free discussions" (Rawlings, 2011). Furthermore, two FGDs were held with 16 lecturers who were lecturing on taxation or the principle of taxation drawn from both colleges and universities. All FGDs were conducted virtually, the researchers created a link on the Teams platform, and a link was sent to the participants. Each group comprised 8 participants.

**Table 1.** Profile of the participants

| Category | Pseudo/Code | Total | Mode | Physical/virtual | Duration |
|---|---|---|---|---|---|
| Taxpayer | TIN | 20 | Interview | Face-to-face | 30 to 40 minutes |
| Consultant | TC | 5 | Interview | Face-to-face | 30 to 40 minutes |
| Lecturer | TaxLec | 16 | FGD | Virtual | 40 to 60 minutes |

Source: Authors' elaboration (2024)

### *Data analysis*

Qualitative data collected through interviews and FGDs were analysed via thematic analysis. Thematic analysis is a process of classifying (data reduction), scrutinising (data display) and reporting (interpretation) themes within the collected data (Hussain, 2015; Mason, 2010). The thematic analysis comprises three stages, namely, the first stage being the first-level codes, followed by the codes of themes and last, the creation of subthemes (Cropley, 2019; Clarke & Braun, 2017; Rashid, 2017). Thematic data analysis involves numerous stages but not a standardised procedure: data familiarisation, data coding, theme search and discovery and theme review (Cropley, 2019). Saunders *et al*. (2019) and Hussain (2015) posit that the aim of a thematic analysis is to identify themes that occur throughout the data set. Studies show that thematic analysis is a "foundational method for qualitative data" (Saunders *et al*., 2019).

This study adopted and followed Clarke & Braun's (2017) thematic analysis process or stages. The researcher developed codes manually and identified key themes from the participants' responses to interpret the issues raised by the participants (Masiero, 2017; Rashid, 2017). As a result of the iterative process, two overarching themes and several subthemes emerged from the feedback.

### *Ethical considerations*

The following pseudonyms were used to identify participants in this study: taxpayers – TIN; tax consultants – TC; and lecturers – TaxLec (see also Table 1). The use of pseudonyms or codes in this study was important to protect the true identifying details of the participants, which is a fundamental ethical issue. The study was approved by the Faculty of Economics and Management Science Research Ethics Committee at the North West University.

## Empirical results and discussion

This study revealed that the government of Botswana, through BURS, has developed and implemented strategies aimed at addressing tax noncompliance, as suggested by Alm (2019). The findings from these studies demonstrate that, regardless of these efforts and reforms to encourage and promote tax compliance behaviour, high levels of tax noncompliance still exist (Ndlovu & Schutte, 2022). BURS imposed penalties on noncompliant taxpayers as a way of encouraging tax compliance. The results of this study show that penalties have emerged as an additional cost, leading to tax noncompliance. Table 2 below shows the effects of participants' responses or views about the effect of BURS' response to tax noncompliance in Botswana on taxpayer compliance behaviour.

**Table 2.** Excerpts from the participants' statements

| **Emergent subthemes** | **Excerpts from the participants' statements** |
|---|---|
| Audit and investigation rate | *"BURS has increased audit and investigation of tax evasion, and this has induced fear in taxpayers…", TC1*<br>*"BURS conducted a massive tax audit and investigation which had resulted in many car sales losing their trading licence…and as such the taxpayers decided to be faithful…" TC2*<br>*"I think generally, small companies file their tax returns timeously to avoid the taxman's penalties." TC4*<br>*"Generally, business operators feared some the intensity of investigation and people decided to comply with tax laws." TIN13*<br>*"We disclose income faithfully because of fear of being exposed…" TIN14*<br>*"The approach BURS embarked upon was effective if it was continuous …people now have relaxed because the auditing is not regular…" FGD1* |

| **Emergent subthemes** | **Excerpts from the participants' statements** |
|---|---|
| | *"The move was aggressive, especially on the second-hand motor business operators; operations were suspended for those operators who were violating tax law…" FGD2* *"The exercise is effective if they continue and implement it on a wider scale than targeted individuals…",TIN19* |
| Digitalisation (e-filling, e-payment) | *"I think people lacked education, as a result, many people did not use the e-filing…and they continue to queue, and some decided not to file…" T17* *"The introduction of e-payment was welcomed by working classes only and the majority of garages still accept hard cash…and they encourage people to do so…" T11* *"Some operators are discouraging people from using cards (swipes) and shop owners are charging extra P20 for any transaction paid in cash…this was done to conceal the actual transactions leading to underreporting of income…" T4* *"indeed the e-filling is a good move because it saves time and one can file at any time and you don't have to queue, but I believe that in terms of compliance it didn't make any significant difference…" FGD1* *"I don't think the introduction of e-filling significantly improve taxpayers' compliance behaviour, what was supposed to improve tax compliance is e-payment of which the majority of taxpayers do love to see some notes in their pockets than swiping…" FGD2* *"The digitalisation of e-filling does not change the taxpayer's decision or attitude towards tax compliance at all…may be going cashless can significantly contribute to the reduction in tax evasion'"TC5* *"BURS launched e-filling as a way of encouraging taxpayers to comply…my analysis is that taxpayers who were conversant with technology… but the majority still not understanding it…" TC2* |
| Tax sanctions | *"The revenue authority (BURS) used the concept: Kill one and silence 1,000, the cancellation of trading licences on second-hand car dealers in the Mogoditshane area and some Indian shops sent shockwaves to many taxpayers, leading to improved compliance level…" FDG1* |

| **Emergent subthemes** | **Excerpts from the participants' statements** |
|---|---|
| | *"More than 1,000 cars in Mogoditshane were brought under BURS administration due to noncompliance…" FGD2*<br>*"The penalties were severe, resulting in many players in the industry to comply and display their tax clearance certificates…"TC3*<br>*"The fines and penalties were too harsh and compelled people to comply with tax law." TIN17*<br>*"It was a temporary move because there are reports that the evader is devising some ways to escape the taxman…"TIN3*<br>*"The are also some reports of dirt money being cleaned in the name of tithing or pledges to churches…which cripples government effects to close the revenue gap…" TIN18*<br>*"The strategies work well at first, but now people are becoming too sophisticated in cooking books and reducing their tax liability, as such tax revenue collected will remain low…despite all these efforts…" TIN11*<br>*"Tax evaders do not fear penalties or fines at all…they continue to evade…"*<br>*"Naming and shaming is not even a good strategy because we are witnessing corrupt people who have been labelled walking freely…" TIN19*<br>*"The fact that Indians and Chinese-owned shops are allowed to trade on a cash basis and without banking money is one loophole that motivates people not to pay tax, regardless of the severity of punishment…" TIN 15*<br>*"If tax sanctions were uniformly applied regardless of race, gender and creed, then taxpayers are likely to comply…" TIN7*<br>*"Although imprisonment is pronounced in the tax act but I have never heard of anyone in prison because of evading tax…" TIN2* |
| Tax socialisation (education and awareness) | *"Generally, massive tax education and awareness campaigns were conducted by BURS and I believe everyone is now aware of the benefits of paying tax to the government…the strategy is effective and the majority of people are responding well…" FGD1*<br>*"The tax officials are relaying tax information in the vernacular, which increased taxpayers' understanding of tax…leading to positive responses…I am quite sure that BURS witnessed a significant change in terms of compliance level and revenue..." FGD2* |

| **Emergent subthemes** | **Excerpts from the participants' statements** |
|---|---|
| | *"The tax education programme aired on Radio Botswana thrice a week, I believe it is cultivating the spirit of tax compliance among taxpayers". TC3*<br>*"BURS tax education campaign, I believe, is widespread and all taxpayers have heard and are now responding by paying their dues…" TIN12*<br>*"You can take a horse to the river, but you can force it to drink…you can't convince a tax evader through education…these people need real punishment or imprisonment…" TIN11* |
| Tax amnesty | *"I don't have an idea, but I heard about this on the radio…"TIN1*<br>*"The grace period extended to defaulting taxpayers, I believe, enables taxpayers to meet their tax obligation…"TIN3*<br>*"Reports from BURS show that taxpayers' response to the call is worrisome as many people did not come forth to declare their tax liabilities to the local authority', TC4*<br>*"Indeed, BURS witnessed a significant number of taxpayers who voluntarily disclose to the taxman what they owe; however, judging from the newspaper reports and BURS' statement, the exercise did not yield the expected results", FGD1*<br>*"Yes, the window period given to taxpayers to pay their due has been extended …which to me is a sign of nonadherence or unresponsiveness of taxpayers…" TIN9*<br>*"In my opinion, the strategy did not work, as evidenced by a report from BURS…" TIN16*<br>*"We witnessed many taxpayers who did not file their tax returns queuing at BURS office…however, we cannot reasonably judge whether it influences a change in tax compliance behaviour or not…direct this question to BURS". FGD2*<br>*"I will not comment on this one…kindly get hold of BURS, they will give you statistics…" TC1* |
| The provision of public goods and services | *"Although there are reports of corruption here and there, I believe that taxpayers in Botswana have trust in their government and are happy with the services they are receiving from the government…hence complying" TC2*<br>*"What gives people confidence and motivation to pay tax is the quality of services offered by the government…"TIN5* |

| Emergent subthemes | Excerpts from the participants' statements |
|---|---|
| | *"We know where our money goes and we are happy, hence we pay taxes…."FGD1*<br>*"Recently, the government has constructed 3 flyovers a sign of commitment to service delivery, and we are motivated to pay taxes…" FGD2*<br>*"Free education since independence and feeding programme, isn't a sign of good governance…reasonable people would opt to pay their dues…and we continue to support the government…"TIN17*<br>*"We have electricity, tarred roads in the villages, running water in the villages- and as such, as taxpayers, we support the government to carry out its mandate…"TIN13*<br>*"Judging from the progress and development thus far…us as taxpayers are happy and committed to fulfil moral duty to the government."TIN8* |

**Source:** Authors' compilation

The interviews conducted clearly revealed that BURS has implemented several interventions aimed at alleviating tax noncompliance. Among the strategies implemented are audit and investigation, tax amnesty, tax education and awareness, self-assessment tax (SAT), service delivery and tax sanctions, which align with prior research on tax compliance (Slemrod *et al.,* 2022). Table 2 provides the views of various participants about their perceptions of the impact of the BURS response to tax noncompliance on tax compliance behaviour among taxpayers in Botswana.

### *Audits and investigations*

The findings of this study elucidate the nuanced role of tax audits and investigations within the broader framework of Botswana's tax reforms, revealing both alignment and divergence with the literature. The participants predominantly view intensified audit and investigation efforts as a provisional measure rather than a sustainable strategy for achieving enduring tax compliance. This perspective aligns with the theoretical assertions of Alm (1999), who posits that taxpayers' adherence to tax laws is contingent upon the perceived probability of being audited. However, the participants also highlight a critical shortcoming: while audits and investigations have proven effective in eliciting immediate compliance, their impact is inherently temporary if not complemented by more enduring strategies.

This study corroborates the findings by Kasper & Alm (2022), who emphasise the positive behavioural response induced by heightened audit activities. The participants specifically noted that increased audits and investigations by BURS led to a notable increase in compliance due to heightened fear of punitive measures, such as the revocation of trading licences. This empirical evidence supports Bornman's (2014) assertion that such enforcement measures are pivotal in driving compliance but contrasts with Balán *et al*. (2022), who advocate for tax reforms focused on fostering voluntary compliance as a pathway to sustainable development.

Furthermore, the results reveal a critical nuance regarding the frequency of audits. Slemrod *et al.* (2022) suggested that the efficacy of audits in stimulating compliance is significantly dependent on their regularity. The participants' feedback reflects this concern, indicating that infrequent audits undermine the potential for long-term compliance improvements. Thus, while the BURS reform efforts have indeed demonstrated a commitment to enhancing tax compliance and increasing revenue, the study highlights the need for a more balanced approach that integrates frequent auditing with other strategies to achieve sustained compliance. The insights from this research underscore the importance of aligning audit frequency with broader reform goals to effectively combat tax noncompliance and support sustainable development objectives.

### *Digitalisation (e-filing, e-payment)*

The findings of this study offer a critical evaluation of the integration of digital tools in tax administration, particularly within BURS. The analysis reveals that BURS has made incremental strides toward digitalisation, primarily through the implementation of e-services and e-filing systems. The participants indicate that approximately 75% of taxpayers now utilise these digital platforms for submitting returns and making payments, signifying a substantial advancement in reducing compliance burdens and processing times. This observation is consistent with the work of Okunogbe & Santoro (2023), who assert that the automation of tax systems significantly enhances revenue collection efficacy, particularly in developing nations.

Despite these advancements, some participants within BURS noted a continued preference among taxpayers for manual systems over digital alternatives, highlighting a critical area for intervention: public education on the benefits of digital tax services. This sentiment aligns with Balán *et al*. (2022), who emphasise that digital solutions facilitate access to taxpayer information that might otherwise remain concealed, thereby improving revenue collection and compliance.

Further corroboration comes from Ali *et al*. (2021), whose research indicates that digital tools markedly increase reported tax revenues. The evidence from this study thus supports the notion that digitalisation positively impacts both tax compliance behaviour and revenue collection. However, the transitional nature of BURS' technological adoption underscores the need for a comprehensive strategy that not only invests in digital tools but also addresses taxpayer education and support to maximise the benefits of these innovations. This balanced approach is crucial for optimising the impact of digitalisation on tax administration and ensuring sustainable improvements in compliance and revenue outcomes.

***Tax sanctions***

The findings of this study elucidate the intensified efforts by BURS to bolster tax revenue and mitigate tax noncompliance through a punitive framework. The imposition of penalties is a central strategy employed by BURS to enforce compliance among tax defaulters. These penalties, designed as deterrents, aim to promote compliance with tax laws. The study reveals that prior to levying penalties, BURS investigators engage in interviews to ascertain the context of noncompliance. The participants reported that the threat of severe penalties, including imprisonment, fines, and blacklisting, significantly influences taxpayers to fulfil their obligations, which aligns with Angaretis *et al*. (2024), who suggested that compliance is often motivated by the desire to avoid harsh consequences.

However, the study also highlights a critical perspective: while penalties may drive immediate compliance, they may also incite negative responses such as evasion or tax revolt. Some participants argued that excessive punitive measures could foster deviant behaviour rather than genuine compliance. They advocate for a more balanced approach, suggesting that penalties should be a last resort, following the implementation of more accommodative strategies such as tax amnesty, improved service delivery, tax rewards, and educational initiatives. This perspective is supported by Yong & Fukofuka (2023), who emphasise that punitive actions should be coupled with educational and empowering measures to effectively transform noncompliant behaviour.

***Tax amnesty***

The findings from this study reveal that despite multiple extensions of deadlines for the tax amnesty scheme initiated by the BURS in 2021, the strategy has largely been deemed ineffective by participants. The scheme, which offered taxpayers immunity from penalties and criminal sanctions in exchange for voluntary disclosure of foreign assets and taxable income, resulted in some taxpayers coming forward. However, the overall efficacy of this scheme remains questionable.

The participants suggest that while there was a notable increase in declarations of hidden assets and taxable income, the anticipated outcomes were not fully realised, and the true impact of the amnesty is difficult to measure without further detailed analysis from BURS.

