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Using Chatbots to Enhance Integrated Reporting: Insights from Accounting and Consultancy Companies from Romania

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Abstract: Integrated reporting is essential for businesses to communicate long-term value creation. Despite growing interest, little research has examined AI technologies like chatbots in sustainable reporting practices. This study addresses this gap, exploring chatbot adoption within 11,113 Romanian accounting and consultancy firms in Romania's emerging digital landscape. Researchers used Python's Seaborn library to analyze financial data from 2018 to 2022, finding that companies with higher revenue and liquidity were more likely to make their mark on how to achieve integrated reporting. Additionally, this study revealed the potential of chatbot technology adoption to enhance financial reporting and management, significantly improving financial reporting efficiency, accuracy, and accessibility. By automating data collection and analysis, generating real-time reports, and improving communication with stakeholders, chatbots can significantly improve efficiency and accuracy in financial processes. By addressing the challenges and capitalizing on the opportunities, firms can use chatbot technology to create more efficient, effective, and sustainable reporting practices. The findings contribute to this field of knowledge on sustainable reporting by examining the potential of technology and artificial intelligence (virtual assistants) to improve stakeholder communication. This study provides a case study from Romania, with implications for other regions.

Keywords: sustainable accounting; integrated reporting; chatbots; artificial intelligence; digital technologies; financial performance; communication; management optimization

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1. Introduction

Sustainability accounting plays a critical role in addressing Environmental, Social, and Governance (ESG) objectives by enabling organizations to quantify and disclose their impact on stakeholders and the environment. It is the process by which companies must assume responsibilities, become aware, and act for the well-being of all stakeholders. An active contribution to this global movement is represented by the multitude of organizations that target objectives concerning environmental issues, social responsibility, and corporate governance (ESG). Institutions with responsibilities in the accounting field such as the International Accounting Standards Board (IASB) (an independent body within the IFRS Foundation) and the International Sustainability Standards Board (ISSB) (an independent standard-setting body within the same foundation) are responsible for the development of the IFRS Accounting Standards and the IFRS Sustainability Disclosure Standards, respectively [1]. Although, in most of them, the companies do not make a complete disclosure of the internal and external sustainability strategies, the expectations

and the need to inform clients about the environmental and social performances attract the development of sustainability accounting [2]. While prior research emphasized the use of digital tools for sustainability reporting, limited attention has been given to AI-driven solutions like chatbots. These tools offer transformative potential by automating data collection, generating real-time reports, and enhancing communication with stakeholders. Previous studies on sustainability accounting have largely focused on reporting processes using traditional digital tools, often overlooking AI-based interactive technologies. This lack of empirical data on AI-driven automation and engagement tools in sustainability contexts highlights the need for research on chatbot applications in integrated reporting. The existing literature on AI applications in sustainability reporting primarily focuses on analytics and predictive capabilities, with little attention given to the role of interactive tools like chatbots. Moreover, the potential of chatbots to improve real-time communication and automate data-driven reporting in sustainability contexts remains largely unexplored. As an emerging market in the European Union, Romania provides a compelling context for exploring digital transformation in sustainability reporting. Despite growing interest, challenges such as limited infrastructure and varying digital literacy levels create opportunities for innovative solutions like chatbots to address gaps in reporting practices. Studying chatbot adoption in Romania provides insights into the potential for digital tools to enhance sustainability practices in similar emerging markets, where the dynamics of digital adoption may differ significantly from those in more developed countries.

Sustainability accounting must emphasize environmental performance reporting so that management decisions on resource consumption operations optimize and pursue sustainability goals. It also contributes to the assessment of the impact of the activity on the environment [3–5] and assesses the sustainability efforts that companies are making to meet regulations. In this context, the accounting profession actively participates in delivering quality information related to sustainability to all stakeholders [6]. Professional entities identify the existing stage in the professional training of specialists and establish key areas for developing new skills and updating the knowledge they possess so that the data they produce on sustainability issues conveys confidence to users. The significant changes in stakeholder expectations regarding sustainability, as communicated through reports prepared by companies, require the accounting profession to prepare for sustainability reporting and a certain alignment at a global level regarding mandatory disclosure. So, entities like the International Sustainability Standards Board (ISSB) and the International Auditing and Assurance Standards Board (IAASB) work together to provide direction for aligning sustainability standards.

In this complex sustainability reporting process, accounting firms are interested in working with professional accountants whose skills are in the following areas: analysis and systemic thinking, critical thinking and solving problems, working in teams interdisciplinary, communication skills, ease of adaptation and flexibility, etc. [7,8]. To achieve such qualities, the existence of strategies aimed at training professional accountants in an adequate way, starting in the academic framework, to provide services related to sustainability, is required.

While studies by PwC US [9] and Deloitte [10] underscore the importance of integrating sustainability into education programs, promoting innovation, and the role of technology in achieving business goals. The existing literature on AI applications in sustainability reporting [11] primarily focuses on analytics and predictive capabilities, with little attention given to interactive tools like chatbots [12].

The integration of sustainability in the accounting curriculum appears as a necessity in the context where issues such as social and environmental responsibility, environmental and social accounting, and, currently, sustainability are topics that concern the business world, the academic world, governments, and all other stakeholders [13]. According to a study, the traditional accounting curriculum focuses more on the technical side of training future professionals, while the sustainability curriculum aims to contribute to the development of independent and holistic thinking regarding economic phenomena. Curriculums

must quickly adapt to the implementation process of sustainability standards and actively participate in supporting companies that prepare sustainability disclosure reports.

Moreover, while artificial intelligence is increasingly implemented across various sectors to enhance efficiency and support data-driven decision-making, limited research by refs. [14–16] has explored its specific application within sustainability management and financial reporting [17–19]. Most studies on AI in business contexts have focused on predictive analysis [20], data processing [21,22], or customer engagement, with few examining the potential role of virtual assistants [23,24], such as chatbots, in supporting reporting on sustainability standards. A systematic review of a recent literature review revealed a gap in understanding how chatbots might contribute to sustainable business operations by optimizing financial management and reporting. In this context, the study examines how the use of artificial intelligence can improve the dissemination of information related to the fulfillment of sustainability standards. The study addresses the central research question, namely, *how can digital technologies, such as chatbots, enhance sustainability-focused reporting and value creation for stakeholders?* To explore this, this study examines the following subquestions: (1) How can chatbot technology enhance the accuracy and timeliness of financial reporting? (2) In what ways can chatbots optimize financial management and operational efficiency? (3) How can chatbots support effective communication with stakeholders in sustainability reporting? All these questions represent the basis of the objectives of this study, which, for greater specificity, are represented by the following: (1) to assess the potential of chatbots in improving the timeliness, accuracy, and efficiency of sustainability reporting; (2) to explore how chatbot technology can optimize financial management and operational processes in sustainability contexts; and (3) to evaluate the role of chatbots in facilitating effective communication and engagement with stakeholders.

This study employs a mixed-method approach, combining exploratory data analysis and cost amortization analysis to assess chatbot adoption and its financial impact. These methods allow the capturing of early-stage adoption patterns in emerging digital landscape markets, providing insights distinct from those in the existing literature.

This study demonstrates the potential of chatbot technology to enhance financial reporting and management, and it focuses on the economic dimension of sustainable development, specifically examining how chatbots may enhance financial reporting and management efficiency. Although sustainable development encompasses economic, social, and environmental aspects [25], the scope of this paper is limited to economic impacts, with a goal to establish how AI-driven technologies can support economically sustainable practices within organizations. By automating data collection and analysis, generating real-time reports, and improving communication with stakeholders, chatbots can significantly improve efficiency and accuracy in financial processes.

To introduce the outcomes of this study, this paper presents five sections. After introducing the literature review about the topic of interest, namely, sustainability in accounting, integrated reporting, and virtual assistants' implications in sustainable accounting, the third section draws attention to the materials and methods used for this study.