This result resonates with the findings of Pratama (2023), who posits that the success of tax amnesty programs is heavily influenced by sociological, psychological, and demographic factors that must be understood and addressed prior to implementation. Despite its theoretical appeal, the practical application of tax amnesty in Botswana appears to have faltered, undermining its potential to enhance tax compliance and revenue collection. The study indicates that although tax amnesty is a theoretically sound strategy, its implementation may have inadvertently compromised the existing tax compliance culture and jeopardised the sustainability of tax revenue collection in Botswana.

These insights suggest that while tax amnesty can be a compelling policy tool in theory, its effectiveness is contingent upon a nuanced understanding of taxpayer behaviour and contextual factors. The findings imply that without a comprehensive approach that incorporates these elements, tax amnesty may not achieve the desired results and could undermine broader tax compliance efforts.

***Tax socialisation (education and awareness)***

These findings underscore the pivotal role of tax education and awareness in fostering tax compliance among taxpayers. The participants unanimously identified tax education as the most effective mechanism for enhancing adherence to tax laws. They reported that taxpayers demonstrated improved compliance when they were well-informed rather than acting out of ignorance. This sentiment reflects a broader trend where BURS employed minimal coercive measures and focused instead on educational initiatives to promote compliance.

The participants highlighted that ongoing educational efforts are crucial for both converting non-compliant individuals and reinforcing the commitment of those already compliant. They stressed that the majority of taxpayers are inherently tax illiterate, necessitating continuous educational interventions to elucidate the importance of fulfilling tax obligations and compliance procedures. This approach aligns with the perspective of Al-Maghrebi *et al.* (2022), who argue that tax education, awareness, and equitable policy execution are fundamental in shaping taxpayer behaviour.

The study further reveals that BURS has implemented various educational programs, including advertising campaigns, leaflets, seminars, and door-to-door outreach, to increase awareness of tax compliance. These initiatives are consistent with Slemrod *et al.* (2022) noting that a lack of understanding regarding tax obligations can lead to noncompliance. The participants' feedback indicates that these educational efforts have been appreciated and have contributed to an observable improvement in tax compliance levels.

These findings are in accordance with the research of Quispe-Mamani *et al.* (2021), who affirm that effective communication and educational interaction between tax authorities and taxpayers establish a robust foundation for a culture of compliance. The results demonstrate that taxpayers who are well-informed about their tax duties are more likely to comply. This suggests that tax education is not merely a supplementary tool but also a central element in cultivating a responsible taxpaying culture.

To sum up, the study supports the theoretical assertion that comprehensive tax education and awareness campaigns significantly influence taxpayer compliance behaviour. By addressing the inherent tax illiteracy among taxpayers and providing clear, accessible information about tax obligations, BURS has effectively increased compliance rates and reinforced the social contract between the government and its citizens.

***Provision of public goods and services***

The findings of this study indicate that the government of Botswana is perceived by participants as effectively utilising taxpayers' contributions for public benefit, which significantly influences tax compliance behaviour. In the 2022/2023 fiscal period, the government's investments in infrastructure, such as the construction of four flyovers to alleviate traffic congestion and its commitment to maintaining free primary and secondary education, as well as sponsorships for tertiary and vocational training, were particularly noteworthy. These initiatives, which trace back to policies established by Botswana's first president, have been instrumental in fostering a sense of moral and psychological duty among taxpayers.

The participants reported that the government's successful use of taxpayer funds in enhancing public infrastructure and educational opportunities positively affects taxpayer attitudes, reinforcing the notion of tax compliance as a moral obligation. This aligns with the perspective of Quispe-Mamani *et al.* (2021), who argue that taxpayers are more inclined to comply with tax regulations when they perceive that their contributions effectively improve public welfare and infrastructure.

The positive response from taxpayers in Botswana reflects a broader principle observed in the extant literature. Hong (2023) suggested that transparency and the effective use of public funds are crucial for encouraging taxpayer compliance. This is consistent with the findings of Mukherjee (2022) as well as Duhoon & Sigh (2023), who emphasised that enhanced service delivery and improved governmental trust are pivotal factors influencing tax compliance behaviour. The government's efforts to provide equitable access to education and infrastructure demonstrate a commitment to redistributive justice and inclusivity, which in turn cultivates a culture of tax compliance.

These findings underscore the importance of perceived government efficacy and transparency in shaping taxpayer attitudes. By ensuring that taxpayer money is invested in public goods and services that directly benefit the community, the Botswana government not only fosters a culture of compliance but also strengthens the social contract between the state and its citizens. This approach highlights the critical role of effective public service delivery in promoting responsible taxpaying behaviour and enhancing overall tax compliance.

## Conclusion and recommendations

This study has elucidated the multifaceted strategies employed by BURS in addressing tax noncompliance and their resultant impact on taxpayer behaviour. Analysis of the findings indicates that BURS' response, which includes a blend of tax education, punitive measures, and enhanced public services, has significantly influenced tax compliance. These strategies have led to a notable improvement in tax revenue collection and a positive shift in taxpayer attitudes toward fulfilling their obligations.

Drawing from the deterrence model, Fischer model, and Australian Taxation Office compliance model, this study highlights that effective tax compliance strategies must integrate economic, psychological, and administrative factors. The deterrence model emphasises the role of penalties in discouraging noncompliance, whereas the Fischer model underscores the importance of taxpayer perceptions and information asymmetry. The Australian Taxation Office compliance model supports the notion that a combination of enforcement and support mechanisms is crucial for fostering voluntary compliance. The findings align with these theories, demonstrating that BURS' strategies effectively combined these elements to mitigate tax noncompliance.

The study reveals that tax education and the provision of public services have emerged as critical factors influencing taxpayer compliance behaviour in Botswana. Consistent with Ndlovu & Schutte (2022), this research affirms that educating taxpayers about their obligations and ensuring the effective use of tax revenues in public goods and services are pivotal in shaping positive compliance behaviour. The implementation of these strategies has been instrumental in addressing tax fraud and evasion, thereby enhancing overall tax revenue generation.

Despite these advancements, the study identifies the need for further innovative approaches to sustain and enhance voluntary tax compliance. The findings suggest that the incorporation of advanced technological solutions such as AI could play a crucial role in this endeavour. Therefore, this study recommends that the government of Botswana adopt an alternative model to the existing tax, legal, and regulatory framework- one that is better suited to a hybrid environment characterized by an AI-driven tax system and a transition to cashless transactions. Integrating AI technologies into the tax administration system can streamline processes, improve accuracy in tax reporting, and enhance taxpayer engagement. Additionally, the promotion of e-payment platforms is likely to facilitate more efficient and transparent transactions, further encouraging compliance.

In conclusion, while BURS has made substantial progress in promoting tax compliance through a combination of education, enforcement, and improved services, adopting digital tools and technological innovations presents a promising avenue for further advancing tax compliance. The deployment of AI and cashless systems holds the potential for optimising tax administration and fostering a more robust culture of compliance in Botswana.

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## Competing interests

The authors declare that no competing interests exist.

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# A SYSTEMATIC LITERATURE REVIEW ON THE INTERNATIONALIZATION OF SMALL AND MEDIUM-SIZED ENTERPRISES ON THE AFRICAN CONTINENT

**Mbali Ayanda SITHOLE**[1]

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**ABSTRACT.** This study aimed to identify prominent themes discussed in the research on the internationalization of SMEs on the African continent from 2005 to 2023. For this study, a total of 50 articles were selected, and thematic analysis was conducted to identify the prominent themes. Among the fifty articles selected for this systematic literature review (SLR), seven prominent themes were found: pull factors, network theory, export performance, mindset, entry mode decision, institutions, and barriers to internationalization. In this sample of articles, the most discussed themes are pull factors, network theory, and export performance, while the least discussed is barriers to internationalization. The findings of this study suggest that further research should be conducted to examine how the mindset of entrepreneurs or top managers may affect the internationalization of African SMEs, and how this may also affect the mode of entry adopted bysmall and medium size enterprises (SMEs). In addition, further research should be conducted on the barriers to internationalization of SMEs on the African continent. Lastly, this study recommends that further research be conducted on the role that institutions play in facilitating the internationalization of SMEs in Africa. The significant contribution of this study was identifying the prominent themes concerning internationalization in the African context. In addition, it identified areas for further research in order to gain a deeper understanding of this phenomenon in Africa.

**Keywords:** Internationalization, Africa, SME, SLR, Thematic analysis

**JEL Classification:** F23, L26, O55

[1] PhD candidate at Budapest University of Economics and Business.
E-mail: Sithole.Mbali.Ayanda.46@unibge.hu

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## Introduction

SMEs play a crucial role in the economy of Africa: in 2017 the Small Medium Enterprises (SMEs) sector accounted for approximately ninety percent of all businesses on the African continent and contributed approximately fifty percent to its Gross Domestic Product or GDP (Muriithi, 2017). It has been shown by researchers such, as Abisuga-Oyekunle *et al.* (2019) and Mahamadou (2021), that SMEs play a crucial role in the socio-economic development of Africa. For example, on the continent SMEs have contributed to improving life quality and income distribution through generating employment for the growing number of Africans (Abisuga-Oyekunle *et al.*, 2019). Furthermore, SMEs have contributed to the industrialization of the continent and enhanced its competitiveness.

This positive contribution can be even higher in the case of internationalised African SMEs. As a way to increase SMEs' contribution to employment generation and socioeconomic development, Osei-Bonsu (2014) suggests that SMEs may consider internationalizing and expanding internationally. In their study, Abisuga-Oyekunle *et al.* (2019) argue that there is evidence suggesting that African enterprises that engage in global business through exporting and foreign ownership tend to create a greater number of jobs than enterprises that do not participate in global business. Thus, the internationalization of SMEs in Africa is pivotal (Abisuga-Oyekunle *et al.*, 2019).

However, internationalising SMEs may face several difficulties coming from either their own weaknesses or from various developments and features in their business as well as in their economic, political, and social environment. The internationalization of SMEs is influenced by several factors, including access to resources unavailable domestically, lower trade barriers, trade agreements, purchasing resources at a lower cost, access to higher value markets, and domestic market conditions (Aldibiki & El Ebrashi, 2023; Misati *et al.*, 2017). African SMEs might find it difficult to internationalize due to institutional voids such as corruption, infrastructure barriers, and investment promotion policies (Mahamadou, 2021).

Our understanding of the internationalization of SMEs in Africa is limited because the literature on the internationalization of enterprises focuses on developed countries and on large multinational enterprises or MNEs (Kujala & Owusu, 2022). This is unfortunate because SMEs have different characteristics compared with large MNEs, and thus different factors may persuade or dissuade them to internationalize (Steinhauser *et al.*, 2020). Furthermore, developed and developing countries encounter different socioeconomic factors, making it difficult to generalize theories and empirical findings about the phenomenon from developed countries to developing countries (Kujala & Owusu, 2022; Haddoud *et al.*, 2017). These differences may lead to different internationalization behaviours among enterprises. In addition, there are large differences among the countries of the continent as well. Thus, the literature on this phenomenon in the African context may not be applicable to all African countries because of differences in socioeconomic conditions, levels of development, and economic structures (Mahamadou, 2021; Zahoor *et al.*, 2023). Additionally, the socio-economic conditions and institutional contexts may influence the enterprises' propensity to internationalize and engage in international markets differently (Kujala & Owusu, 2022).

Researchers, such as Goncalves (2022), Zahoor *et al.* (2023), Misati *et al.* (2017), and Amoako & Matlay (2015), have highlighted that there is a limited number of studies that focus on the internationalization of SMEs in Africa. Subsequently, policymakers are making decisions and recommendations based on data from advanced economies (Damoah, 2018), which may be misleading, as it was highlighted above. Using a systematic literature review (SLR), this article adds to the body of knowledge by combining and analysing articles related to the internationalization of SMEs in Africa between 2005 and 2023. In this study, the researchers will identify some gaps in the literature and identify some predominant themes through the use of an SLR. As part of this paper, the following research questions will be addressed:

## Research Questions

- Which is the current state of research on the internationalization of SMEs in Africa?
- In the literature on the internationalization of SMEs in Africa from 2005 to 2023, what themes are considered relevant?
- What gaps still exist in the literature that could be opportunities for future research in the field?

## Methodology Section

In conducting the SLR, several articles provided guidance, such as Oguji *et al.* (2018) and Zahoor *et al.* (2023). Tranfield *et al.* (2003) explained that a SLR consists of three steps: firstly, the researcher plans how the SLR will be conducted, secondly, the researcher executes the plan, and thirdly, the researcher reports and disseminates their findings. As a starting point for the SLR, internationalization and SMEs were defined, which explains the study's conceptual boundary. Secondly, the researchers discuss the screening criteria that was used in the SLR. Thirdly, a descriptive analysis of the articles included in the SLR is provided, and subsequently the researcher explains the current state of research, in this particular case on the internationalization of SMEs in Africa.

## Broad conceptualization

### *Internationalization*

Internationalization is a growth strategy through which enterprises expand geographically and increase their involvement and commitment to international markets (Eduardsen & Marinova, 2020). The process of internationalization may involve expanding an enterprise's business activity outside of an enterprise's domestic market (Fernandes *et al.*, 2023; Adomako *et al.*, 2021). Fernandez & Nieto (2006) argue that SMEs internationalize when a part of or all of their sales are generated by foreign sales. Damoah (2018), however, asserts that internationalization is the process of adapting the structure, resources, and strategy of an enterprise to the international environment. It is evident from the different definitions of internationalization by various scholars (Eduardsen & Marinova, 2020; Fernandes *et al.*, 2023; Adomako *et al.*, 2021; Fernandez & Nieto, 2006; Damoah, 2018) that there still is no consensus regarding its definition.

### *SMEs*

Based on the size of the workforce, Zahoor *et al.* (2023) found that there is no consensus about what defines an SME on the African continent. For example, according to Ahimbisibwe *et al.* (2022a), in Uganda an enterprise is considered an SME if it has fewer than 249 employees. According to Mahamadou (2021), an enterprise in Sub-Saharan Africa is considered a SME if it has ten to 300 employees. In Ghana, enterprises are considered SMEs when they have a maximum of ninety-nine employees (Damoah, 2018; Amoako & Matlay, 2015). A study conducted by Okpara & Kabongo (2010) in Nigeria identified enterprises that had between ten to five hundred employees as SMEs. SMEs are not uniformly defined in Africa, which hinders the analysis of the internationalisation of SMEs because the data is incomparable. In this section, the researchers have discussed the various definitions of internationalization and SMEs. In the next section, the authors will discuss the criteria they used for selecting articles that formed part of the study's sample.

### *Screening Criteria*

The screening criteria describe along what considerations the researchers chose which articles to include or exclude from the sample. The screening criteria were based on literature review articles written by other scholars in this field. For this study, the articles had to have been published between 2005 and 2023 in order to meet the screening criteria. Secondly, only articles that focused on the internationalization of SMEs in Africa were considered, thus articles that focused on other regions were excluded. Thirdly, the articles had to be written in English. Fourthly, the articles were retrieved only from Scopus, Science Direct, Emerald, Sabient, and Taylor & Francis databases in order to focus only on high quality publications. To assess the quartile of journals, the researchers used Scimago Scientific Journal Ranking. Only articles in quartiles Q1 to Q4 were considered to ensure high quality. Articles that were not included in this database were not taken into account. The researchers used the following keywords: Internationalization, SMEs, and Africa. For the keyword 'internationalization', the researcher also used 'exporting' as one of the synonyms since it is commonly used by SMEs to enter global markets (Ipsmiller & Dikova, 2021; Adomako *et al.*, 2021). Additionally, the keywords *foreign entry*, *entry mode choice,* and *regional integration* were used as synonyms for internationalization. For the keyword *Africa* the researcher accepted either the names of the fifty-four African countries; furthermore, the researcher also accepted articles that had the following keywords: *Sub-Saharan Africa*, *West Africa*, *East Africa*, and *North Africa* as synonyms for the keyword *Africa*. For the keyword *SME*, the researcher also used *small and medium enterprises*, and *small businesses* as synonyms. The next section will provide an overview of the literature analysed. Also, it will illustrate the state of the research in the period between 2005 and 2023.

## Which is the current state of research on the internationalization of SMEs in Africa?

As part of the assessment of the state of research on the internationalization of SMEs in Africa, a spreadsheet was created to identify the articles that may form part of the sample because they contained the keywords and focused on African countries. Using this spreadsheet, the researcher used the Scimago database to determine the quartile in which each journal ranked: if the journal in which the article was published was not ranked between Q1 and Q4, it was excluded from the analysis. The ranking of the journal is important because practitioners in academia and scholars may attribute quality to the article based on the journal it was published in (Vogel *et al.*, 2017). As a result of this analysis, the researchers found that 28 of the articles appeared in journals ranked Q1, twelve articles were published in journals ranked Q2, four were published in journals ranked Q3, and six were published in journals ranked Q4. Furthermore, the researchers discovered that of the fifty articles selected for the sample, thirty-four came from different journals. There were five articles in the Journal of Small Business and Enterprise Development, followed by four in the African Journal of Economic and Management Studies, three in Thunderbird International Business Review, and three in Acta Commercii. Table 1 illustrates the different journals that the articles for this study were found in. First, the journals in the table are sorted into quartiles starting with journals ranked Q1 to Q4, and within each quartile, the journals are sorted based on where the majority of articles in that quartile were published.

**Table 1.** Journals the articles were retrieved from

| Name of Journal | Number of papers in the journal | Ranking of the Journal |
|---|---|---|
| Journal of Small Business and Enterprise Development (J.Small Bus. Enterp. Dev) | 5 | Q1 |
| Thunderbird International Business Review (TIBR) | 3 | Q1 |
| Journal of Business Research (JBR) | 2 | Q1 |
| Journal of International Management (J.Int. Manag) | 2 | Q1 |
| World Journal of Entrepreneurship, Management and Sustainable Development (World J.Entrep.Manag.Sustain. Dev.) | 2 | Q1 |
| Competition & Change (Compet Change) | 1 | Q1 |
| Entrepreneurship Theory and Practice (ETP) | 1 | Q1 |
| International Business Review (Int Bus Rev) | 1 | Q1 |
| International Journal of Entrepreneurship and Innovation (Int.J.Entrepreneurship Innov.) | 1 | Q1 |
| International Journal of Entrepreneurial Behaviour and Research (Int.J.Entrep.Behav. Res) | 1 | Q1 |
| International Journal of Emerging Markets (IJoEM) | 1 | Q1 |
| International Marketing Review (Int.Mark.Rev.) | 1 | Q1 |
| International Small Business Journal (ISBJ) | 1 | Q1 |
| Journal of Global Marketing (J.Glob.Mark) | 1 | Q1 |
| Journal of Small Business & Entrepreneurship (J.Small Bus.Entrep). | 1 | Q1 |
| Journal of Strategic Marketing (J.Strateg.Mark) | 1 | Q1 |
| Management Decision (Manag.Decis) | 1 | Q1 |
| Online Information Review (Online Inf.Rev.) | 1 | Q1 |

| **Name of Journal** | **Number of papers in the journal** | **Ranking of the Journal** |
|---|---|---|
| Technovation | 1 | Q1 |
| African Journal of Economic and Management Studies (Afr.J.Econ.Manag.Stud.) | 4 | Q2 |
| Review of International Business and Strategy (Rev.Int.Bus.Strategy) | 2 | Q2 |
| Africa Journal of Management (AJOM) | 1 | Q2 |
| Critical Perspectives on International Business (CPOIB) | 1 | Q2 |
| DEVELOPMENT SOUTHERN AFRICA (Dev.South.Afr) | 1 | Q2 |
| Global Business Review (Glob.Bus.Rev.) | 1 | Q2 |
| Global Knowledge, Memory and Communication (Glob.Knowl.Mem.Commun.) | 1 | Q2 |
| Journal of Entrepreneurship and Innovation in Emerging Economies (JEIEE) | 1 | Q2 |
| Journal of Developmental Entrepreneurship (J.Dev.Entrep) | 1 | Q3 |
| Journal of Transnational Management (J.Transnatl.Manag) | 1 | Q3 |
| Perspectives on Global Development and Technology (Perspect.Glob.Dev.Technol.) | 1 | Q3 |
| South African Journal of Business Management (S.Afr.J.Bus.Manag.) | 1 | Q3 |
| Acta Commercii (Acta Commer.) | 3 | Q4 |
| International Journal of Business and Globalisation (IJBG) | 1 | Q4 |
| International Journal of Management and Enterprise Development (IJMED) | 1 | Q4 |
| Review of Development Finance (Rev.Dev.Finance.) | 1 | Q4 |
| **Total number of articles:** | 50 | |

Source: Author's compilation

According to the literature review conducted for this study, the highest number of articles were published in 2017 (7), while five articles were published each year during 2018, 2021, and 2022. There were no articles published in 2007 or 2009 in the sample of articles for this SLR. Figure 1 illustrates the number of articles published each year.

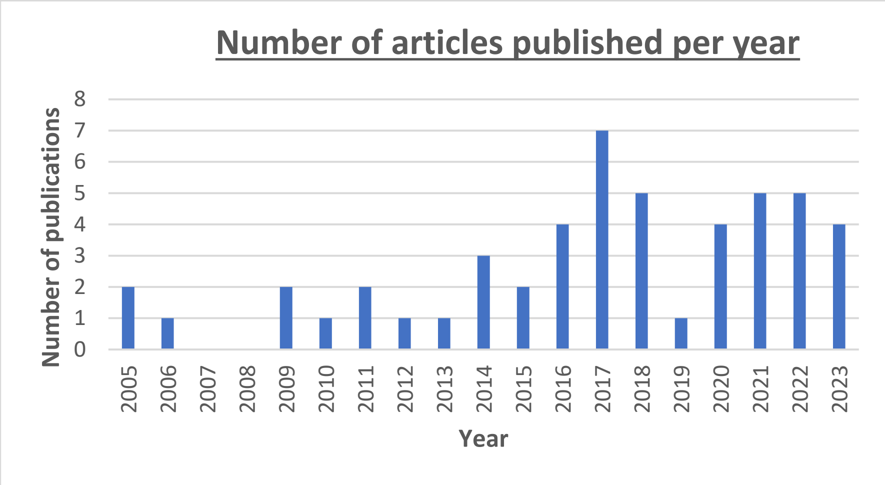


**Figure 1.** Number of articles published per year
Source: Author's compilation

In this study, fifty articles were reviewed, fifteen of which were qualitative. Additionally, twelve of those fifteen qualitative articles used interviews for data collection. Secondly, 29 of the articles selected for this SLR were quantitative, 26 out of the 29 used questionnaires with closed-ended questions to collect data, and the other studies used statistical analysis software to analyse data they acquired from databases. Among the sample of 50 articles, six used mixed approaches. A significant number of these articles collected data using both questionnaires and interviews. Lastly, forty-eight of the articles selected as part of this sample were empirical, and only two were conceptual. In comparison to Ipsmiller & Dikova's (2021) SLR on SME internationalization in Central Eastern Europe (CEE), which examined 141 articles in total, the majority (93) of the reviewed articles were quantitative, only 12 used mixed methods, and the remaining (24) were qualitative. In addition, only 12 articles of the 141 articles reviewed by Ipsmiller & Dikova (2021) were non-empirical, while the rest were empirical. The significant difference between this study's sample size and the sample size of the article used by Ipsmiller & Dikova (2021) may be explained by the limited amount of research on the internationalization of SMEs on the African continent. This problem is reiterated by researchers such as Goncalves (2022) and Misati *et al.* (2017) who urge researchers to conduct more research on the internationalization of SMEs on the African continent. The next section within this methodology part discusses how different themes within this study were identified.

To assess which themes have been considered prominent from the year 2005 until 2023, the researchers conducted a thematic analysis (TA). TA is a technique used by researchers to identify and report themes and patterns within qualitative data in order to answer the research questions of their study (Willig, 2014; Kiger & Varpio, 2020). Morgan (2022) explains that there are a variety of methods for identifying themes and patterns in qualitative data (Morgan, 2022). Vaismoradi & Snelgrove (2019) describe TA as an interpretive research approach that relies on the researcher's subjectivity and insight to interpret data and develop themes. As outlined by Kiger & Varpio (2020), this study adopted the following process for its thematic analysis:

- Getting familiar with the data

The researcher first ensured that the articles met the screening criteria, afterwards the full text was read.

- Generating initial codes and searching for themes

To summarize the articles and identify the prominent themes from the sample, the researcher used the data extraction form created by Cacciotti & Hayton (2015). The same data extraction form was used by Eduardsen & Marinova (2020). This included headings such as methodology, purpose, research questions, and findings. In this study, the data extraction form was modified to include 'the type of paper' as a heading, and articles were listed by their authors' names.

- Reviewing themes, defining and naming them

Another researcher with extensive experience worked with the researcher to identify themes within the sample of articles. Both researchers then reviewed the themes to ensure they encapsulated the data within each theme.

In this section of methodology, we have discussed how the researcher identified the different themes among the articles selected for the SLR. In the next section, we will discuss the different themes identified within the articles.

## In the literature on the internationalization of SMEs in Africa from 2005 to 2023, what themes have been considered relevant?

SMEs have created a large number of jobs on the African continent and have contributed to the continent's growth in sales and employment (Abor & Quartey, 2010). Despite the important role that SMEs play in the socio-economic development of the continent, they still have a high failure rate (Olaore *et al.*, 2020). SMEs account for a large number of enterprises on the African continent, as explained by El Guili (2018), and as a result the internationalization of SMEs in Africa has become an important topic for researchers. Based on a study by Olaore *et al.* (2020), internationalization improves SMEs' competitiveness in Africa. The following section of the SLR discusses the literature on the internationalization of African SMEs between 2005 and 2023, as well as undertakes a thematic analysis to identify the main themes. In the scope the literature review, the researchers identified the following themes: ***pull factors***, ***network theory***, ***export performance***, ***barriers to internationalization***, ***mindset***, ***entry mode decision***, and ***institutions***.

### *Pull factors*

The first theme to be explored in this SLR is *Pull factors* which focuses on factors that drive or influence SMEs to internationalize from their home markets. There are thirteen articles on this theme, nine of them are quantitative, three are qualitative, and one is a mixed-method article. The article written by Gyamerah *et al.* (2020) was identified as one of the articles that are part of the *Pull Factor* theme because the article identified the different factors that persuaded SMEs from East Africa to internationalize, and it illustrated how SMEs from different industries may internationalize through the Belt and Road Initiative (BRI). The purpose of this article was to assess whether the BRI benefitted SMEs from East Africa, and it specifically focused on SMEs from Kenya, Ethiopia, Djibouti, and Tanzania. In this theme, articles were included from all four regions of Africa (North, Southern, West, and East). All the articles in this theme identified the factors that encouraged SMEs to internationalize in the various regions, and they all emphasized the importance of the internationalization of SMEs. In comparison to other themes in the study, the identification of factors that encourage SMEs to internationalize was found to be a prevalent topic throughout the African continent.

**Table 2.** Pull factors

| **Authors** | **Purpose of the study** | **Sample and method** | **Main research findings** |
|---|---|---|---|
| Gyamerah *et al.* (2020) | Whether the Belt and Road Initiative (BRI) benefited SMEs from East Africa, focusing specifically on Kenya, Ethiopia, Djibouti, and Tanzania. | 26 SME owners/managers from Kenya, Ethiopia, Djibouti, and Tanzania. Qualitative Interviews | The results of this study show that BRI initiatives have a direct and indirect impact on the internationalization of SMEs in Kenya, Ethiopia, Djibouti, and Tanzania. Furthermore, this study found that partnerships, innovativeness, and specialized services played a crucial role in the internationalization of these SMEs within the BRI initiative. |
| Adomako *et al.* (2021) | To examine the impact of the usage of R&D support on driving internationalization as well as the mediating effect of this association. | 227 SMEs from Ghana. Quantitative surveys | In this study, R&D support was positively correlated with technological capability, and technological turbulence played a crucial role in moderating this relationship. |

| **Authors** | **Purpose of the study** | **Sample and method** | **Main research findings** |
|---|---|---|---|
| Damoah (2018) | This study assessed the critical incidents that lead to SMEs in Ghana initiating exports in the garment and textile sectors | 36 Ghanian SMEs Qualitative Interviews | In this study, government awards, international orientations, and unsolicited orders were among the factors that led to export initiation by SMEs |
| Misati *et al.* (2017) | This study examined some of the antecedents and consequences of SMEs' South-North internationalization. In addition, it analysed these SMEs strategies, methods, and timing when expanding internationally. | 3 SMEs from Kenya, Rwanda, and Uganda. Qualitative Interviews | In this study, they found that integrating several internationalization frameworks, like network theory and Uppsala, led to a better understanding of how SMEs internationalize. |
| Omer *et al.* (2015) | This study illustrated that going abroad can help SMEs in South Africa overcome some of the challenges they face domestically such as competition, corruption, legislation, and finance gaps | 962 SMEs in South Africa Quantitative surveys | Internationalization, the size of the enterprise, and education were identified as some of the most important factors that help SMEs overcome domestic barriers. |
| Mtigwe(2005) | The purpose of this study was to identify the internationalization process entrepreneurial enterprises adopted, additionally, it identified the outcomes from internationalization | 494 SMEs from South Africa and Zimbabwe. Quantitative surveys | Based on the results of this study, there is a common model of internationalization for entrepreneurial firms in Southern Africa. |
| Van Staden (2022) | The purpose of the study was to indicate and assess the main factors that are influencing the export orientation of SMEs in South Africa | 240 SMEs in South Africa<br><br>Quantitative surveys | This study identified various factors (government support, willingness to participate in export, marketing capability) which influenced the export propensity of SMEs however, the willingness to export was ranked highest by the study's participants. Additionally, this factor had a high correlation with management commitment and marketing capability. Lastly, this study found that SMEs performance is influenced by government support, marketing capabilities, and management support. |
| Babatunde (2017) | The purpose of the study was to investigate among SMEs in Nigeria the determinants of export propensity and intensity. | The study's subsample was 349 SMEs Quantitative | This study found that the following factors are crucial determinants of the SMEs export propensity and they also strengthen the SMEs export intensity: age of the enterprise, labour productivity, capital and skill intensity, access to loans, managerial experience, and infrastructure |

| **Authors** | **Purpose of the study** | **Sample and method** | **Main research findings** |
|---|---|---|---|
| Shree & Urban (2012) | This research was conducted to investigate and clarify the different capital factors that encourage and inhibit South African SMEs from expanding internationally | 67 SMEs in South Africa. Quantitative surveys | This study found that financial capital items were deemed as obstacles to the SMEs ability to expand abroad |
| Abor *et al.* (2014) | The purpose of the study was to investigate how SMEs export activities are affected by their access to bank finance | This study used datasets on SMEs in Ghana which were acquired from Regional Project on Enterprise Development (RPED). The dataset spanned from the year 1991 until 2002. Quantitative | The study's result suggests that access to bank finance could improve the SMEs' odds to export. Additionally, this study found that firms that were most probable to enter international markets through exporting were older, larger, and productive. |
| Sibanda *et al.* (2018) | This article examined how the exporting behaviour and performance of Zimbabwean SMEs was affected by their accessibility to finance. | 159 SMEs from Zimbabwe Quantitative surveys | In this study, access to finance was found to positively influence SMEs' export behaviour in Zimbabwe. Hypotheses 2 and 3 were not supported by the study's results. |
| Haddoud *et al.* (2017) | This study's aim was to assess the determinants of export propensity amongst SMEs in Algeria | 208 Algerian SMEs Quantitative | This study's analysis revealed that in Algeria five clusters exist. Each cluster varies in terms of resources and capabilities, and each cluster is related to export propensity differently |
| Ayakwah *et al.* (2020) | This study examined the role played by return entrepreneurs in internationalizing Ghanaian SMEs | 82 Firms in Ghana Mixed methods Surveys Interviews | The study found that return entrepreneurs (RE) are crucial to the internationalization of SMEs since they are able to develop and grow international customer networks. Additionally, their ability to help their enterprises meet international standards makes them catalysts for internationalization. Lastly, this study found that RE can build trust-based relationships within their business structures in their domestic market, and they can establish and maintain relationships with overseas customers. |