Therefore, the results and discussions present the contributions to the specialized literature, followed by the final section, where the conclusions highlight the theoretical and managerial implications, limitations, and potential for further research.

2. Literature Review

2.1. Sustainability in Accounting

At the European level, the private association European Financial Reporting Advisory Group (EFRAG)—established in 2001—was involved in the development of the International Financial Reporting Standards, and currently contributes through the consultancy offered to the development of directives regarding EU sustainability reporting standards.

The professional entities, in turn, are engaged in the development, adoption, and implementation of international standards for accounting, ethics, and deontology education in the public sector, as well as auditing and assurance. They participate through collective

actions at the global, regional, and local level in the training of members in order to deepen existing knowledge, but also to accumulate new knowledge to adapt to the requirements regarding the implementation of sustainability reporting standards [26].

The process regarding the adoption and implementation of sustainability reporting standards aims at the direct and responsible participation of accounting in the sense of expressing sustainability in quantitative indicators, such as the analysis and reporting of the social and environmental impact of a company [27–29].

Along with the professional bodies, the companies that offer accounting, taxation, audits, and insurance services in the process regarding the sustainable reporting standards, through the activity carried out, claim the need for digitization and the use of advanced technologies in carrying out their actions [30]. Research indicates that AI adoption in sustainability and integrated reporting varies significantly between developed and developing countries. Developed countries, with advanced digital infrastructures and greater regulatory support, have seen a more widespread integration of AI technologies, including chatbots, in corporate reporting [31]. In contrast, developing countries face challenges such as limited technological infrastructure, lower levels of digital literacy, and budget constraints, which can hinder AI adoption in reporting practices [32,33]. This disparity highlights the need for context-specific studies, such as this study on Romania, to understand the unique opportunities and barriers in emerging markets.

Digital transformation has required the development of skills and competencies to help develop accounting and finance work in a digital economy. In this sense, some of necessary the skills are as follows: learning and applying transformative technologies, ease in analyzing and presenting data, critical thinking and communication with partners, openness to learning new things, etc. [19,34].

The existence of a wide range of stakeholders with multiple and varied concerns gives rise to the need to find solutions that combine all environmental, social, and governance aspects of an organization with common interests and future well-being. The intervention of sustainability accounting can help companies develop businesses that differentiate them in the market, are competitive, and achieve financial and environmental performance. The issue of sustainability and stakeholder engagement formed the premise from which the Sustainability Accounting Standards Board (SASB) identified issues relevant to investors that vary by industry. At the same time, the analysis carried out by the Global Reporting Initiative (GRI) established a whole range of sustainability issues of importance to society. Joint research by the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB) explored the experiences of companies using the two sets of standards together to meet their reporting needs [35].

From investors to consumers and state institutions, a joint effort to change lifestyles and practices can support the development of a society where companies are interested in measuring and reporting their sustainability information.

According to the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS), users interested in a certain company must be allowed to know not only the significant impacts it has on the environment and people but also the significant effects that environmental aspects have on the company's development and performance.

In the conditions of an ongoing digitization process, the business model, the sustainability management system, and its monitoring are easier to access, and transparency in the disclosure of sustainability information is increasing [36]. Accounting service companies are directly involved in the use of digital technologies, and communication with the users of financial accounting information tends to be performed in real time. For the preparation of integrated reports comprising financial and non-financial information, they offer consultancy in order to apply sustainability standards that are intended to allow investors and other users to evaluate the risks of the investment from the point of view of the impact on the environment and other aspects of sustainability and to increase the degree of transparency in communication [37]. In Europe, the most common accounting

services offered by specialized companies are as follows: external audits, accounting and financial reporting, accounting and auditing in the public sector, real estate valuation, and financial consulting [30].

The training accounting services to measure specific sustainability indicators are resource consumption (materials, water, energy) and the impact of the entity's activity on the natural environment (conditions of land use, emissions in the air, in water, in the soil that seriously affect the natural environment, waste, the number of indemnities paid by judicial decisions regarding the natural environment). The measures taken by the entity to reduce these impacts (Global Reporting Initiative (GRI) represent the stage of involvement of the field in the creation of value for sustainable businesses. Accounting must respond to the needs of the interested parties and find a balance in the creation of the value related to each party. According to Harrison, ref. [38], conducting business is the result of a set of relationships that contribute to the creation of value for stakeholders in the firm's activities and results and that influence the achievement of its objectives.

Effective stakeholder relationship management can bring competitive advantages to the company and impact the company's conduct of responsible business [39–41]. Sustainability accounting can provide information on different aspects of sustainability and help to compare ESG performance indicators considering the investment function developed in the company. The impact of each project and the business model can be reflected by cost accounting and measuring the benefits recorded [42–44]. In this sense, an important role belongs to management accounting, which must provide relevant data on the consumption of raw materials, energy, water, and the waste generated by the company's activity, as well as data on the costs of protecting and maintaining the environment in relation to performance financial because of the application of environmental policies and the reduction in the consumption of natural resources.

Sustainability accounting deals with tracking, aggregating, and reporting environmental and social information, often linked to economic information related to reducing sustainability problems or contributing to sustainable development [45–47]. In conventional accounting, thinking in relation to stakeholders registers a certain gap that is also maintained regarding sustainability accounting and stakeholder information. The results of a study on the level of reporting of value creation and distribution to stakeholders [48] shows that, in general, companies do not address the full variety of stakeholders when reporting on value creation. Sometimes, in the development of integrated reports, significant influences are found in some departments within the company.

With the help of sustainability accounting, the business model managed by the entity; the monitoring of the impact of the activity carried out on financial performance, the environment, and society; and the quality of the disclosure of non-financial information, are reflected in all interested parties [49].

Artificial intelligence can be implemented into this communication process, bringing with it opportunities and challenges that influence everything from data analysis to decision-making processes. AI intervenes in the accounting processes not only for the processing of transactions of purchases, payments, receipts, and closings of the month but also for the realization of a real-time analysis to substantiate business decisions. The integration of AI into the organization and management of companies allows professionals to focus more on strategic analysis to achieve performance goals and create value.

2.2. Integrated Reporting

Integrated reporting encompasses an entire process of developing a report based on the concept of integrative thinking (IT) [50], intended to convey information in a clear format and increase corporate transparency. According to a recent reference, ref. [51], an integrated report must contain information about all aspects of the company, conveying it accurately and in a balanced way to investors and other interested parties [52,53].

According to the study carried out by Nandram et al., company management is tempted to disclose information on performance indicators (KPI—Key Performance In-

dicator) emphasizing good performance and minimizing poor performance through the presentation in the form of the integrated report. Therefore, there are situations where management turns to positive presentation models, using impression management, to express a better picture of the result in their integrated reports for the purpose of transmission to users [54].

In this way, the concept of information asymmetry is present, but it can be ameliorated by considering the content elements of an integrated report. According to Ghofar, 2023, an integrated ratio presented with fidelity negatively influences the information asymmetry (IA) and cost of equity (COE) of companies [55].

Accounting also contributes to the reduction in information asymmetry, which reflects the process in which information flows are provided for managerial decision-making, becoming a tool for designing a company's relationship with its stakeholders [56].

The quality of integrated reporting has increased over time, a phenomenon also supported by the study conducted by Nada and Hassan [57]. This study uses a company disclosure index based on the balanced scorecard (BSC) relationship that reflects the information content of integrated reports. The transmission of financial information with fidelity supplemented with non-financial information about the objectives regarding the sustainability of the company's business model is a necessity under the conditions of the introduction of sustainable reporting standards. Their implementation directly involves the work of professional accountants and sustainability accounting.

Integrated reporting can be considered a derivative of sustainability accounting as long as sustainability accounting is analyzed as a part of financial accounting. It aims to convey non-financial information to stakeholders and focuses on issues such as social and environmental accounting along with social and corporate responsibility reporting [58].

Stakeholders aim to understand how companies manage and use resources to achieve their strategic goals while considering sustainable development goals.