Source: Author's compilation

### *Export performance*

Exporting is the most commonly used mode of entry by SMEs because in comparison to other modes of entry it requires the least amount of resources and commitment (D'Angelo *et al.*, 2011; Kumari *et al.*, 2023; Cassiman & Golovko, 2011). According to Rua *et al.* (2018), the size of the enterprise and international experience are some of the determinants of export performance, but the researchers emphasize that no consensus has been reached on the determinants of export performance. Export performance was identified as the second theme amongst the sample of articles. This theme consisted of twelve articles. The analysis of the articles in this theme revealed three prominent sub-themes: export promotion programs, strategic orientation, and export intensity. Those articles that did not fit into these subthemes were grouped into another theme called ***other***.

### *Export promotion programs (EPPs)*

SMEs may face numerous challenges when entering foreign markets due to a lack of resources and a lack of knowledge of the market, which inhibit their ability to compete (Malca *et al.*, 2020). Governments have thus created measures such as export promotion programs (EPPs) to assist enterprises in foreign markets to overcome some of the challenges they may encounter (Catanzaro & Teyssier, 2021; Sraha, 2014). One of the subthemes identified by this study is EPP, which contains three articles. One article in this theme, Quaye *et al.* (2017) discusses how a country's decision to participate in promoting their country in other countries may help the country improve its export performance. For example, the purpose of Quaye *et al.* (2017) study was to comprehend the relationship between export promotional activity and the export performance of Ghanian manufacturing firms. The study found that exporters should focus on conducting specific EPPs such as attending trade fairs, maintaining foreign offices, and offering financial incentives, because they were found to be positively correlated to export performance. The communality amongst the three articles is that they discussed how EPPs affected the export performance of their SMEs, and they were based in countries in West Africa.

**Table 3.** Export promotion programs (EPPs)

| Authors | Purpose of the study | Sample and method | Main results |
|---|---|---|---|
| Njinyah (2017) | This study had the aim to assess the importance of both the direct and indirect effects of government policies for export promotion (GPEP) on the performance of cocoa exporting Cameroonian SMEs | 101 SMEs in Cameroon Quantitative surveys | Overall, this study found that the GPEP had a direct and indirect impact on the performance of exporters in Cameroon |

| Authors | Purpose of the study | Sample and method | Main results |
|---|---|---|---|
| Quaye *et al.* (2017) | This study aims to investigate the impact of export promotion programmes on export performance. | 169 SMEs in Ghana. Quantitative surveys | In this study, it was found that exporters in Ghana should use particular export programmes such as trade fairs, tax and financial incentives in order to strengthen their performance. |
| Sraha (2014) | This study investigated the entrepreneurial development within the Ghanaian value-added export sector and analysed EPPs and their effects on the export performance of these firms abroad. | This paper relied on secondary data, it assessed the EPPs used in Ghana by the public policy makers | This study identified the factors (export training, market access, and export assistance programmes) that influence exporters to improve their export performance. |

Source: Author's compilation.

### *Strategic orientation*

Strategic orientation is the strategic direction that an enterprise may adopt to acquire good business performance (Cho *et al.*, 2022). Strategic orientation reveals the philosophy of an enterprise: underpinning this philosophy is the enterprise's beliefs and values it exhibits when competing in the market and making decisions (Adams *et al.*,2019; Vlasic, 2022). There are many types of strategic orientations that an enterprise may adopt: for example, Vlasic (2022) discusses market orientation (MO) and technology orientation, Gao *et al.* (2018) discusses proactive orientation and entrepreneurial orientation (EO) has been discussed by various researchers such as Wales *et al.* (2020) and Lee *et al.* (2019). There are three articles under this sub-theme, all of which examine how the different strategic orientations affect the performance of SMEs. As an example, Robb & Stephens (2021) examined 259 South African SMEs;during this study, they examined whether export performance was related to strategic orientations (market orientation and proactive orientation), market capabilities, and innovation, as well as the strength of the relationship. Some of the study's findings was that market orientation (MO) did improve SMEs market capabilities. Another finding was that proactive orientation (PO) did improve innovation in SMEs. The other two articles focused on SMEs in Nigeria, and both assessed how EO affected SMEs' export performance. All three of these articles, to varying degrees, discussed the impact of proactive orientation on the enterprises' export performance.

**Table 4.** Strategic orientation

| **Authors** | **Purpose of the study** | **Sample and method** | **Main results** |
|---|---|---|---|
| Robb & Stephens (2021) | The aim of this study was to assess the relationship between market orientation (MO), proactive orientation (PO), market capability and innovation as they affect the export performance of SMEs in South Africa | 259 South African SMEs. Quantitative surveys | This study found that MO does improve SMEs' marketing capabilities. Secondly, it found that PO does improve SMEs' innovation. Thirdly, it also found that market distance does have an adverse influence on export performance. Fourthly, it found that concerning South African SMEs innovation does improve their market capability. Lastly, it found that innovation and market capability improved these SMEs' export performance. |
| Okpara & Kabongo (2010) | This study assessed the impact of entrepreneurial export orientation on the performance of Nigerian SMEs | 143 Nigerian SMEs Mixed methods Surveys Interviews | According to this study's results, proactive entrepreneurs participated in the export market more than conservatives. Additionally, it found that SMEs that were proactively orientated performed better SMEs that were conservatively orientated. |
| Ajayi (2016) | This study assessed how institutional factors may impact export performance of SMEs in the Nigerian agricultural sector | 235 Nigerian agricultural SMEs. Quantitative surveys | This study found that in the Nigerian agricultural sector, entrepreneurial orientation, networking capability, and institutional environment were positively correlated with the export performance of SMEs. |

Source: Author's compilation.

### *Export intensity*

This sub-theme consists of two articles: one of the articles used quantitative methods to gather data whilst the other one used mixed methods. The two articles in this theme are vastly different; however, they both assessed export intensity. The article written by Crick *et al.* (2011) assessed the differences amongst Tanzania exporters with low export intensity and exporters with high export intensity in relation to their perceived competitiveness in global markets. Whilst the article by Tarek *et al.* (2016) analysed competitive intelligence and further explored how it affected the international competitiveness of North African SMEs. Although this study did not have clear research questions it analysed the relationship between North African SMEs' export intensity and their use of business and competitive intelligence.

**Table 5.** Export intensity

| Authors | Purpose of the study | Sample and Method | Main Results |
|---|---|---|---|
| Crick *et al.* (2011) | In this study, the researchers examined whether Tanzanian internationalizing SMEs with low or high export intensities differed. | 205 Tanzanian SMEs<br>Mixed methods<br>Interviews and surveys | The results provide insight into the patterns of internationalization amongst the two types of firms. |
| Tarek *et al.* (2016) | This study assessed the extent to which the international competitiveness of SMEs is linked to competitive intelligence. | 180 North African (Algeria, Egypt, Morocco, and Tunisia) SMEs<br>Surveys | Innovation and the protection of information assets moderate and mediate the relationship between business intelligence and SMEs' international competitiveness |

Source: Author's compilation

### *Other themes*

This category consisted of four articles and there are no similarities amongst the articles other than that they focus on SMEs export performance. For example, the purpose of the study conducted by Hinson & Abor (2005) was to assess the extent to which non-traditional Ghanian exporters use the Internet. Whilst the purpose of the study by Abubakari *et al.* (2021) explored the effect of foreign market knowledge on the export performance of Ghanian SMEs. The study conducted by El Makrini (2017) was based on Moroccan SMEs, and it found that the size of enterprises was positively correlated to its export sales. Additionally, this study found that R&D and advertising were also positively correlated to the SMEs' export sales. Lastly, the study conducted by Easmon *et al.* (2019) found that social capital was not positively correlated with the export performance of Ghanian SMEs.

**Table 6.** Other themes

| Authors | Purpose of the study | Sample and method | Main results |
|---|---|---|---|
| Hinson & Abor (2005) | The purpose of the study was to assess the usage of internet amongst internationalizing SMEs, specifically non-traditional exporters | 106 exporting SMEs in Ghana<br>Qualitative<br>Questionnaires | In this study, it was found that nontraditional exporters had low levels of internet usage. Additionally, this study found that there was a strong relationship between internet usage and the age of the SME. |

| **Authors** | **Purpose of the study** | **Sample and method** | **Main results** |
|---|---|---|---|
| Abubakari *et al.* (2021) | This study examined the effect of foreign institutional knowledge (FIK), foreign business knowledge (FBK), and internationalization knowledge (IK) on the export performance of SMEs. | 257 SMEs in Accra, Ghana, Quantitative surveys | This study found that FIK, FBK and IK had a positive effect on the export performance of SMEs |
| El Makrini (2017) | This study examined Moroccan SMEs' export performance based specifically on size, R&D, advertising, and network relationships. | 168 SMEs in Morocco. Quantitative | This study found that the size of the enterprise did have a positive relationship with export sales. Secondly, it found that expenditures on R&D had a positive relationship with export sales. Thirdly, it found that advertising had a positive relationship with export sales. Lastly, it found that being part of a business network did increase the export sales of the enterprise |
| Easmon *et al.* (2019) | This study analysed the impact of social capital and market-based capabilities on the export performance of SMEs in Ghana | 297 Exporters from Ghana. Quantitative Questionnaires | This study found that social capital, innovation, and marketing capabilities influenced the export performance of SMEs in Ghana |

Source: Author’s compilation

### *Network theory*

Network theory is an approach that has been commonly used to comprehend the internationalisation process that some enterprises have adopted (Peiris *et al.*, 2012). According to Ratajczak-Mrozek (2017), Johanson & Mattson (1988) article played a pivotal role in the development and expansion of network theory. In this article, it was explained that the relationships an enterprise has cultivated in its network may enable it to gather the information and resources it needs to enter international markets (Ratajczak-Mrozek, 2017). In this study, one of the themes identified was network theory. A total of eight articles were included under this theme, four of which were quantitative, two were mixed methods, and two were qualitative. Although the articles on this theme had different purposes and findings, the concept of network theory underpinned them all. In the study conducted by Aldibiki & El Ebrashi (2023), SMEs in Egypt were examined for their use of various types of networks in order to enter international markets. The results from this study demonstrated the relationship between the different types of networks and their impact on SMEs' international growth. Another study conducted by Ahimbisibwe *et al.* (2020) examined which level in international networking was essential for the internationalization of SMEs in Uganda. In this study, it was found that network extension and network integration were essential to the internationalization of Ugandan SMEs, but that network penetration was not. The study conducted by Sendawula *et al.* (2020) focused on manufacturing SMEs in Uganda. The purpose of this study was to determine what role organizational learning plays in mediating the relationship between business networking and internationalization. The study found a positive correlation between business networking and Ugandan SME internationalization. Secondly, the statistical analysis performed by the researcher indicated that business networking was strongly associated with organizational learning, which supported the researcher's hypothesis. There was a wide range of purposes and methodologies used in these articles, which reflected their heterogeneity, these differences are illustrated in Table 7. Despite the differences in the studies in this theme, a majority of the articles found that an enterprise network played an essential role in SMEs internationalization process.

**Table 7.** Network theory

| **Authors** | **Purpose of the study** | **Sample and method** | **Main results** |
|---|---|---|---|
| Aldibiki& El Ebrashi (2023) | This study assessed the role networks play in the internationalization of SMEs in an emerging country | 300 SMEs in Egypt. Quantitative surveys. Data was analysed using SPSS | Amongst the three types of networks this study found that only non-business networks had a significant direct positive impact on the international performance of Egyptian SMEs. |
| Ferrucci *et al.* (2018) | In this study, the different paths that Italian SMEs used when entering the African market were evaluated. | 18 managers and entrepreneurs from Italian SMEs in Africa. Qualitative Semi-structured interviews Cross case analysis | This study found that in the African continent networks play a crucial role in facilitating the internationalization of Italian SMEs. |
| Amoako & Matlay (2015) | This study analysed how certain cultural norms affected the trust building and cooperation amongst the relationships formed by exporting Ghanian SMEs | 12 SMEs in Ghana. Qualitative Interviews Case study | The findings of this study shed light on how indigenous and global norms have hybridized over time. Furthermore, it illustrated how this hybridization supported the internationalization of Ghanian SMEs. |

| **Authors** | **Purpose of the study** | **Sample and method** | **Main results** |
|---|---|---|---|
| Ahimbisibwe *et al.* (2020) | This article assessed whether the levels of international networking were crucial for the internationalization of SMEs. | 206 Ugandan exporting SMEs Quantitative surveys | This study found that there was a positive relationship between network extension and the SMEs internationalization. Additionally, the study's findings disproved the study's second hypothesis. Lastly, the study found that network integration was also positively related to SMEs' internalization. |
| Sendawula *et al.* (2020) | This study examined manufacturing SMEs in Uganda and analysed the role of organizational learning in the relationship between business networking and internationalization of these enterprises | 96 Ugandan manufacturing SMEs. Quantitative surveys | This study found that there was a significant relationship between organizational learning and the internationalization of SMEs. |
| Tajeddin & Carney (2018) | This study examined how domestically owned SMEs can cope with imperfect markets through the formation of private governance system, which are illustrated through business groups (BGs). | 8885 SMEs from sub-Sahara Africa (SSA). Quantitative Data was retrieved from the World Bank's Enterprise Survey (WBES) the data spanned from the year 2006 until 2015. Data was statistically analysed | This study found that in terms of export intensity BG-affiliated SMEs were stronger than independent firms. |
| Kazungu (2020) | In this study, the impact of network linkages on Tanzanian handicraft exporting MSEs was examined. | 171 Tanzanian SMEs. Mixed methods | The findings of this study supported the hypothesis. For example, this study found that that before the implementation of the network programmes, handicrafts-exporting MSEs were not able to access foreign market distributors, local and foreign business associations, raw materials suppliers and ancillary support firms, which are vital to their business operations both in local and foreign markets. |

Source: Author's compilation

### *Institutions*

Institutions include judicial systems, governmental structures, and other market structures that determine how enterprises may operate in a country (Voss *et al.*, 2010). A study conducted by Shirokova & Tsukanova (2013) found that institutions play a significant role in the internationalization process of SMEs. The next theme identified was 'institutions', which contained five articles. This sample contains three qualitative articles, one quantitative article, and one mixed-methods article. Three of the articles in this sample are focused on West Africa, specifically Nigeria and Ghana. Each article on this theme had a different purpose, but they all discussed and focused on the role of institutions. The article by Amoako & Lyon (2014) sought to determine how contexts influenced the institutions and relationships created by exporting SMEs. Additionally, this article examined how exporting SMEs perceived Ghana's legal institutions. The purpose of the article by Narooz & Child (2017) was to illustrate the differences between the Egyptian and the United Kingdom (UK) institutions that facilitate SMEs internationalization. There is a commonality between these articles in that they all emphasize the importance of institutions for internationalization. There were a few articles that discussed how the failure or absence of formal institutions has led to the emergence of informal institutions, as demonstrated by Omeihe *et al.* (2021) and Amoako & Lyon (2014). The sample of articles in this theme suggest that institutions play a pivotal role in the internationalization of SMEs.