Along with sustainability accounting, which highlights all the processes directly related to a company's external performance, sustainability audits examine the strategy for achieving sustainable development goals and their disclosure through integrated reports. Thus, sustainability audits and reports guarantee an oversight of how the organization complies with tax laws, environmental laws, and social protection laws and how stakeholders are involved in its processes [59]. The use of innovative management accounting tools (IMAT Innovative Management Accounting Tools) results in better financial and sustainable organizational performance [60]. The companies that used innovative management accounting tools performed significantly better and created the framework to measure and manage a sustainable approach. They provide more and more detailed information on company performance and business sustainability behavior. Integrated reporting is influenced by innovation performance, especially within companies that have a high level of sustainability performance—a factor with an impact on the tendency to publish integrated reports, along with innovation performance at the country level [61].

The managerial control system (MCS) has an important role in the qualitative process of integrated reporting [62]. Also, integrated reporting developed based on reporting data formation methodology that includes a basis for generating financial and non-financial information and a complex integrated accounting policy would lead to a qualitative increase in the flow of information [63] and could contribute to the sustainable accounting paradigm [64].

The increase in the quality of financial and non-financial information disclosures has also been influenced by the means of disseminating content through ICT that can transmit information in real time and at the right time for all interested parties. Thus, the eXtensible Business Reporting Language (XBRL) can be used for the unitary representation of the content of financial statements or other types of performance and business reports. However, studies conducted on industry reporting [5,65,66] show that factors such as online financial reporting, profitability, size, and stakeholder involvement have little significant effects on integrated reporting. However, a complex business system with performance results

requires the development of a sustainability report whose premise consists of a business model that contains the objectives of sustainable development, namely, performance, environment, and social responsibility. Through integrated reporting, it is conveyed how the merging of objectives related to governance, performance, and social responsibility leads to the creation of value in the short, medium, and long term. Measuring the achievement of sustainability objectives is facilitated with the help of integrated reports that analyze the integrated transmission of financial and non-financial information for the six types of capital ("financial capital, manufactured capital, intellectual capital, human capital, social and relationship capital, and natural capital") [67].

2.3. The Role of Digitalization in Increasing the Level of Sustainability in Accounting

The digitization of the process of accounting activities has reached the stage where the automatic recording of repetitive transactions in accounts is ensured, contributing to the dedication of accountants to the control activities of accounting operations and the financial management of the company. Digitization brings benefits in terms of time savings, lower costs, and an overview of the amount owed on invoices [68].

Using technical knowledge and developing skills specific to digital transformation, accounting professionals are challenged in thinking about accounting processes using digital technologies. In the development of the accounting field, the existence of a balance between the improvement of technological knowledge and communication, critical thinking, and creativity is affirmed. In this context, the accounting professional must relate to technology, adapt, accumulate digital knowledge and skills, and use analysis and synthesis for communication in client relations [69].

All economic entities are oriented towards the digitization of business and pursue the use of information technology (intelligence, software robots, and blockchain) to increase performance. The digitization of accounting is not left out of the process and is leaving its mark on the working style and role of accounting professionals [70]. The research by Coman et al. shows that the accounting digitalization process, in addition to the implementation stages, has a component related to the human factor (change in mentality) and a component related to the organizational culture of economic entities that must be oriented towards sustainable business models.

Digitization is associated with technologies such as artificial intelligence, process automation through robotics, blockchain, intelligent data analysis, and cyber security, which help change processes inside and outside the company. Digitization assimilated in the field of management accounting and control contributes to the creation of value by designing new forms of collaboration between all interested parties, including organizations, suppliers, customers, and employees [71].

The use of AI leads to the development of new skills and knowledge, such as data analysis, critical analysis, and creative thinking. In the study carried out by the Institute of Management Accountants (IMA), the development of the following skills is identified as a result of the impact of AI on accounting and finance: cognitive skills (analytical thinking, creative thinking), self-efficacy (resilience, flexibility and agility, motivation and self-awareness, curiosity and lifelong learning, reliability and attention to detail), managerial skills (quality control), technological skills (technological literacy), and skills for working with others (empathy and active listening, leadership and social influence). Digitization in all areas of business (The European Green Deal) encourages organizations to adopt the latest digital technologies; the accounting function of a company cannot be excluded from this process, highlighting the need to update university curricula [72].

The digitization of the accounting field brings opportunities and also risks, which can be expressed in the decrease in the importance of providing information related to the other functions of the organization (marketing, IT, etc.). Accounting professionals must engage in technological development, participate in training through education, and activate the role of the educational system in the evolution of digital technologies [73].

By emphasizing the usage of the virtual assistants (chatbots) in integrated reporting [74,75], the process of making the information about reporting becomes more easy to communicate and more transparent [76], with a particular impact on the company's image to users who access the organization's presentation platform in search engines. Increasing transparency, clients identify the organization as a reliable one, wanting to collaborate with it. In this sense, in the long term, it can be stated that the use of artificial intelligence through chatbots to operationalize integrated reporting will increase the degree of interest for the company's stakeholders, and, implicitly, the financial performance will also experience improvements [77,78]. It can thus be said that, by increasing the company's trust using chatbots, AI also helps in the long-term growth of organizations that apply the principles of integrated reporting, even with financial implications.

A relevant example is given by Manifest Climate, which supports the use of AI to report with confidence, arguing that chatbots offer several advantages for financial reporting, such as automating routine tasks, freeing up human resources for strategic work, and providing real-time insights to process and analyze data quickly for timely decision-making. Also, the potential to obtain improved communication with personalized financial information and 24/7 accessibility is another factor [79].

In this context, the accounting profession requires people qualified in information technology (IT) and accounting information systems (AISs) and who can quickly familiarize themselves with the software tools used to maximize accounting functions [80]. The changes that take place through the adoption of digital technology influence the company's business model, its strategic and competitive objectives, and also the demands of consumers in the market [81].

Under these conditions, business management is more creative, and the training of the accounting function and its tasks contributes to the ability to access information much faster, from anywhere, and with impact in terms of corporate reporting [82]. The use of technology simplifies accounting tasks; therefore, accounting practice becomes easier, faster, and more accurate. Plus, accountants can access their work from almost anywhere, and corporate reporting is more efficient. Undeniably, there are advantages to digitization in the accounting profession, but its implementation can also encounter some difficulties, especially in smaller accounting service companies where investments in AI involve considerable efforts [83]. Thus, to be competitive, organizations must invest in new technology that brings with it increased productivity and the creation of new types of jobs with different skills.

Conversational artificial intelligence can be successfully used for communication and prospecting [84–86]. It can connect with accounting professionals to ask specific management consulting, accounting, taxation, or international business development questions due to its acceptance in the communication process in business [87]. Therefore, the integration of artificial intelligence in accounting, accounting education, and consultancy is a necessity and a present reality [59,88–90]. Thus, the integration of AI in this field allows companies to remain present in an ever-evolving field and contribute to the application of sustainable business models. By promoting integrated thinking, the existence of a global reference framework for sustainable reporting, which ensures ethics and independence and strengthens the application of sustainable practices, is enhanced [91–93]. This can be considered a holistic approach to business that helps create value and quantify performance.

In summary, while prior research has explored AI's potential in various business functions, limited studies have focused on AI applications in sustainability reporting, particularly in the form of chatbots. Furthermore, few studies address the unique challenges faced by developing countries in adopting AI for integrated reporting. These gaps highlight the need for research on how emerging digital technologies can support sustainability reporting within developing market contexts, providing a foundation for our study's research questions and objectives.

3. Materials and Methods

For the purpose of determining how effectively accounting and consultancy firms can ensure communication with users by using artificial intelligence, this study employed a methodology that used a mixed-method approach to integrate exploratory qualitative analysis with quantitative cost amortization modeling. This design allows for a comprehensive examination of the early adoption patterns of chatbots in sustainability reporting, combining financial data insights with an interpretive analysis of their managerial and operational impacts. Specifically, this study first explored the database (compounded by 11,113 consultancy and accounting companies from Romania) based on revenues and liquidity, as these metrics were seen as indicators of companies' openness to digital technologies [94–96]. The researchers' assumption that revenues and liquidity can serve as indicators of a company's openness to digital technologies is supported by prior research. Studies on organizational innovation have demonstrated that companies with higher revenue and stronger liquidity positions are more likely to adopt new technologies due to their greater financial flexibility and risk tolerance [97,98]. Additionally, from a Resource-Based View (RBV) perspective, financial resources represent a critical asset that enables firms to invest in and experiment with innovative solutions, including digital tools such as chatbots [99,100]. Consequently, this study proposes that revenue and liquidity are relevant indicators of a company's capacity and willingness to embrace digital transformation.

The researchers used the Seaborn library in Python 3.11.0 to analyze financial data from 2018 to 2022, including revenues, profits, debt, equity, and liquidity. They found that companies with higher revenue and liquidity were more likely to make their mark on how to convey information through integrated reporting. Additionally, they analyzed the potential and cost-effectiveness of using chatbots for financial reporting because this technology can significantly improve financial reporting efficiency, accuracy, and accessibility [101]. By following a mathematical model to calculate the amortized cost of chatbot usage, this study concludes that chatbots can be a valuable tool for improving financial reporting efficiency and accuracy. The research methods used (1) exploratory data analysis to understand the openness of the companies to digital technologies [102,103] and (2) the analysis of potential and cost amortization of chatbot usage as a continuation of the potential existing in the literature [104,105]. The dataset used in this study was fully anonymized and organized using an automated system with continuous numbering to ensure confidentiality and maintain data integrity.

The methodological approach is grounded in scientific basis, with the authors selecting the exploratory data analysis (EDA) and cost amortization analysis as methods that are suitable for studying the emerging adoption patterns of chatbots. EDA allows us to understand potential barriers and analyze preliminary patterns in the data, which are crucial when dealing with early-stage adoption where established models may not yet apply. Cost amortization analysis complements this approach by examining the economic impact and long-term return associated with chatbot implementation, offering insight into the financial feasibility of digital adoption for Romanian companies. Together, these methods provide a structured yet flexible approach to understanding the relationship between chatbot adoption and economic factors in a market where the digital transformation of companies is developing. The researchers state that this methodology is well-suited to the Romanian context and helps to establish a foundational understanding that can guide further research in similar emerging markets.

The exploratory data analysis addressed Objective 1 by identifying patterns in financial readiness for chatbot adoption. Cost amortization modeling supported Objective 2 by evaluating the economic sustainability of integrating chatbots into reporting processes. Together, these methods inform Objective 3 by highlighting the potential managerial and financial benefits of chatbot deployment for stakeholder communication.

3.1. Exploratory Data Analysis (EDA)

The openness of the companies to digital technologies is determined by high values in revenues and liquidity. Based on this, the authors explored the database from the point of view of these two significant metrics. The exploratory analysis involved examining financial performance indicators (e.g., revenue, profit, equity, and liquidity) for 11,113 Romanian accounting and consultancy firms from 2018 to 2022. Using Python's Seaborn library, we computed a correlation matrix to identify patterns between financial metrics and digital adoption potential. Outliers were identified and treated using the interquartile range method, and year-over-year growth rates were calculated to evaluate financial consistency and trends.

Financial resources, risk tolerance, or strategic vision are characteristics of companies that invest in new technologies without jeopardizing their core operations and might be more forward-thinking and open to adopting technologies that could drive future growth. Assuming a possible strong influence on how to achieve integrated reporting, the authors assigned an important role of revenues and liquidity in the analysis of discovering how companies could report sustainability in an integrated manner. Thus, they explored the database and calculated the average revenue and the average liquidity for each year across all firms. The outcomes will confirm a valuable opportunity for going further and finding correlations presented in the Results Section.

By using Python 3.11.0 and the "seaborn" library, the authors intended to compute the heatmap of the correlation matrix, including total assets, revenue, number of employees, profit, debt, equity, and liquidity, between 2018 and 2022. Before this step, they checked for the lack of missing values; searched for outliers; checked data distribution; evaluated consistency across years; searched for zero or negative values; and finally, calculated correlations. By using the interquartile range (IQR) method computed by using Python 3.11.0, 733 outliers in the revenue data for 2022 were found. These outliers were identified as being significantly higher than the typical revenue values in the dataset. Data distribution was not illustrated as being normal but rather skewed to the left, indicating that most companies have relatively low revenue values, with a few companies having very high values. The consistency of revenues and profit across years was evaluated by detecting the presence of zero or negative values. Afterward, all these values were cleaned, and year-over-year growth rates were calculated.

In the continuation of the results obtained, the authors computed the correlation matrix as a heatmap to identify possible relationships between financial metrics. Each cell of it shows includes the correlation coefficient between pairs of variables, ranging from -1 to 1. Values closer to 1 indicate a strong positive correlation, values closer to -1 indicate a strong negative correlation, and values around 0 indicate no correlation. The result of the matrix was used to understand the financial context of the development of integrated reporting.

3.2. Analysis of Potential and Cost Amortization of Chatbots Usage

The cost amortization analysis was conducted to evaluate the financial feasibility of chatbot adoption. A mathematical model was developed using variables such as initial development costs, monthly operational expenses (e.g., maintenance, hosting, customer support), and estimated benefits (e.g., savings from reduced manual reporting and improved stakeholder engagement). The total costs and benefits were projected over a five-year period to calculate the net amortized cost per month. This approach ensures a realistic assessment of long-term cost efficiency.

The second part of the data analysis section is dedicated to the potential and cost amortization of chatbot usage analysis. To formalize the amortized analysis, the mathematical model is used to calculate the net amortized cost per month (ϕ_{amort}) of utilizing basic chatbots to communicate reports to stakeholders. To proceed, the authors used the following variables: (1) the initial cost of developing the chatbot (ϕ_{dev}), (2) the initial cost of integration and setup (ϕ_{int}), (3) the total initial cost (ϕ_{init}), (4) the monthly maintenance and updated cost (ϕ_{maint}), (5) the monthly hosting and data storage cost (ϕ_{host}), (6) monthly customer support fee (ϕ_{sup}), (7) the total monthly operating cost (ϕ_{op}), (8) monthly savings

from reduced manual reporting (ϕ_{rep}), (9) monthly benefits from improved stakeholder engagement (ϕ_{eng}), (10) monthly benefits from improved data analytics and feedback (ϕ_{data}), (11) total monthly benefits (ϕ_{tot}), (12) time period in months for amortized analysis (T), (13) total benefits for the period $T(\phi_{totT})$, (14) net cost for period $T(\phi_{net})$, and (15) the amortized cost per month (ϕ_{amort}). The calculation method is presented as follows:
Initial costs:

$$\phi_{init} = \phi_{dev} + \phi_{int} \tag{1}$$

Monthly operating costs:

$$\phi_{op} = \phi_{maint} + \phi_{host} + \phi_{sup} \tag{2}$$

Monthly benefits:

$$\phi_{tot} = \phi_{rep} + \phi_{eng} + \phi_{data} \tag{3}$$

Total cost for period T:

$$\phi_{tot} = \phi_{init} + \left(\phi_{op} \times T\right) \tag{4}$$

Total benefits for the period T:

$$\phi_{totT} = \phi_{tot} \times T \tag{5}$$

Net cost for period T:

$$\phi_{net} = \phi_{tot} - \phi_{totT} \tag{6}$$

Amortized cost per month

$$\phi_{amort} = \frac{\phi_{net}}{T} \tag{7}$$

Considering the hypothesized scenario with market analysis results, the size of the variables is shown in Table 1.

Table 1. Value for assumed scenario.