**Table 8.** Institutions

| **Authors** | **Purpose of the study** | **Sample and method** | **Main research findings** |
|---|---|---|---|
| Adomako *et al.* (2021) | "This study examined the relationship between perceived corruption (PC) and degree of internationalization (DOI) through business process digitization (BPD)" | 464 CEOs based in Ghana and Nigeria. Quantitative surveys | This study found that perceived corruption had a positive relationship with business process digitization. Additionally, they found thatbusiness process digitization had a positive relationship with the enterprises degree of internationalization |
| Omeihe *et al.* (2021) | This study aimed to create a better understanding of how trust, indigenous institutions, and formal institutions interact in Nigeria. | 36 SME owners in Nigeria. Qualitative Data was collected through conversations, observations, and archival records. | One of the main findings is that in Nigeria, informal institutions such as trade associations have taken over the authoritative role previously played by formal institutions such as courts. |

| **Authors** | **Purpose of the study** | **Sample and method** | **Main research findings** |
|---|---|---|---|
| Narooz and Child (2017) | In the study, the authors aimed to illustrate the contrast in how developed and developing countries help their SMEs internationalize through their institutional provisions | 20 SMEs from Egypt and 20 SMEs from the UK.<br>Qualitative<br>Semi-structured interviews | Some of the results that the researchers found was that in contrast to SMEs in the UK, Egyptian SMEs relied more on the institutional agencies. This study also identified some of the institutional voids Egyptian SMEs encountered. In contrast to Egyptian SMEs, SMEs from the UK did not have a negative perception of the institutions in the UK. Furthermore, this study found that SMEs from the UK in comparison to SMEs from the Egypt have access to information from a wider range of sources. |
| Amoako & Lyon (2014) | This article examines how exporting SMEs create strategic relationships and institutions in response to the environment in which they operate. Furthermore, it examines how SMEs' strategic partnerships and institutions aid them when the country's institutions are weak. | 12 SMEs from Ghana<br>Qualitative<br>Semi-structured interviews | This study illustrates how exporting SMEs have circumvented formalized institutions such as courts and rather rely on culturally specific relationships, and informal institutions to resolve disagreements amongst other business associates. |
| Sibanda *et al.* (2018) | This study examined how access to finance affects the behaviour and performance of exporting enterprises in Zimbabwe | 159 SMEs from Zimbabwe<br>Quantitative surveys | This study found that there was a positive relationship between exporting behaviour and access to finance. |

Source: Author's compilation

### *Entry mode decision*

One of the most crucial decisions an enterprise must make is which entry mode to use to enter an international market (Shen *et al.*, 2017). Moreover, Shen *et al.* (2017) explain that this decision reflects the level of commitment, engagement, and risk that the enterprise is taking. A study conducted by Tepjun (2016) found that the availability of resources influences the entry mode that an enterprise may adopt and the level of commitment that an enterprise may make to foreign markets. Garg (2014) explains that there are two main categories of entry modes equity (joint ventures and wholly owned subsidiary) and non-equity mode (exports and contractual agreements). This theme consists of four articles. Two of the articles used qualitative methods, the other two articles used quantitative methods to gather information. The purpose of the article written by Mahamadou (2021) was to illustrate how SMEs, particularly the ones in Ivory Coast, internationalize. The results of from the study indicated that most of the SMEs imported products before they began exporting, and additionally the article identified the types (upstream and downstream) of internationalization the SMEs engaged in and the factors that encouraged them to trade with other countries. The table below illustrates the different purposes and methodologies that articles in this theme adopted. Furthermore, Table 9 illustrates how diverse the topic 'entry mode decision' is: for example, two of the articles assessed the entry mode that SMEs adopted whilst another study assessed the applicability of the current theories on the internationalization of SMEs and the remaining study investigated the mediating effect of equity entry mode.

**Table 9.** Entry mode decision

| **Authors** | **Purpose of the study** | **Sample and method** | **Research findings** |
|---|---|---|---|
| Goncalves (2022) | This study investigated how SMEs from Lusophone Africa specifically Mozambique and Angola internationalize. Additionally, it examined whether the current theories on internationalization are applicable. | 29 SMEs from Mozambique and Angola.<br>Qualitative<br>Online questionnaire and semi-structured interviews | The researcher found that different theories of internationalization were suitable and applicable at different phases of internationalization for LASMEs. Additionally, the researcher proposed a new framework that takes this into account. |
| Mahamadou (2021) | This study illustrated the main paths that Ivorian SMEs adopt when internationalizing. | 6 Ivorian SMEs<br>Qualitative<br>Interviews | The results from the interviews illustrated that to enter international markets Ivorian SMEs participated in both upstream (importing) and downstream (exporting) internationalization. |
| Abubakar *et al.* (2019) | This study examined if there are specific modes of entry which induced the SMEs innovation in Sub-Saharan least developed countries (LDCs) | 1058 SMEs from LDC'S (Djibouti, Tanzania, Uganda, Zambia, and Congo)<br>Quantitative<br>This study utilized secondary data that was retrieved from the World Bank Enterprise Surveys (WBES) | The main results from this study infer that foreign technology licensing had a positive relationship with the product and process innovation of Sub-Saharan LDCs SMEs. |

| Authors | Purpose of the study | Sample and method | Research findings |
|---|---|---|---|
| Amankwah-Amoah *et al.* (2022) | This article examined when foreign market knowledge (FMK) strengthens SMEs equity mode choice. | 205 SMEs from Ghana. Quantitative surveys | The main findings from this study is that equity entry mode choice is a mediator for the relationship between foreign market choice and the enterprises performance abroad. |

Source: Author's compilation

### *Mindset*

Mindset (strategy frame or belief structure) may refer to the knowledge structures that an enterprise or entrepreneur may use to make strategic decisions (Nadkarni & Perez, 2007). This theme consisted of three articles, and all three are quantitative and two have the same lead author. The purpose of the first article written by Ahimbisibwe *et al.* (2022a) was to assess the mediation role of international networking between entrepreneurial mindset and internationalizing Ugandan SMEs. The purpose of the second article by Ahimbisibwe *et al.* (2022b) was to assess the relationship between entrepreneurial mindset and the internationalization of SMEs in Uganda. All the articles on this theme focused on countries in Sub-Saharan Africa. Secondly, they focused primarily on how top management, or the CEO/owner/manager mindset influenced the internationalization of the enterprise.

**Table 10.** Mindset

| Authors | Purpose of the study | Sample and method | Research findings |
|---|---|---|---|
| Adomako *et al.* (2017) | The study examined how the CEO's regulatory focus on the SMEs internationalization is influenced by the competitive market and how intense it is | 289 SMEs in Ghana Quantitative surveys | The study found that CEOs' promotion focus was stronger as a driver of internationalization when competition in their domestic markets was high |
| Ahimbisibwe *et al.* (2022b) | This study examined the relationship between entrepreneurial mindset and the internationalization of Ugandan SMEs | 144 SMEs in Uganda Quantitative survey | Among the three mindsets examined, only the implemental mindset was significantly related to SME internationalization. |
| Ahimbisibwe *et al.* (2022a) | In this study, international networking was examined as a mediator between entrepreneurial mindset and | 206 SMEs in Uganda Quantitativesurveys | The results from the study proved that the international networking did have a positive |

| Authors | Purpose of the study | Sample and method | Research findings |
|---|---|---|---|
| | the internationalization of Ugandan small and medium enterprises | | relationship with the internationalization of SMEs. Additionally, it found that international networking did mediate the relationship between entrepreneurial mindset and the internationalization of SMEs |

Source: Author's compilation

### *Barriers to internationalization*

Barriers to internationalization are factors that hinder SMEs from expanding nationally or internationally (Virglerova *et al.*, 2020). This theme focused on articles that identified factors that deter SMEs from internationalizing, in this SLR those factors were labelled 'barriers to internationalization'. The findings of this SLR in terms of 'barriers to internationalization' were in line with those identified by Moreira *et al.* (2024). The review found that the common barriers among the sample of articles included: corruption, inadequate infrastructure, limited capital access, limited market knowledge, insufficient domestic policies and laws, and insufficient research into foreign markets. For example, the article by Okpara & Kabongo (2010) found that factors such as stiff competition in foreign markets, corruption, lack of knowhow on exporting, insufficient infrastructure, constricted access to finance, the scarcity of experienced staff in export planning were factors that hindered their export activities. The communality amongst the three studies is that they are all based on countries that are part of Sub-Saharan Africa. Secondly, they all discussed how having knowledge and experience about the mode of entry or a particular market affected their decision to expand there. However, the lack of this knowledge also discouraged them from internationalizing, additionally, they highlighted that bureaucracy was an obstacle.

**Table 11.** Barriers to internationalization

| Authors | Purpose of the study | Sample and method | Main results |
|---|---|---|---|
| Okpara& Kabongo (2010) | This study investigated how the internationalization of exporting SMEs in Nigeria is affected by the following factors: knowledge barriers, resource barriers, corruption, procedure barriers and external barriers | 120 SMEs in Nigeria Quantitative surveys | This study identified some of the factors (restricted access to finance, competition, limited knowledge on exporting, and corruption) that hindered export development in Nigeria |

| **Authors** | **Purpose of the study** | **Sample and method** | **Main results** |
|---|---|---|---|
| Mpinganjira (2011) | This study investigated the 'perceived' impediments to export involvement within non-exporting Malawian SMEs. | 80 SMEs from Malawi. Mixed methods approach. Surveys and interviews | This article identified the following factors as impediments to export participation: limited knowledge on export opportunities, and a lack of skills and know-how in exporting. |
| Thomas & Marandu (2017) | This article identifies and examines the challenges that SMEs in Botswana face when importing and exporting products within Southern Africa. | 21 SMEs from Botswana Qualitative Interviews and Observations | In this study, administrative procedures, ambiguity in the application of laws at the borders, and logistical difficulties were identified as some of the main obstacles on the national level. |

Source: Author's compilation

## What gaps still exist in the literature that could be opportunities for future research in the field?

Researchers such as Zahoor *et al.* (2023) have argued that there is a scarcity of research on the internationalization of SMEs in Africa. Thus, this study was conducted to add to the body of literature on this phenomenon in the African context. Through a SLR, this study summarized the literature available on the internationalization of SMEs in Africa from 2005 to 2023 and identified prominent themes. In conducting the SLR, the researchers discovered only three articles related to the mindset theme. As argued by Acedo & Jones (2007) and Ahimbisibwe *et al.* (2022b), there is a lack of literature examining how cognitive factors such as mindset and behaviour may influence or relate to internationalization. As a result, this study urges researchers to investigate how mindset could contribute to or hinder the internationalization of SMEs in Africa. Additionally, this study urges researchers to examine whether a country's foreign and trade policies affect the mindset of business owners and managers in terms of internationalization. Finally, this study recommends that more research to be conducted that determines whether an owner/top management mindset may influence the entry mode an enterprise uses to expand within the African continent and abroad.

One of the themes that this SLR identified was entry mode decision and this theme consisted of four articles. This theme was essential because as argued by Shen *et al.* (2017), mode of entry is one of the most important decisions SMEs that are intending to internationalize are going to make. This study subsequently encourages researchers to investigate factors that influence

SMEs' decision to enter a market through a particular mode. Secondly, through conducting the SLR, this study recommends that more studies should be conducted that explore how SMEs internationalize in Africa. For example, the study conducted by Mahamadou (2021) illustrated the different paths that Ivorian SMEs adopt when they are internationalizing.

Another theme that this study identified was institutions: this theme consisted of five articles. This study recommends that researchers should investigate how the rise of informal institutions in regions such as West Africa particularly Nigeria and Ghana have affected the internationalization of SMEs in that region. Researchers should also examine if informal institutions have assisted or hindered the internationalization of SMEs. Additionally, it has been demonstrated by Omeihe *et al.* (2021) and Amoako & Lyon (2014) that informal institutions have circumvented formal institutions. According to this study, more research should examine whether informal and formal institutions are able to coexist and how this relationship influences the propensity of SMEs to internationalize within those regions.

Based on the sample of articles analyzed, this study suggests that more studies should evaluate how human capital impacts the internationalization of SMEs in Africa. Dar & Mishra (2019) argue that human capital is crucial to the internationalization of SMEs. In a study by Buzavaite & Korsakiene (2019), the authors suggest that further analysis should be conducted to determine how human capital elements such as education and experience may impact internationalization.

Lastly, amongst the sample of articles for this study it was found that only six articles used mixed methods, the majority of articles were quantitative. In a study conducted by McKim (2016) on graduate students, these students indicated that they perceived mixed methods to be more rigorous than other forms of research methods. Further, they indicated that when mixed methods were used by authors to collect data, they were able to understand the phenomenon better. Researchers should consider adopting this methodology more often since students, who are the main audience for academic research, prefer it.

## Discussion

In recent years, there has been an increase in economics and business research focusing on Africa and greater recognition of the region's unique characteristics (Nachum *et al.*, 2022). For instance, there has been a rise in literature reviews discussing the internationalization of African firms, among other topics. As an example, the study by Ibeh *et al.* (2012) reviewed 54 relevant studies between 1995 and 2011. In their study, they highlighted that African firms are increasingly internationalizing, and explained how managerial and organizational resources, as well as network connections, are key to that process. The study conducted by Boso *et al.* (2019) indicates that African firms have been internationalizing within the African continent, which has resulted in the rise of firms, mainly from certain sectors and from specific countries, such as South Africa and Nigeria, that have dominated their domestic and regional markets.

In contrast to the study conducted by Ibeh *et al.* (2012) and Boso *et al.* (2019) the study conducted by Misati *et al.* (2017) focuses on the internationalization of African SMEs. The study sheds light on some of the antecedents and consequences of the internationalization of African SMEs. Furthermore, it argues that the internationalization of African SMEs may be evaluated through the lens of a multiple-theoretical approach which consists of theories such as the Uppsala model, network theory, and Linkage-Leverage-Learning framework. El Guili (2018) also conducted a study on the internationalisation of African SMEs. El Guili (2018) found that the emergence of regional "champions" as well as other innovative and creative SMEs is one reason for the increased internationalization of African SMEs. El Guili (2018) further explains that the historical context is also critically important when assessing and analysing the internationalization of SMEs. A study conducted by Zahoor *et al.* (2023) also focused on the internationalization of African SMEs. Zahoor *et al.* (2023) noted "…Despite a proliferation of studies on the subject, the literature has hitherto remained fragmented, theoretically limited, and empirically inconclusive, thereby leaving important topics underexplored."