Variable	Notation	Value
The initial cost of developing the chatbot	ϕ_{dev}	RON 50,000
The initial cost of integration and setup	ϕ_{init}	RON 10,000
The monthly maintenance and updated cost	ϕ_{maint}	RON 1000
The monthly hosting and data storage cost	ϕ_{host}	RON 500
The monthly customer support fee	ϕ_{sup}	RON 500
Monthly savings from reduced manual reporting	ϕ_{rep}	RON 3000
Monthly benefits from improved stakeholder engagement	ϕ_{eng}	RON 1000
Monthly benefits from improved data analytics and feedback	ϕ_{data}	RON 500
Time period in months for amortized analysis	T	12 months

To analyze the long-term potential of using chatbots in the reporting process, the authors performed an analysis in which the initial state (without chatbot) is the starting point. Specifically, C_0 is the initial total cost for integrating reporting without chatbots in the communication process.

The potential function was defined as a simple equation to reflect the difference between the current situation and the desired situation (with the implemented chatbot):

$$\Phi = C_{without\ chatbot} - C_{with\ chatbot} \tag{8}$$

The authors identified long-term investment analysis (five-year potential period) as being mandatory for this study. Thus, several aspects are presented. Firstly, *the cost spread over time* allows a more accurate reflection of the utility and financial performance for sustainable reporting purposes. Also, amortizing the cost acknowledges that the chatbot will provide value over an extended period rather than the starting point of the investment. This approach helps in budget planning and management by allocating a predictable expense over multiple fiscal periods.

Secondly, approaching the long-term potential of using chatbots for integrated reporting from the point of view of *technological depreciation*. Due to advancements in technology and changes in user requirements, technology assets typically depreciate over time. Amortizing the cost of a chatbot over five years aligns with the expected lifecycle and decreases the efficacy of the technology, ensuring that cost accounting practices match the practical depreciation of the asset.

Another argument is the *matching principle* because, in accounting, it dictates that expenses should be recorded in the same accounting period as the revenues they help to generate. By amortizing the cost of the chatbot, expenses are matched with the benefits realized from its use, such as improved customer service, increased sales, or cost savings from automation, throughout its operational life.

Also, the five-year period provides a framework for evaluating the performance and return on investment of the chatbot over a realistic timeline during which its benefits can be fully assessed and quantified. By emphasizing that a five-year amortization period for a chatbot deployment is prudent financial and strategic planning for integrated reporting, it aligns accounting practices with business benefits, supports effective budgeting, and provides flexibility in managing technological advancements. Thus, based on these aspects, continuing the calculation of amortized cost ($\hat{C}$) for the five-year potential period, the authors intended to determine the $\hat{C}$ for each operation as the sum of the effective costs of the operation and potential change by using the elements in the following formula:

$$\hat{C} = C_{effective} + \Delta\Phi \tag{9}$$

To draw up the initial scenario, the values used for communication and stakeholders' engagement are presented in Table 2. Therefore, they evaluated the costs and the benefits over an extended period using data shown in Table 3 and the results obtained by applying Equations (1)–(7).

Table 2. Costs without chatbot.

Costs without Chatbot (C_0)	Value
Manual reporting	
Monthly cost for manual reporting	RON 5000
Annual cost for manual reporting: (12 months)	RON 60,000
Five-year cost for manual reporting	RON 300,000
Costs for communication and stakeholders' engagement	
Monthly costs for communication and engagement	RON 2000
Annual costs for communication and engagement	RON 24,000
Five-year cost for communication and engagement	RON 120,000

Table 3. Costs with chatbot.

Costs with Chatbot ($C_{with\ chatbot}$)	Value
Initial costs	
Chatbot development	RON 50,000
Integration and setup	RON 10,000
Total initial costs	RON 60,000
Monthly operating costs	
Maintenance and updates	RON 1000
Hosting and data storage	RON 500
Customer support	RON 500
Total monthly operational costs	RON 2000
Five-year costs with chatbot	
Annual operating costs	RON 24,000
Five-year operating costs	RON 120,000
Annual economies and benefits	RON 54,000
Five-year economies and benefits	RON 270,000

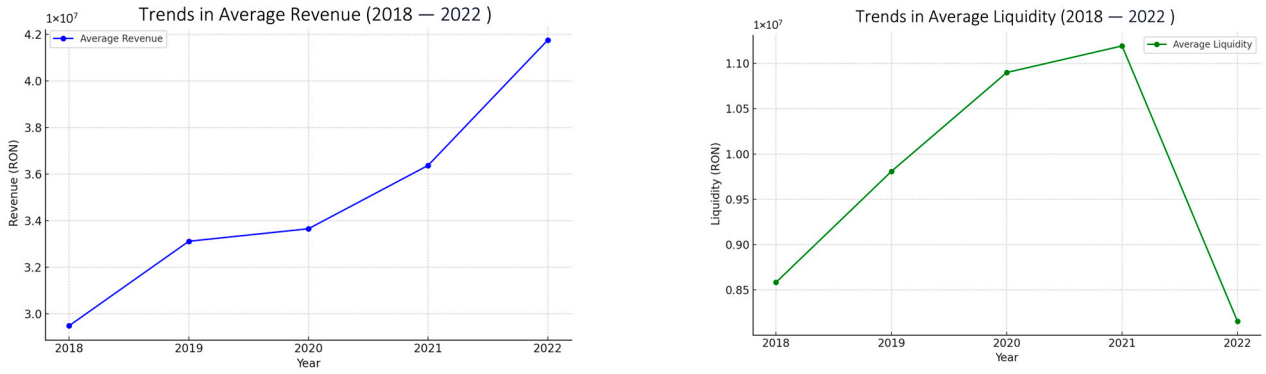
After calculating the five-year total costs for the current (C_0) and desired situation ($C_{with\ chatbot}$), the authors calculated the function of potential (Equation (9)).

4. Results

This section provides a comprehensive overview of the study's findings, focusing on three key areas. Firstly, it presents the results of an exploratory analysis, which presents the current state of chatbot usage and identifies potential areas for improvement. Secondly, it explores the potential cost savings and revenue generation opportunities that chatbots can offer. Lastly, it examines the factors influencing the return on investment for chatbot implementations, including cost amortization and long-term benefits.

4.1. Exploratory Analysis Outcomes

The EDA outcomes illustrate the trends for the average of two of the most significant financial performance indicators, namely, revenue and liquidity. Figure 1 shows a noticeable increase in average revenue in 2022, indicating a high financial performance over the years; however, regarding the average liquidity, the trend suggests fluctuations, with a general upward trend towards 2022, indicating improvements in terms of financial stability.



(**a**) (**b**)

Figure 1. The evolution in average revenue (**a**) and liquidity (**b**) between 2018 and 2022. Source: authors' conceptualization based on the dataset.

To determine what generates a consistency of revenue and profit across years, the authors first detected the presence of zero or negative values (Table 4). After this step, they cleaned the t database, and year-over-year growth rates were calculated (Table 5).

Table 4. The number of occurrences of zero and negative values.

Year	Occurrences of Zero or Negative Values
2018	1109
2019	968
2020	937
2021	943
2022	950

Source: calculated by the authors using Python 3.11.0.

There was significant revenue growth in 2019, followed by moderate growth rates in the subsequent years. Profit growth was the highest in 2019 and showed a decreasing trend in the following years but still maintained relatively high growth rates. Visualized as a heatmap, Figure 2 illustrates all the relationships between firms' indicators. After the heatmap presentation, the centralization of the outcomes can be found in Table 6.

Table 5. Year-over-year growth rates for revenue and profit.

Year	Average Revenue Growth (%)	Average Profit Growth (%)
2019	50.5	172.01
2020	12.3	110.81
2021	17.11	90.17
2022	16.64	88.44

Source: calculated by the authors using Python 3.11.0.

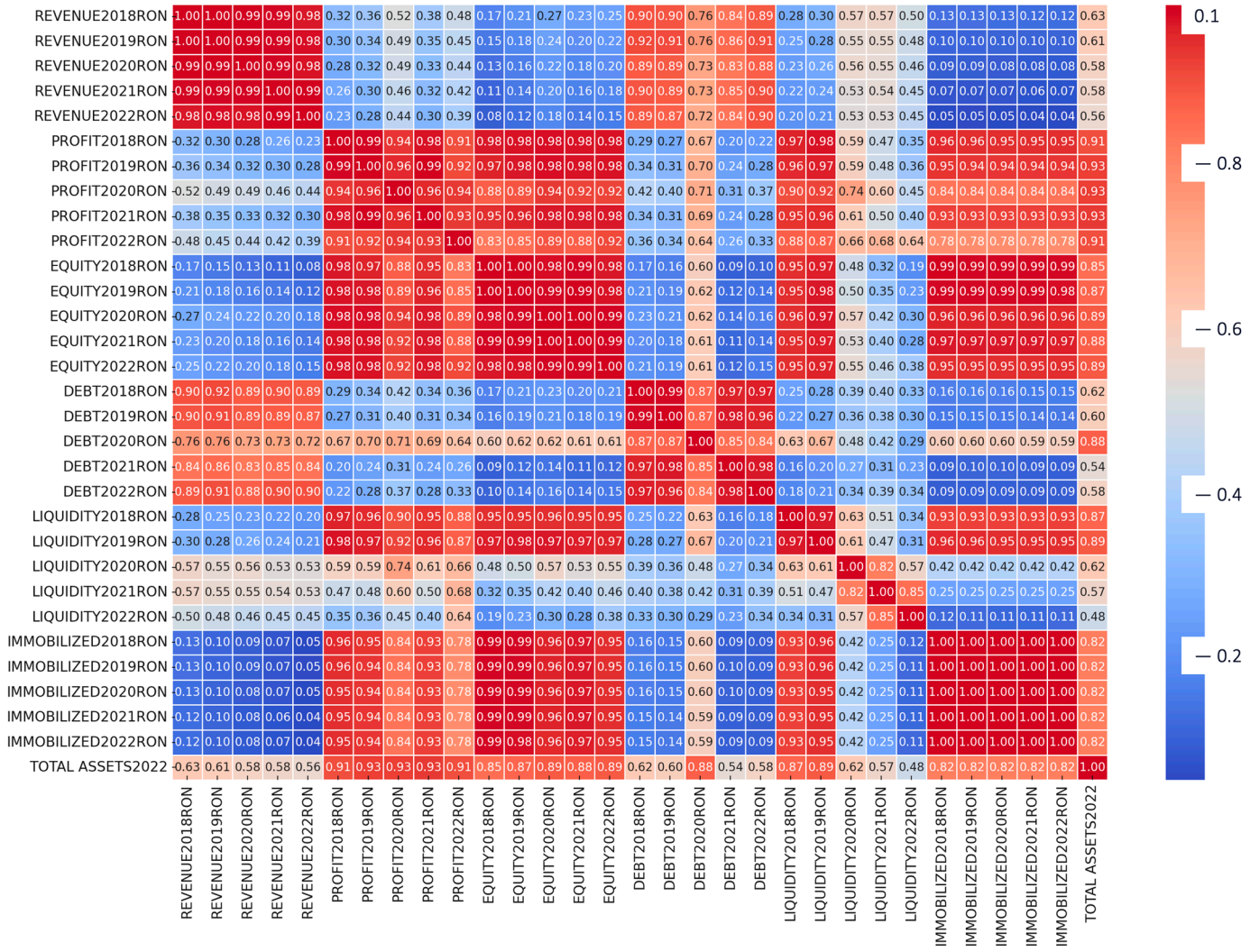


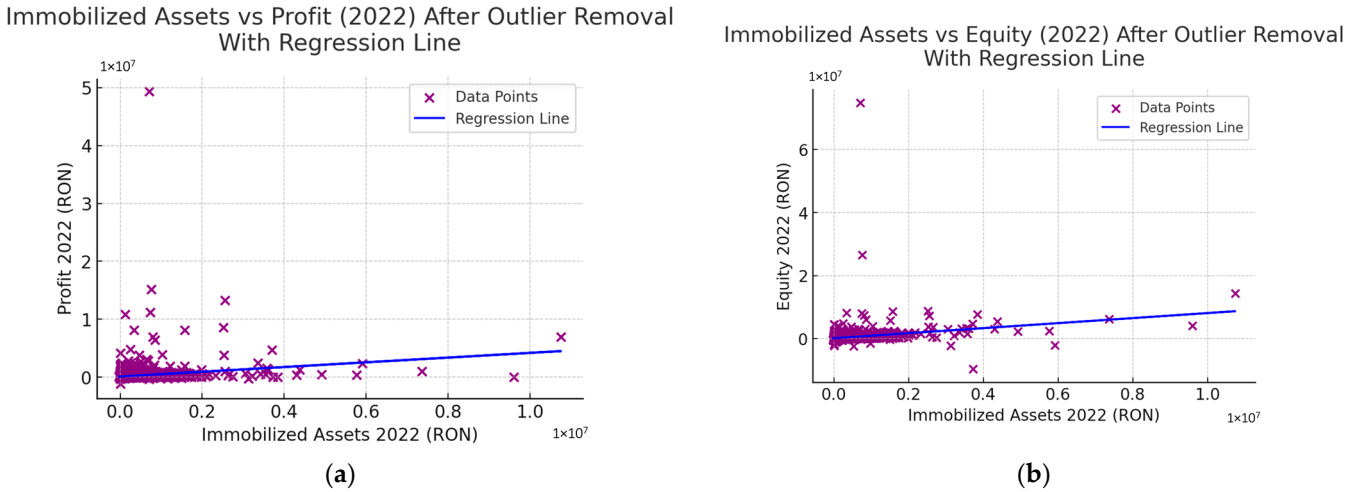
Figure 2. The heatmap of correlation matrix for financial metrics. Source: authors' computation using Seaborn library in Python 3.11.0. The currency used: RON (Romania's currency). Not relevant to convert it to euros or dollars. The relationships are not affected [106].

Table 6 highlights the strong positive correlation between profit and equity, underscoring how efficient management of digital tools like chatbots can enhance financial stability. This correlation supports the study's conclusion that investments in AI technologies contribute to both operational efficiency and profitability in sustainability reporting.

After outlier removal, correlations between immobilized assets and profit, and immobilized assets and equity, were illustrated (Figure 3).

Table 6. The centralization of the correlation matrix outcomes.

Relationship	Observation
Revenue and profit across years	Revenue and profit present which relation indicates a consistent performance year over year, suggesting effective business strategies, consistent demand for their services, or consistent profitability, which could reflect effective cost management and stable operational efficiency. This indicates that the company's ability to generate revenue has a direct and significant impact on profitability. While revenues in one year do influence profits in future years, the strength of that influence tends to weaken as the time gap increases.
Debt and revenue	A strong positive correlation between debt and revenue suggests that as revenue increases, debt levels also increase, and vice versa. This relationship can be indicative of several underlying dynamics within a business. It demonstrates significant implications for sustainable accounting. Debt should not just be seen as a financial burden but as a catalyst for growth. Especially, within the context of using digital technologies used in integrated reporting to ensure and enhance transparency, accuracy, and strategic insights into financial management, this correlation can be addressed effectively through digital technologies in integrated reporting for sustainable purposes. However, if revenue growth does not keep up with increases in debt (as is shown for 2020), it could signal potential financial distress or inefficiency in using borrowed capital.
Profit and equity	The strong positive correlation between profit and equity highlights effective financial management and successful operations, primarily because profits contribute directly to retained earnings, thereby enhancing equity. This correlation signifies sustainable growth as higher profits enable further investment into the business, enhancing the equity base and financial stability. This outcome is valuable to assess a company's long-term viability and operational efficiency.
Profit and liquidity	A strong and positive relationship between profit and liquidity was discovered. This kind of relationship is symbiotic. Strong profitability supports and often enhances liquidity, providing a company with a protection period against financial instability and the means to capitalize on growth opportunities without needing external financing. This dynamic is integral to maintaining the day-to-day operations and strategic flexibility.
Total assets and profit	A strong, positive correlation between total assets and profit implies that as the assets of a company increase, its profits generally also increase. This relationship suggests effective asset management and the ability to use assets to generate higher income.
Total assets and equity	The companies demonstrated a similarly strong, positive relationship between total assets and equity. This fact highlights that as a company's asset base grows, its equity does as well. This relationship can be attributed to the reinvestment of profits back into the company (increasing both equity and assets) or/and effective overall growth management. This outcome became very interesting for the researchers during the process of data analysis. Total assets include immobilized assets, the ones that can highlight the investments made for the adoption of technologies in the company. Based on this premise, the authors tried to identify a possible correlation between immobilized assets and other indicators (Figure 2) to find out if the company could be oriented to the adoption of digital technology to become more sustainable.