Internationalisation of African SMEs is analysed in an international comparison with Latin American firms by Moreira *et al.* (2024). They relied on 97 papers for the period between 1995 and 2017, identifying six relevant topics: international networking; financing, export promotion; internationalisation strategies; resources and business environment/context; e-business, e-commerce, and barriers to internationalisation. Moreira *et al.* (2024) found that the focus of articles on African SMEs differed from Latin American ones. For instance, articles that focused on the internationalization of African SMEs mainly discussed supply performance, international behaviour, internationalisation process, knowledge, and key-selection of foreign markets. Furthermore, these articles highlighted the main challenges, opportunities, and perspectives associated with the internationalization of African SMEs.

As compared with the above-described articles, this study focused on articles published between 2005 until 2023. Additionally, in contrast to El Guili's (2018) study that focused on the challenges and risks of internationalizing SMEs in Africa, this study had a different emphasis. For example, this study examined the current state of literature on the internationalization of SMEs in Africa. It identified the gaps in the literature on this phenomenon and suggested areas for further research. Moreover, this article identified and discussed the recurring themes in the research that focused on this phenomenon.

In this study, seven key themes were identified from the sample of articles selected for this SLR. Of the seven themes identified, three (entry mode decision, mindset, and export performance) had not been identified as key themes in previous SLRs conducted by Zahoor *et al.* (2023) and Moreira *et al.* (2024). Furthermore, this study found that MO, technological orientation, and PO also influenced the internationalization of African SMEs besides EO, which was emphasized by Zahoor *et al.* (2023). In Zahoor *et al.* (2023), only two databases were used, Web of Science and Scopus, whereas this study's SLR used a wider range of databases which led to a variety of different journals being assessed such as Acta Commercii and the South African Journal of Business Management. Additionally, in Zahoor *et al.* (2023), the resource-based view (RBV) and the knowledge-based view (KBV) were identified as prominent theoretical perspectives. However, although RBV and KBV were discussed in a small number of articles, they were not prominent enough within the sample of articles to constitute a theme in this SLR.

The present study, in contrast to the research conducted by Zahoor *et al.* (2023) and Moreira *et al.* (2024), suggested that further research was needed to examine whether foreign trade policies influence business owners' and managers' mindset and their proclivity to internationalize. Researchers such as Ahimbisibwe *et al.* (2022a) have examined the influence of managers' and owners' mindset on the internationalization of SMEs. However, according to this SLR's author, there have been no studies that have investigated whether African countries' foreign trade policies may influence business owners' and managers' mindsets and propensity to internationalize their SMEs. This study also suggested that more research should examine whether informal and formal institutions are able to coexist in those regions (especially West Africa) and whether this influences the propensity of SMEs to internationalize. This suggestion is based on the findings from the study conducted by Omeihe *et al.* (2021) which found that informal institutions in Nigeria such as trade associations have adopted a more authoritative role which was previously occupied by formal institutions such as courts. In addition, the study conducted by Amoako & Lyon (2014) found that in Ghana informal institutions such as chieftaincies and trade associations have adopted a prominent role in resolving conflicts amongst SMEs than formal institutions like courts.

The article written by Nachum *et al.* (2022) contends that in order to have an in-depth and holistic understanding of the business dynamic on the continent its essential to investigate the role that people could play in the development of the African continent. Moreover, this article then discussed the complexities of the African countries and how heterogenous the countries are. Similar to Nachum *et al.* (2022) this article also discussed the role of institutions on the continent. However, in contrast to this Nachum *et al.* (2022) this article does not discuss the possible relationship between institutions and people instead this article focuses on SMEs and how their internationalization may improve the continents socio-economic development. Moreover, this article discussed rather how institutions both formal and informal could facilitate or hinder the internationalization of SMEs.This study suggests that more studies should be conducted on the role of institutions throughout Africa. In addition, this study suggests more comparative studies to be conducted between African countries on the topic of SMEs' internationalization. Such research may help academics and practitioners to compare institutions amongst different African countries and assess the different roles that institutions play in facilitating the internationalization of SMEs on the continent.

## Conclusion

The purpose of this study was to identify prominent themes discussed in the research on the internationalization of SMEs on the African continent from 2005 to 2023. By conducting the SLR this study identified the following seven themes: pull factors, network theory, export performance, mindset, entry mode decision, institutions, and barriers to internationalization. In this sample of articles, the most discussed themes were pull factors, network theory, and export performance, while the least discussed was barriers to internationalization. In addition, this study also shed light on areas of research on this phenomenon in the African context that require further research. One of the most important contributions of this study is that it addressed an area of research that is still underexplored, especially within the context of African SMEs. Secondly, this study found that there was a limited number of articles that focus on 'barriers to internationalization' in the context of African SMEs. Identifying barriers to internationalization is crucial as it will help academics and policy makers address the factors that inhibit the expansion of African SMEs internationally. Thirdly, this SLR found there was a limited number of studies analysing how mindset may affect the internationalization of SMEs in Africa, as well as whether the mindset of the top management and founder of the enterprise influences the internationalization of these SMEs. Lastly, this study responded to calls for more research on the internationalization of African SMEs made by researchers such as Zahoor *et al.* (2023), Misati *et al.* (2017), and El Guili (2018).

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# THE IMPACT OF ARTIFICIAL INTELLIGENCE ON ROMANIA'S ECONOMY: SECTORAL IMPACTS, LABOR MARKET SHIFTS, AND FUTURE FORECASTS

**Davide Nicola PÂNTEA[1], Oana Ruxandra BODE[2], Rozalia Veronica RUS[3], and Valeria GIDIU[4]**

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**ABSTRACT.** Modern technologies are continuously transforming the world, and Artificial Intelligence may be considered one of the most important discoveries of this century. The unknown nature of this technology, mixed with the rational and irrational fears of the vast majority, makes this research a must to give some order to the chaos created in the last few years. A concise and explicative explanation of Artificial Intelligence (AI) is given to understand the potential of this technology. Many workers perceive this technology as a threat, while their employers see it as an opportunity to cut costs. The main objective of this study is to identify the possible impact that the application of AI may have in the future, in Romania, in each economic sector (primary, secondary, and tertiary). This will lead to an in-depth analysis of the transition that AI will force on these sectors.

**Keywords:** Artificial Intelligence, labor market, productivity, economic sectors

**JEL classification:** E24, J29, O39, L86

1 BSc. in Business Administration, Faculty of Business; Bachelor's Student in Computer Science, Faculty of Mathematics and Informatics, Babes-Bolyai University, Cluj-Napoca, Romania, e-mail: davide.pantea@stud.ubbcluj.ro

2 Assoc. Prof. Dr., Department of Hospitality Services, Faculty of Business, Babes-Bolyai University, Cluj-Napoca, Romania, e-mail: oana.bode@ubbcluj.ro.

3 Assoc. Prof. Dr., Department of Hospitality Services, Faculty of Business, Babes-Bolyai University, Cluj-Napoca, Romania, e-mail: veronica.rus@ubbcluj.ro

4 Dr., Department of Hospitality Services, Faculty of Business, Babes-Bolyai University, Cluj-Napoca, Romania, e-mail: valeria.gidiu@ubbcluj.ro

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## Introduction

Technology represents the engine that helps an economy grow and evolve. This impacts productivity by making processes faster and more precise. It can be introduced through different economic channels, but the main creators and importers of technology are firms. This has an impact, especially on the lives of workers, who can access the last novelty and can increase both their welfare and their benefit. Research & Development (R&D) and accessibility to new technology represent a necessity for developing countries that want to evolve. There is no underdeveloped country in the history of economics that has advanced without investing in this sector. One of the technologies that had the highest adoption rate in the last years is Artificial Intelligence (AI). It includes a diverse range of technologies and "refers to the development of computer systems capable of performing tasks that typically require human intelligence" (Loukides & Lorica, 2016). Since the design of the Turing test proposed by Alan Turing in 1950 (Russell & Norvig, 2021), this concept has become a constant in the world of computer science. In fact, in the last years, at the global level, each industry has started to apply this technology in their manufacturing process, marketing strategy, business analytics, and most importantly in their products. By doing so, many more people started to experiment with it and realized how impactful it is on their daily lives.

What computers do best with their basic function is to perform repetitive tasks that can also be done by humans but are considered tedious. For example, a computer will easily count the distribution of letters in a book but will hardly recognize all the elements in a simple picture. At the same time, a human will be able to instantly identify all the elements in the same picture but will need a countless amount of time to enumerate all the apparencies of a defined letter in a book. AI tries to take the best characteristics from both humans and computers, by using more complex algorithms in a way that resembles human thought. However, the goal of achieving a fully functional AI that replicates a real brain is far from being reached. This can be noticed just by analyzing the development and classification of AI.

## Review of Literature

According to (Joshi, 2019), AI technology can be classified based on capabilities in: Artificial Narrow Intelligence, Artificial General Intelligence, and Artificial Superintelligence.

Artificial Narrow Intelligence (or "Weak AI") excels in performing specific tasks with a high level of accuracy and efficiency, in a way that equals or exceeds human intelligence. They represent the current state of most AI systems and are applied in a wide range of cases from self-driving vehicles to spam filters. (Joshi, 2019). There are millions of narrow AI applications: digital voice assistants (Siri, Alexa), expert systems, speech recognition, computer vision (Sharda et al., 2021).

Artificial General Intelligence (or "Strong AI") possesses human-level intelligence or surpasses it in a wide range of tasks. Artificial Super Intelligence represents the last known stage of the evolution of AI. It is a hypothetical machine intelligence that can surpass the human brain in all aspects (Joshi, 2019).

Based on their resemblance to the human mind and their ability to "think" and "feel" like humans, AI systems can be classified into four categories: reactive machines, limited memory machines, theory of mind, and self-aware AI (Joshi, 2019).

Over time, globally, many companies discovered AI and started to invest more in R&D. Corporations like Google, OpenAI, IBM, and Microsoft started to work on their AI solutions, and many others followed them. This created a fast-paced run to create the most versatile and precise Large Language model. Those models have become a major force shaping the world and affect every market that exists. On 30 November 2022 OpenAI first released an early demo of the ChatGPT and only in five days the chatbot had attracted over one million users (Marr, 2023). These weren't the first AI solutions released, but they created a turning point in modern history. After their general release to the public, many other companies followed and published their own models. This created curiosity, especially among business-related people who see this as a revolution and who saw a possibility of cutting costs. At the same time, workers, especially from the service sector are seeing it as a threat. This dual divided the public into two factions. On the one hand, one can see the ones that are ready to automate their work, are overly excited about this technology and are ready to delegate their tasks to AI. On the other hand, there are the scared ones, that fear an AI war in the style of a science fiction film and want to stop the development of this technology.

This behaviour was explained by (Acemoglu & Restrepo, 2018) who provided a theoretical framework to understand the impact of new technologies on the labor market. This can also be seen in the current literature about the implications that AI brings in the labor market. In general, two broad categories can be found, one positive and the doomsayers (Acemoglu & Restrepo, 2019).

Globally, the impact of AI on the labor market will be considerable, as this is different from any other technology introduced in the past. The first reason is strictly related to the ability of AI to adapt beyond repetitive and noncognitive tasks. This means that also those sectors with a higher rate of uncertainty, including less repetitive jobs, could be affected. This leads to the second reason or the fact that AI is a general-purpose technology, in other words almost every sector can be affected, including low-skilled, middle-skilled, and high-skilled jobs. The last reason is the unprecedented speed of development (OECD, 2023).

All sectors can benefit from the use of AI. Viewed through the branch structure, the economy is divided into the following: primary sector - focussing on extracting or harvesting natural resources directly from the earth, including agriculture, fishing, forestry, and mining; secondary sector, transforming raw materials into finished goods or intermediate products, including construction, manufacturing, energy production, and processing industries; tertiary sector - focusing on providing services, including retail, hospitality, healthcare, education, finance, transport, communication, IT, and tourism. The *quaternary sector* is based on knowledge and includes ICT, R&D, consulting, financial technology, innovation, and intellectual property (IMF, 2024).

In the primary sector AI can improve crop yields, optimize resource usage (e.g., water and fertilizers), and predict events like floods or pest invasions. AI-powered systems can monitor the health of livestock health and reproductive cycles using image recognition. Smart-crop monitoring, drone farming, smart-livestock monitoring, and autonomous farming machinery have the potential to radically transform many aspects of farming (Goedde et al., 2020).

Secondary sector can benefit from AI to enhance production processes, for quality control, and for equipment failure prediction. However, the applications are not only limited to the manufacturing fields but also to the extractive ones. Analyzing geological and seismic data for resource identification, using AI (machine learning and deep learning) can improve the efficiency, accuracy, and effectiveness of exploration processes (Daramola et al., 2024). In energy production, AI can forecast demand, optimize power generation, and support self-healing grids.

In the tertiary sector (services) AI is widely applied in customer service (e.g., chatbots), marketing, and dynamic pricing optimization. Banks and insurance companies use AI for fraud detection (Finance Talks, n.d.), risk analysis, and personalized plans. Not only the private sector but also the public one will be able to benefit from AIs. Public healthcare can benefit from AI's predictive analysis of symptoms based on past and current history of patients. Industry 4.0 is widely recognized as the driving force behind the current wave of technological transformation, integrating advanced technologies like AI, robotics, the Internet of Things (IOT), autonomous vehicle, 3-D printing, etc. into every facet of the economy (Schwab, 2024). In IT and software development, AI is used for automation, cybersecurity, and operational efficiency. AI drives innovation in software development automating tasks and boosting productivity in different areas: code generation, testing, bugs detection and fixing, project management, security, UX design and improves IT operations (Finio & Downie, 2024). Industry 4.0 supports the creation of advanced tools for other industries, making it a key player in technological advancement.

AI technologies can help companies in the quaternary sector increase innovation, optimize their processes, optimize innovation strategies, extract insights form data for better decisions, and provide products or services tailored to market demands. By using AI, companies can improve the R&D cycle and reduce the time it takes to bring new products to market (Rout et al., 2024).

Each sector benefits differently, with the tertiary and Industry 4.0 sectors experiencing the most immediate and significant impact due to their adaptability and reliance on technology.

People are insecure about their future and don't know how to behave in front of so much novelty brought by this technology. From employees to business owners, and wealthy to poor countries all will be affected by the AI revolution. According to World Economic Forum (2025), over the next five years, 170 million new jobs are projected to be created (equivalent to 14% of today's total employment), while 92 million existing jobs are expected to be displaced (8% of total employment). Li (2022) emphasises that the new digitalization revolution will have a significant impact on employment in the years to come. Almost every job will change, and many employees will need to acquire new skills to adapt to changes (Li, 2022).