(**a**) (**b**)

Figure 3. The correlation between immobilized assets and profit (**a**) and the correlation between immobilized assets and equity (**b**). Source: authors' computation.

The trend between immobilized assets and profit (a) appears flatter. The same trend is related to the relationship between immobilized assets and equity. The positive correlation is still present but is less pronounced compared to the version with extreme values. However, visually emphasizes the strong positive correlations, namely, 0.78 and 0.95, respectively (Figure 4).

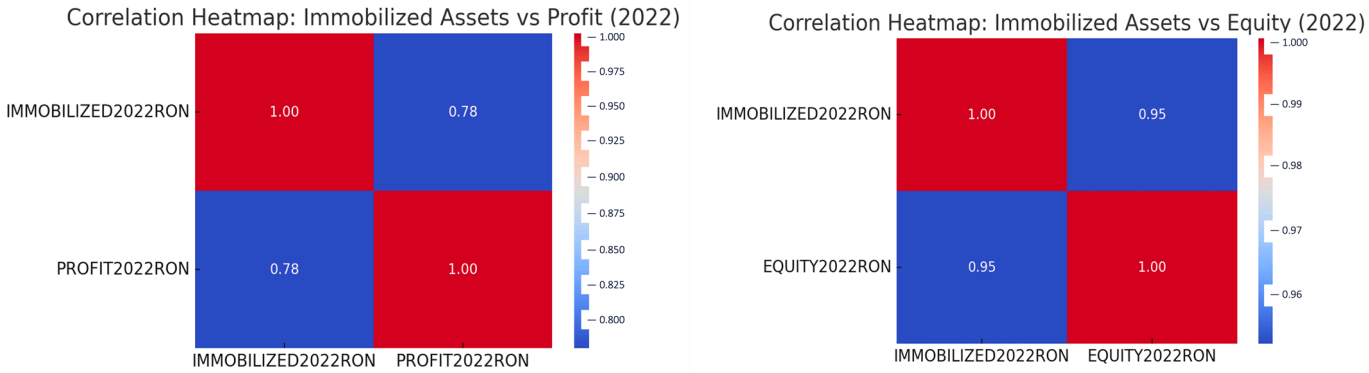


Figure 4. The heatmap for visualizing the correlation between immobilized assets and profit (**a**) and the correlation between immobilized assets and equity (**b**). Source: authors' computation.

The strong correlation between immobilized assets and profit indicates that as the value of immobilized assets increases, profit also tends to increase. This finding can suggest that investments in assets that are not readily convertible in cash, potentially including long-term investments such as digital technologies, especially in the case of consultancy and accounting companies. Also, a strong and positive relationship between immobilized assets and equity was identified. This very strong positive correlation indicates a robust link between the value of immobilized assets and the equity of the company.

Investments in immobilized assets, potentially including substantial expenditures on digital technologies, are directly correlating with an increase in the company's total equity. The strong correlations of immobilized assets and profit and equity suggest that the value of long-term assets held by these companies changes proportionately, reflecting consistent investment or depreciation policies over time. This indicates that such investments are not only enhancing operational capabilities but are also significantly increasing the company's net worth, far beyond just impacting profitability. The correlation underscores that digital technology investments, (immobilized assets), are a critical driver of both profitability and overall company value (equity). Investments in technology can be seen as capital investments that substantially increase the worth of a company, reflecting confidence and growth potential. The almost direct proportionality (with a correlation close to 1) suggests that equity growth is heavily dependent on how much is invested in these fixed assets.

These aspects highlight the strategic importance of investing in digital technologies such as chatbots. These investments are crucial not only for maintaining competitive advantage but also for significantly enhancing shareholder value through increased equity. In conclusion, this might involve long-term commitments to digital development through sustainable and integrated reporting.

4.2. The Analysis of Potential and Cost Amortization of Chatbot Usage Results

In the first stage, the authors obtained results for amortized costs:
Initial costs:

$$\phi_{init} = \phi_{dev} + \phi_{int} = \text{RON } 50{,}000 + \text{RON } 10{,}000 = \text{RON } 60{,}000 \quad (10)$$

Monthly operating costs:

$$\phi_{op} = \phi_{maint} + \phi_{host} + \phi_{sup} = \text{RON } 1000 + \text{RON } 500 + \text{RON } 500 = \text{RON } 2000 \quad (11)$$

Monthly benefits:

$$\phi_{tot} = \phi_{rep} + \phi_{eng} + \phi_{data} = \text{RON } 3000 + \text{RON } 1000 + \text{RON } 500 = \text{RON } 4500 \quad (12)$$

Total cost for 12 months:

$$\phi_{tot} = \phi_{init} + \left(\phi_{op} \times T\right) = \text{RON } 60{,}000 + (\text{RON } \ 2000 \times 12) = \text{RON } 84{,}000 \quad (13)$$

Total benefits for the period T:

$$\phi_{totT} = \phi_{tot} \times T = \text{RON } 4500 \times 12 = \text{RON } 54{,}000 \quad (14)$$

Net cost for the period T:

$$\phi_{net} = \phi_{tot} - \phi_{totT} = \text{RON } 84{,}000 - \text{RON } 54{,}000 = \text{RON } 30{,}000 \quad (15)$$

Amortized cost per month:

$$\phi_{amort} = \frac{\phi_{net}}{T} = \frac{RON\ 30{,}000}{12} = \text{RON } 2500 \quad (16)$$

Thus, the method of amortized analysis of chatbot usage for reporting shows that the net amortized cost per month of using chatbots to communicate sustainability reports is RON 2500 over the first year.

Secondly, the five-year total cost without a chatbot shows the amount of C_0 = 300,000 + 120,000 = RON 420,000.

Therefore, the five-year total cost with a chatbot is $C_{with\ chatbot} = \text{RON } 60{,}000 + \text{RON } 120{,}000 - \text{RON } 270{,}000 = -\text{RON } 90{,}000$.

The equation of the potential calculated, $(\Phi = C_{with\ outchatbot} - C_{with\ chatbot})$ resulted in $\Phi = \text{RON } 420{,}000 - (-\text{RON } 90{,}000) = \text{RON } 510{,}000$. Thus, the five-year amortized cost is

$$\hat{C} = \frac{\text{RON } 510{,}000}{5 \times 12} = \text{RON } 8500 \quad (17)$$

These results demonstrate that using artificial intelligence through chatbots for integrated reporting and sustainable communication can lead to significant long-term savings. Over a five-year period, the net savings represent RON 510,000, and the monthly amortized cost is RON 8500. This result suggests that implementing chatbots not only covers the initial costs but also offers considerable savings over time.

5. Discussion

Examining chatbot applications is a novel development in sustainable reporting, a domain that has predominantly focused on analytics and predictive AI tools. By addressing this gap, this study contributes to the literature on AI by demonstrating how chatbots can improve real-time communication with stakeholders and enhance the accessibility and transparency of sustainability reporting practices in emerging markets. These contributions provide a unique perspective, particularly in the context of Romania's emerging digital landscape, offering insights applicable to similar markets globally. By examining chatbot adoption among Romanian accounting firms, this study not only fills the empirical gap in AI research but also provides actionable insights for similar emerging markets with comparable challenges in digital adoption.