Nonetheless, Romania seems to have embraced this reality in a more conciliative way, if compared to other countries. According to an IPSOS survey conducted in 2023 in 31 countries, Romanians seem to be more receptive to the advantages of AI and less concerned about the disadvantages. Around 77% of Romanians seem to know what AI is, compared to the global average of 67% (IPSOS, 2023). Furthermore, almost three-quarters (73%) of the Romanian respondents seem to be aware of the changes that AI will bring to their daily life over the next 3-5 years. However, not all people are positively seeing these changes, especially if they are asked about the jobs. However, 30% responded that AI will positively impact their jobs and 44% consider that nothing will change. Around 37% of the Romanian participants are sure that this technology will hurt the labor market. On the contrary, 33% expect the impact to be positive, and 25% believe that there will be little or no changes. This general attitude seems to differ depending on the context in which AI is applied. People appear to be aware that their daily lives will change but are still disturbed by the idea of the changes that will be brought into the labor market (IPSOS, 2023).

In Romania people think of having understood what AI is, but the reality is that not many are considering all the real implications, both positive and negative. This attitude will almost certainly bring an unpreparedness of the workforce in the future labor market. Based on a global study done by PWC in 2024, on 56 thousand workers in 50 countries and regions, including more than 500 Romanians, half of the Romanian workers believe that there is too much change at work happening at once, and 41% do not understand why things need to change at all. Workers also consider that their workload has increased significantly in the last 12 months (50%) and they had to learn to use new tools/technologies in order to do their job (45%). However, there are also strong signs of optimism and engagement. Most of the employees (87%) say they are ready to adapt to new ways of working. Many are eager to upskill and see potential in using GenAI to increase their efficiency (PWC, 2024).

Romanians do not differ too much from the rest of the world. Still, they seem to understand the benefits, but they have quite a diverse opinion on the effects that AI will have on the national economy and the labor market in Romania. This market is evolving and progressing, adapting to a continuously growing economy. But it presents many challenges too. Unfortunately, the population of Romania decreased in 2024 by around 0.94 percent from the previous year and is currently ranked eighth in the top 20 countries with the highest rate of population decline (O'Neill, 2025a). With phenomena like the growing number of elderly and the exodus of youths to other countries, it's estimated that the population of Romania will steadily decline by about 720 thousand people from 2024 to 2030 (O'Neill, 2024b). Therefore, Romania faces a declining population due to low birth rates and emigration, continuing a long-term demographic trend influenced by an ageing population. Moreover, the Romanian labor market will also be impacted by the incoming AI revolution, which will bring both novelty and loss of jobs. In other words, this market will need to confront, both internal and external challenges.

Romania's labor market has experienced modest improvements, influenced by economic fluctuations, demographic shifts, and policy changes. The average employment rate between 2022-2024 was approximately 63%, and this rate is estimated also for 2025. As gender, the male employment exceeded the female employment in recent years. Concerning the unemployment rate, one can highlight that youth employment and unemployment rates were the highest ones (Eurostat, 2024). The employment rates for individuals aged 15-64 years are constantly the same, while the youth unemployment rate remained high (Eurostat, 2024). According to the European Commission (2025), the unemployment rate is expected to decrease to almost 5% by the end of 2026.

In Romania, many companies started to invest in R&D when they realized that they could outsource to Europe and still have their costs under control. For this reason alone, the country is not seen as an R&D centre, but rather as an alternative to Western or Asian countries. In fact, in Romania in 2022, 29.2% of the employees were working for foreign corporations that were coming especially from Germany, France, and the United States of America. Considering those data, it's easy to observe that external companies are playing a major role in the Romanian labour market in Romania (INS, 2024a).

Nonetheless, one can state that Romania is still facing a rapid transition period, from the manual and inefficient work of the Communist era to a more automatized and productive labor force. Moreover, it's also fighting an ageing and decreasing population that tests the country's ability to adapt, by obliging it to find alternative methods to maintain its growth. Because of these very reasons, AI may be seen as one of those technologies that may help the country to continue this path and may help the transition to a developed country. Still, this will be possible only if people understand its benefits and limitations, to be able to apply it most efficiently. This is the reason why it's very important to analyze the current use of AI and how it can help Romanian economy in the future.

The remainder of this paper is organized as follows: the second section describes the research methodology that has been employed; the third section highlights the main research findings and finally, the last section underlines the most important conclusions of this study.

## Material and methods

Aiming to reach the main objective of the paper, detailed work of data processing, analysis and forecast was done. For historical data (time span 2015 - 2024), this study principally used primary quantitative data that was collected nationally by the INS (National Institute of Statistics). Although INS releases quarterly and annual reports, few of them provide data that compares or illustrates evolution over time. This is precisely why extensive data collection and cleansing was carried out. The main topics of the data gathered from the INS were GDP relative to the different sectors (primary, secondary and tertiary) including their evolution, as well as their employed labor force. Moreover, to obtain a more accurate perspective of the labor force evolution and forecast in the primary, secondary and tertiary sectors, different non-governmental reports were used. The two main ones that supplied both qualitative and quantitative data were IPSOS (2023) and PWC (2024). Although the first one provided useful insight into Romanians' perceptions on AI, the second one was essential in locating comprehensive data about the future evolution of the labor force and sectors. For the period 2025 – 2030, the data were obtained by extrapolation, using a linear regression model or an exponential one (where applicable) adjusted with a coefficient specific to each sector. The decision between exponential and linear regression was based on whether the model captured the evolution more accurately.

For the linear function $Y = (m + c)x + b$, $m$ represents the growth coefficient (the one that can be calculated from previous years) and $c$ represents the chosen coefficient of growth.

For the exponential function $Y = a \cdot e^{(b+c)x}$ $b$ is the growth rate, and $c$ remains the chosen coefficient of growth. To avoid ambiguity between the models, the $R^2$ coefficient was calculated for each case. The R-Squared, or coefficient of determination, represents how good a model fits the real data, by calculating the difference at each point in time between the forecasted data and the actual one.

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}}$$

where $SS_{RES}$ is how well the data from the regression model represents the actual data and $SS_{tot}$ represents the variation in the data used for the regression. This gives back a result between 0 and 1, where 1 is a perfect fitting model.

A premise that was considered in this forecast analysis was that Romania in the next five years will keep the RON as its currency. This is needed for two main reasons: the first is that EUR and RON have a different inflation rate; the second is more pragmatic and is related to mitigating some values that may increase to an unreasonable value until 2030. Initially, all the forecasts were calculated in RON, but then were transformed into euro at different exchange rates for each year (to simulate inflation among all the years). Therefore, the values highlighted in each chart are in EUR. After inserting all the values into a unified format (using Microsoft Excel), the data was standardized and cleaned. To give a first insight into the data a simple average was used to study the increase in coefficient over the last 9 years. This offered help to determine whether the increase could be considered linear or exponential. Then some realistic values regarding purchasing power parity were selected. Many of them just implied that by applying AI the productivity could increase by a given value ('n' value) and did not really specify a time frame. For this reason, initially the linear increase was applied and just then boost it year by year by applying the spread values to have an 'n' increase at the end of the timeframe. Using this method, the increase would be steady and realistic and would not lead to extreme values. For the forecast in each economic sector, a simple linear regression was used. This aspect was especially considered, specifically in the IT&C sector. In the end, the yearly value of purchasing power parity was calculated for the historical years and the forecasted values were calculated with the purchasing power parity with the different coefficients (the 'n' values), that comprehended a worst, average and best-case scenario. Productivity per employee was calculated considering both the evolution of the number of employees in each sector analyzed and the volume of production.

## Results and discussions

In recent years, Gross Domestic Product (GDP) breakdown was registered for agriculture, industry and services, while the quaternary sector is rising sharply. In Romania, the contributions of the primary, secondary, tertiary and quaternary sectors to the country's gross domestic product in 2023-2024 was: 3-4 % agriculture, 26-27% industry, 60-61% services, while the rest of 10-12 % was represented by the quaternary sector (World Bank Group, n.d.). At the same time, the contribution of these main economic sectors in Romania to labor market was: 22% by the primary sector, 30% by the secondary sector, and 49% by the services sector which also includes also the components of the quaternary knowledge.

Romania is a country where the difference between sectors is abysmal. For example, while companies in the service sector are helping to develop AI, many farmers in the primary sector still use the same ancient method to harvest their fields. A paradox that will create a significant digital division with far-reaching consequences, especially in the labor market. That translates into deeper challenges for the country, related to the infrastructure gap, digital literacy leaks and investment skepticism (Cibian & Dragan, 2022).

Therefore, the implementation of AI technology in different sectors in Romania will be carried out at different speeds and with different approaches. Some sectors like the tertiary one or some branches of the secondary one are already applying those technologies today, meaning that the labor shift will be more controlled in the future. Meanwhile, the primary sector will have the most uncertain future, and for many years the situation of the labor market will not change.

Furthermore, due to the increase in the use of AI in the main economic sectors in Romania, an overview and forecast of employability and productivity for the primary, secondary and tertiary sectors is highlighted.

***Overview of changes in the primary sector***

This sector is mainly made up of most old farmers who are working or producing for their sustainment and are not looking at profits. Many of them are still skeptical about the implementation of AI, which will not bring enough benefits compared to the risk of investment. But for the big farmers that compose less than 2% of the total number, AIs could be applied in response to the crisis that is hitting the labor market too. By increasing production and controlling it thanks to AI, it will be possible for them to control a bigger field with fewer but more prepared employees. In addition, people will need to be instructed to operate the complex structures that will run the farms of the future.

The primary sector in Romania is probably the one that will not be ready to evolve rapidly in time to apply AI. For example, for a farmer who lives in a rural area and does not have the correct infrastructure and recognition, the possibility to access AI resources will be limited. This will especially impact productivity and competitiveness. In front of a more productive farmer, the less productive ones will struggle to sell their products and sustain themselves. In fact, as productivity increases, the costs are cut and the prices are cut, too. Most small Romanian farmers will not have the possibility to compete with these players and will struggle. Many of them are still not prepared and instead of facing new technologies and competition, will prefer to sell their fields, and find other jobs. This will especially happen to those under 50 years old, especially if they have a family to support. Those will prefer to move to more rewarding sectors such as the secondary sector, but it is not yet clear if they will prefer to move from rural areas to cities. In 2024 the number of people living in rural areas has increased with 0,4% compared with the previous year (INS, 2024b). This movement is tied to three phenomena. The first one is related to the post-COVID-19 pandemic situation, as people want to recuperate all the lost experiences after great calamities. The second is related to the pollution and living conditions of cities that are becoming increasingly overpopulated. Meanwhile, the countryside is made up of communes close to roads and is still equipped with the internet, which permits people to work from home. In the end, the third phenomenon is related to the migrations of the diaspora that come back to the country and prefer to live far from the cities in a calmer environment. This clarification is needed as the number of people living in the rural areas in Romania will grow in the next year, but this will need to be differentiated from the number of Romanians who are willing to work in the primary sector.

The technology involved in this sector varies from precision agriculture to digitalized agriculture. Those will use fewer resources and will affect the labor market, as the quantity of the workforce needed will be lower. Only the ones willing to adapt will survive and will use any means to cut costs and improve productivity. These measures will principally imply an extreme reduction in the number of unqualified workers, which will be replaced by both automatization and more qualified ones. In Romania, in this sector around 1.000.000 jobs will be lost until 2035. Because of this very reason, it will become extremely important to increase the rate of farmers who follow superior studies or are upskilled by following courses.

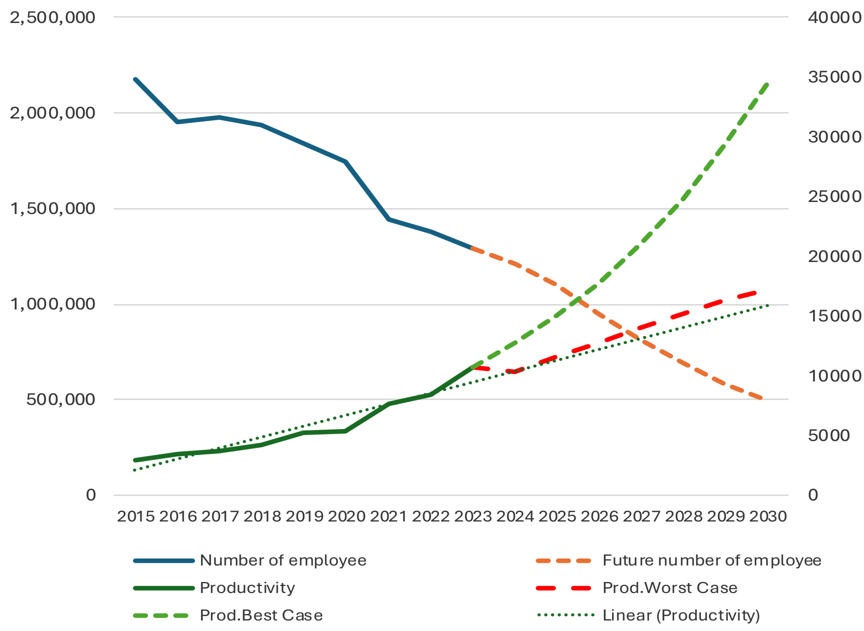


**Figure 1.** Number of Employees and Productivity Forecast in the primary sector
Source: Authors' own processing based on the data available at INS, 2024

Figure 1 responds better to the actual trend of the rapid reduction of self-employed people in the primary sector in Romania. Meanwhile, productivity will have two movements: one where in the future the implementation of AI will not lead in the innovation run - the linear forecast (or worst case), and another one where AI will bring, in the long run, a decisive increase in productivity - the exponential one (or best case).). Looking at the data one can notice that the number of employees will drastically fall reaching around 500.000 employees by 2030. Meanwhile, productivity will increase in an inverted proportion to the previous value. Two opposing phenomena are affecting this sector. The first one is the abandonment of the countryside by farmers, which is leading to a major productivity per worker. The second phenomenon is the adversity brought by the current farmers with their disbelief in these technologies, and climate changes, two effects that combined are slowing the increase of production, and as a result this directly affects also productivity.

Two main conclusions can be highlighted. The first is that in the future the falling number of workers will considerably influence the productivity of this sector. Because of this, the creation of big agricultural companies that will control most of the arable surface is inevitable. From here, the second point is related to the desire of those companies to implement new techniques that will involve AI too. As the quantity of fields is not infinite, and production per hectare neither, the only possible way to increase their exploitation and profitability is to use more advanced techniques and cut costs. Some examples are the use of the centralized system, which would monitor the conditions of a terrain, to control irrigation or the spreading of chemicals. Another may be the use of autonomous vehicles to cut the number of employees. Nonetheless, these choices will not affect this sector in the short run as much as they will in the long run. This is reflected also in the graph (especially in the worst-case scenario) because the possibility of expansion of the properties by buying more land will still be preferred rather than investments in R&D or new technology.

In conclusion, as much as AI systems may be seen as a response to the decreasing number of employees in the farming industry, still it represents too much of an investment for farmers. Because of this reason, in the short term, it is impossible to expect too much of an involvement of this technology in this sector. Still in the medium and long term, when the prices of the field will increase, and the one of AI technologies will decrease it is expected to see a major involvement of farmers in this field.

### ***Overview of changes in the secondary sector***

Globally, in the last few years, the number of people employed in the secondary sector has risen by around 30%. But, despite the stable number of people working in the industry and its rapid expansion, it is possible to conclude that the changing factor was brought by the automatization of the processes. Moreover, it was estimated that the use of AIs increases the productivity in factories by 14.2% (Gao & Feng, 2023) and the costs are cut by 20%. Those permitted fewer workers to be employed in each factory, and at the same time pushed other investors to enter the market. In this way, in the last years the number of workers employed in this sector remained the same, but production per factory increased. These results can give a good insight into what will probably happen in the future. Still, those technologies are seen with skepticism, especially by medium and small companies that are concerned with the slow return of investment. For Romania, this specification is essential as most of the companies are considered micro and small (RBI, 2022).

Jobs in this sector are already being automatized, and in the future, they will improve their productivity thanks to the implementation of processes that may or may not include AI. It's important to consider, that currently, the Romanian companies in the secondary sector are still automating tedious processes thanks to the use of robots and are starting to overview their work with the use of sensors. These steps are necessary for these firms, as they represent a necessity to be able to access AI in the future.

Based on the current situation in the secondary sector in Romania it is possible to forecast that in the future productivity will grow and this change will be led by the tendency to automatize processes. Still, in the short run, the country will need to maintain the current path to be able to reach at least the level of its neighbours. To do this, many technologies will be implemented, but considering the use of AI it would be an overstatement, as the first step in this direction would be robotization. Considering this it's still safe to say that in the short run, the changes in the labor market will be limited to the automatization of robots, rather than AIs. In the next few years these technologies will not invade the secondary sector; they will rather buck it up. In fact, because of the current limitations of this sector, both economic and technological, it won't be possible to acquire and implement AIs. For these very reasons, the labor market in this sector won't be hit by an extreme event, in the next few years, and the demand will remain high. It's forecasted that until 2035 the manufacturing industry will acquire almost 500.000 new employees. Especially more qualified ones, that can operate new technologies rather than working manually. It is estimated that almost 222.000 unqualified jobs will be substituted, underlining the fact that in the future there will be a necessity to upskill the general workforce. This important aspect must be taken into consideration, as in the next few years almost 50% of workers will need to upskill (Li, 2022).

In Romania, in the secondary sector, for construction and industry, in the medium term is still possible to expect a larger adoption of AIs, as they will become cheaper and more accessible also for medium and small companies.

Moreover, it is expected that the productivity of factories that use AI is expected to increase to 28%, making it vital for the companies to be able to respond to the demand. For this very reason, considering the global impact that this technology will have, it will be almost impossible for the national industry not to adapt. As much as this automation will impact the economy positively, the destiny of the labor market is still uncertain. Starting with the medium and continuing in the long term, one of the factors that will define the trajectory will be the willingness of people to evolve. The reason behind this is related to the fact that AI technologies are made to permit humans to dedicate themselves to activities that require intellect and logical thinking and remove them from repetitive jobs. For this very reason in the medium term, there will be a higher loss of jobs among lower-skilled jobs and an increase in the demand for well-prepared and skilled workers.

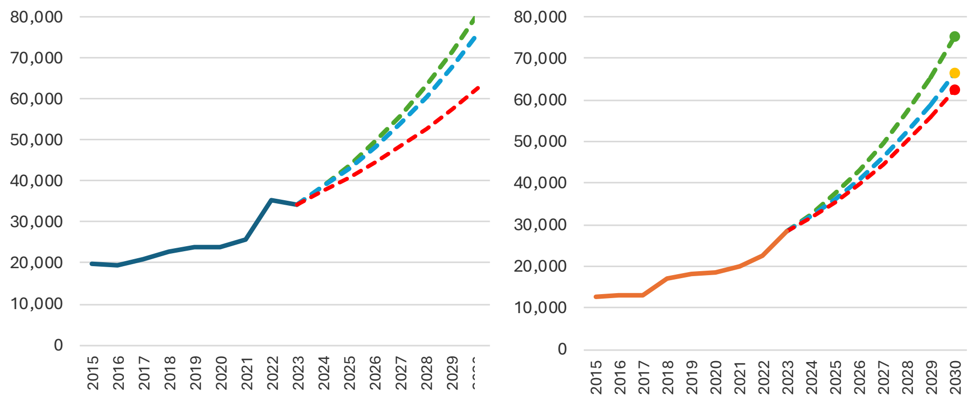


**Figure 2.** Productivity per Person Forecast in construction and Industry
Source: Authors' own processing

It can be noticed that productivity per person will steadily grow for both Construction and Industry at a very high rate. The reason behind these stays in the current growth rates (around 9% each) which must be summed to the forecasted productivity growth. For each, a worst, average and best case was chosen, and then the value was divided by 7 years reaching a more realistic number. It is possible to notice a very steep curve, especially for cases where AI is involved. It is also clear that if the growth continues at this pace, the productivity per person will almost double until 2035. But as much as those results may seem very high, another aspect that must be taken into consideration is the inflation rate. Considering the last available data, the current inflation rate as of the first trimester of 2025 is around 5%.

The Industry sector it's expected to adopt more new technologies because the investment has a more direct impact on the output if compared with the companies that operate in the primary sector. Meanwhile, for the construction sector, a more pessimistic approach regarding the application of AI must be considered. It is hard for AI to impact it, as the applications are not as direct as in the previous case.

***Overview of changes in the tertiary sector***

The tertiary sector in Romania is the greatest contributor to GDP, with a percentage of 57,61% in 2022, and also the major area for the number of people employed, with a value of 51% over the total active population (O'Neill, 2024). By looking at these data, it can be observed that this is the only sector in the country where the percentage of people employed is lower than the share of economic sectors in the GDP. In fact, in the last years, the service sector remained the main contributor to the GDP and in the future, it is easy to state that this contribution will only grow (Lloyds Bank, 2025).

This sector comprehends especially non-routine and routine cognitive jobs, two categories that in the past were hard to automatize, especially the first one, but that are targeted by AI. As much as AI may help to automatize some jobs, the demand for people who have the necessary knowledge to exploit and take care of these operations will still be high.

In this sector, one can underline the long-term trend of job substitution rather than job loss that will affect the high-skilled job market. This industry comprehends especially the IT&C workers, who will need to adapt to new technologies and acquire different knowledge from the present one, to be able to give a different value and knowledge from the one given by AI.

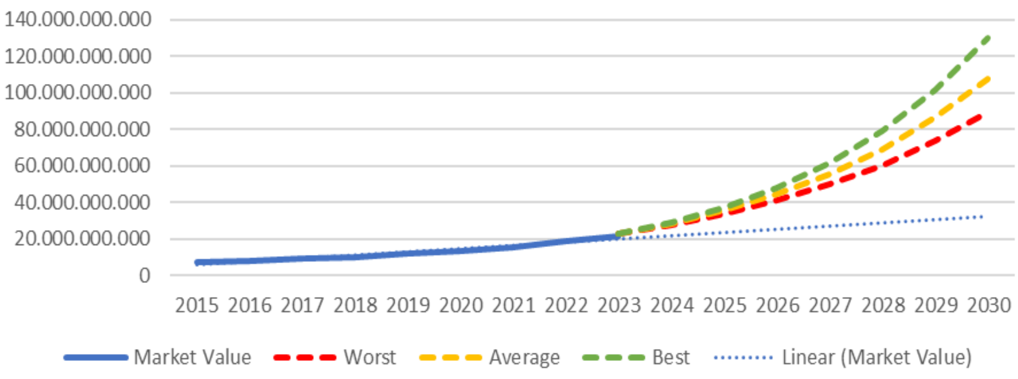


**Figure 3.** Future productivity per person in the tertiary sector.
Source: Authors' own processing

Depending on three possible scenarios until 2030, productivity may attain different values. Starting with the worst-case scenario where the growth will be 1%, meaning that the impact of AI will be minimal, the value will be around 150.000 euros per employee. Meanwhile, in the best-case scenario, with a value of 6,8% yearly, the productivity would reach 200.000 euros per employee, meaning that the impact would be much more considerate, and the market value would increase considerably. Moreover, the growth in the number of employees must also be taken into account, which for simplicity was set at a rate of 12%, since in the last few years its growth was almost linear. This can be translated into almost 350.000 new jobs created. By considering those factors it's possible to create three different scenarios in the future value of the IT&C market that may reach almost 130 Billion euros, in the best-case scenario, in the year 2030, and no less than 90 Billion in the worst-case one. Also, in this case, a mitigating effect is introduced by the high inflation rate that decreases those values considerably. The best case passes from the current value to 66 billion euros, meanwhile, the worst one reaches 46 billion euros. In this industry, it is possible to notice that with or without the presence of AI technologies, the growth is still steady. This behavior may be related to the fact that AI is already widely used, but also to the growing interest of the younger generations in this industry. The principal force that inflates these results is the number of new employees.

On the other industries of the tertiary sector, it is possible to notice a huge increment in productivity and the value of those markets. Still, it is important to consider that not all industries will be affected in the same way, especially public sectors such as Education and Health which will not be impacted by AI as much as the other.

Many sectors will be minimally impacted also in the long term, those comprehend especially all the jobs related to Education, Health and social care. In these industries, it won't be possible to introduce AI as the human presence, also in the long term, will be vital. AI systems still cannot be left alone to make decisions about what concerns the life of a patient or the grade of a student. Because of this very reason, AIs will be used more as a help, rather than a substitute for a medic or a professor. In the case of Health operations, AI systems will be integrated to analyze data and monitor patients, but they will not act unsupervised or with complete autonomy. In these industries, AI will still represent an important technology that will require workers to adapt. In fact, from schools to hospitals, starting from the students to the doctors, people in the medium long term will not be able to ignore it.

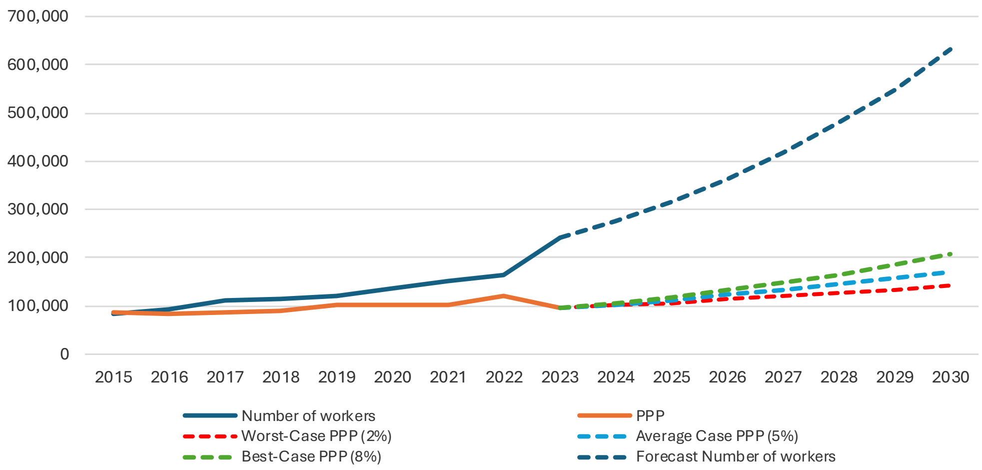


**Figure 4.** Future productivity per person and number of workers in IT&C.
Source: Authors' own processing

The principal 4.0 industry in Romania is the IT&C one which currently has a value of 21 billion euros (Boboc, 2022) and is growing at a rate of almost 12% yearly. In the 4.0 industry, some changes may be seen already in the short term, which will especially regard the productivity of the workers rather than the jobs per se. In fact, this area includes principally nonroutine cognitive jobs, which can hardly be automatized. Still being this sector purely based on R&D and highly innovative, and being the one that creates AI systems, it's easy to state that it will also be the pioneer that will adopt it in the first place. In this industry there is no doubt that companies won't wait long before introducing new technology, creating short-term uncertainty. At this time, the demand for jobs in this sector will slow down, because people will increase their productivity, and hence new employees will be redundant. This will create a period where employees will need to upskill and, in some ways, will create competition between humans and AI. Still in the medium long term when the need for people who can understand those technologies and hence can use them to reach greater results, the demand will grow, and new jobs will be created.

Taking into consideration all these data is still hard to make an accurate future prediction especially because it is important to take all the information given with a grain of salt, as it is almost impossible to expect a 40% growth rate in productivity in just one year. The key is to take a more balanced position between the ones that see this technology as a new industrial revolution and doomsayers that predict disasters both from an economic and social point of view. Moreover, it's also important to take the data and apply it in a context as the Romanian one, where some investments are hard to take into consideration in the current context, for example, the application of AI in hospitals and education environments, as for the moment the country must face other problems. By considering all of these it's possible to make a future prediction that still considers the capacities of AI and at the same time doesn't overvalue the potentialities of the country. As the results show the future growth in the tertiary sector, productivity and employment brought by this technology is real and feasible. It is also possible to analyze this data from different temporal points of view giving this way a more real interpretation of it. In fact, by dividing the next 7 years into short medium and long terms it is possible to notice that the principal changes will happen starting with the medium-term as the situation in the short term will be challenging and not all industries will be ready to welcome AI.

## Conclusions

Undoubtedly, many variables may depend on future forecasted values concerning how much the Romanian labor market will be impacted by AI. The weight that it might have on the labor market and hence on the economy is dependent on many other terms including the psychological factor and the faith to leave a machine to do vital tasks. Another aspect that must be taken into account and that adds complexity to the prediction is related to the future improvement of AI, which may or may not be major. Considering nowadays uncertainty, the number of variables increases, and Research, Science and people are moving faster than ever. Growing industries create new opportunities for people, meanwhile the automatization of jobs is substituting them for repetitive tasks. These two trends will affect the dynamicity of the labor market making it increasingly complex and with a higher variety. Almost any sector will benefit if AI is implemented in the right way and almost all of them will be obliged to do so. Romania finds itself in a very competitive market, with innovations that come from the other side of the world but also from its neighbours.

It is considered that Romania will evolve its primary, secondary, tertiary and quaternary economic sectors, and principally the ones which represents a good amount of its GDP. There will be many challenges that will affect the workers, especially the older ones that, in the future, will represent almost one-third of the workforce. This is another reason to think that in the short term, the country will struggle as this part of the population is harder to upskill.

AI will bring benefits in the long and medium term, but Romania and its citizens, as almost all the world will do, will need to adjust to it by passing on to a short period of uncertainty.

AI impact will vary and may represent a powerful instrument for the country to enhance itself. From higher productivity to the creation of new jobs, this technology will represent a double-sided blade, that will reveal its real potential only if the people will acknowledge its potential and dangers. Still, an aspect must be taken into consideration, that when external companies start to use this technology, also internal companies will be pushed to do the same, making it more a question of time since it will be widely introduced. As for the short term, it's easy to state that the changes will be minimal and will affect especially some industries like the IT one in the tertiary sector, but for the long term it will be harder to define whatever those changes will be drastic for the country. Faith in fact will depend almost totally on the preparation that people will have and on their willingness to adapt.

AI can help Romania to grow and develop, but technological and knowledge barriers are some obstacles that must be faced before continuing this path. People must be prepared and continuously updated on the current state of technological breakthroughs, to exploit this technology at its best. By doing so, problems like ageing and the decline of the population may be resolved by replacing the missing workforce with AIs and automatized processes. Still, this process will require a lot of time and in the meanwhile will continually impact on the labor market as its adoption grows. This will create many problems, especially in the short run, because people aren't ready yet. Many will look at this technology as a labor stealer, ignoring the fact that the possibilities are infinite. In fact, the main help will be given to productivity, which will grow in response to the automatization of many processes.

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