Regarding the objectives formulated, the authors highlight the importance of understanding the potential of accounting and consulting companies to deploy mechanisms that use artificial intelligence to gain more sustainable assets. Figure 5 visualizes the study's

key findings, demonstrating how chatbot adoption facilitates a more integrated approach to sustainability reporting, balancing financial and non-financial objectives. It serves as a practical framework for organizations seeking to align technological investments with sustainability goals.

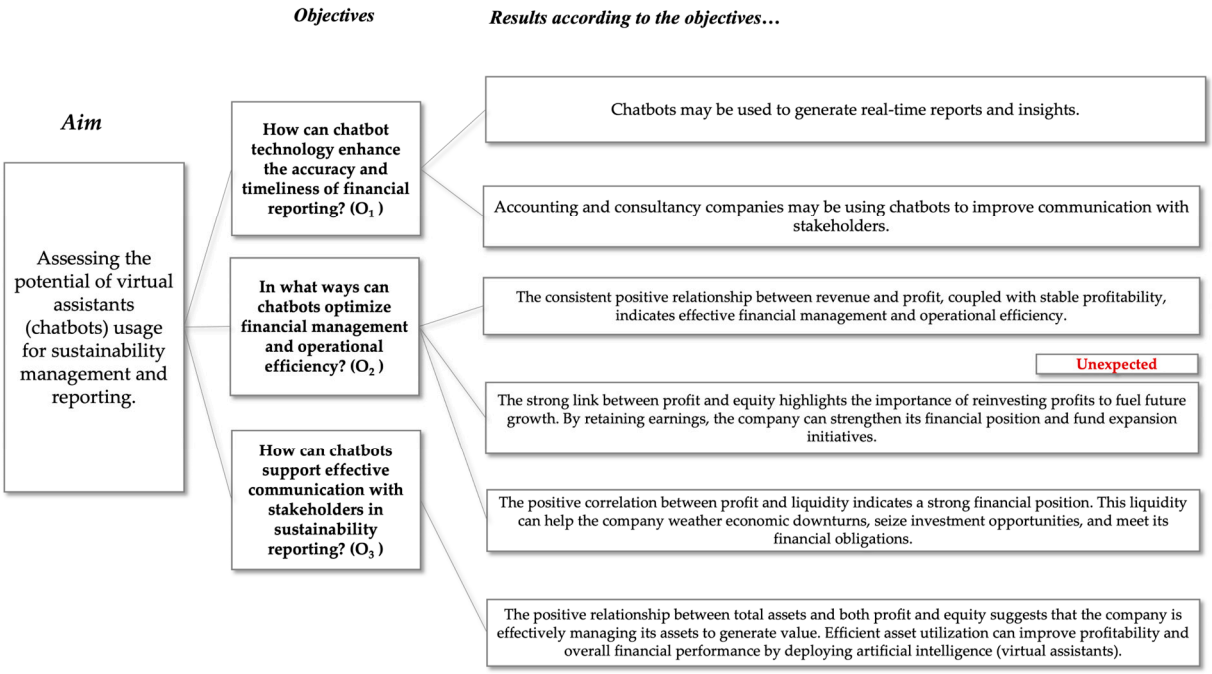


Figure 5. The overall picture of the study performed. Source: authors' conceptualization.

The findings suggest that chatbots can contribute to economically sustainable practices by enhancing financial reporting efficiency and management transparency. While these improvements may indirectly support broader sustainability goals, further research would be needed to assess their impacts on social and environmental dimensions directly. Hence, all three objectives were achieved. In addressing Objective O1, the authors investigated the potential of chatbot technology to enhance financial reporting in sustainability management. The observed correlation between asset investment and profitability underscores the strategic value of adopting digital tools like chatbots. For instance, investments in AI technologies specifically tailored for sustainability reporting contribute not only to operational efficiency but also to enhanced stakeholder trust, which indirectly drives long-term profitability. However, this relationship is contingent upon the effective implementation of these technologies and their alignment with organizational objectives. Implementing chatbots to automate data collection and analysis for real-time reporting can significantly improve financial reporting by providing timely, accurate insights. This approach is valuable not only for accounting and consulting companies, but for a broad range of businesses as evidenced in fields such as corporate finance [107], consumer behavior analysis [108], construction [109], or even government frontline services [110]. For accounting and consultancy firms specifically, chatbots offer opportunities to streamline stakeholder communication, with recent studies indicating the benefits of chatbots integrating for engaging collaborators [111] and supporting data-driven business decision-making [112]. By utilizing chatbots to generate interactive reports and answer stakeholders' queries, companies can deliver personalized financial information, enhancing transparency and facilitating more informed business decisions. This alignment with a chatbot-enabled reporting process allows organizations to provide stakeholders with real-time insights into financial performance and trends, ultimately supporting a sustainability-oriented business environment.

In exploring strategies to optimize financial management and operational efficiency (Objective O2), the researchers examined how integrated chatbots can streamline a range

of financial and administrative tasks. Chatbots can automate routine processes such as expense tracking, invoice processing, and transaction monitoring, thereby reducing manual workload and minimizing errors. Revenue and profit trends are addressed to identify areas for improvement and optimization, reinvest profits strategically to fuel future growth and strengthen the company's financial position, or maintain a healthy liquidity position to weather economic downturns and seize investment opportunities, which are three of the principal directions to develop sustainable reporting [113,114]. The outcomes generated by the correlation matrix presented in Table 6 could be aligned with the list of methods for financial management optimization (predictive analytics by using profitability and opportunity identification [115] or relationship analysis between information systems, demand, revenue, and profit management [116]). For example, the strong positive correlation between debt and revenue can be very useful for real-time reporting and dashboards communicated through a chatbot. Integrated reporting can be enhanced with real-time insights that provide a comprehensive view of financial metrics. A dashboard can be customized to alert partners about key financial ratios or other relevant metrics that exceed predefined thresholds. Real-time reporting enables quicker decision-making processes and ensures that stakeholders are consistently informed about the company's financial status.

To evaluate whether chatbot deployment can improve overall management efficiency by supporting sustainability-related functions, (Objective O3), the authors explored the relationship between technology deployment and financial performance indicators, such as profit and revenue. The findings suggest that effectively managing assets with AI-driven solutions, including chatbots, can enhance profitability and overall financial performance. The positive relationship between total assets and both profit and equity suggests that the company is effectively managing its assets to generate value. The literature supports the view, highlighting that AI technology can play a crucial role in improving profitability by maximizing resource efficiency and asset utilization [117–119].

In the context of sustainable development, the use of AI, including chatbots, offers both opportunities and challenges for accounting professionals. AI-driven automation in areas such as data entry, compliance verification, and complex financial analysis is transforming traditional practices. This shift provides new insights into financial management while also raising ethical considerations around data use. Additionally, advances in AI have led to developments in repetitive task automation, fraud detection, financial forecasting, and compliance checks, which can improve cost efficiency and support informed decision-making. The integration of ERP systems, blockchain, and virtual assistants like chatbots, not only enhances operational efficiency but also aligns with sustainability objectives by supporting ethical and accurate financial reporting.

Therefore, the findings contribute to the Technology Acceptance Model (TAM) [25,120] by demonstrating that chatbot integration in financial management might be perceived by users as both useful and easy to use, which aligns with TAM's primary constructs. Additionally, this study extends the Resource-Based View (RBV) [121,122] by showing that chatbots enhance organizational resources through the automation of repetitive tasks and the optimization of asset utilization, thereby supporting economic sustainability. Also, this study acknowledges that the dynamics of the business environment require a conceptual framework that extends strategic management and defines stakeholders as groups or individuals that can influence the achievement of a company's objectives [123]; also, it acknowledges that organizational efficiency is based on contingent factors such as technology development, the size of the organization, etc. (Contingency Theory) [124,125]. This finding suggests that chatbots can be viewed as strategic assets that improve operational efficiency, a perspective that is particularly relevant for sustainability-oriented business models. Investments in chatbots, as demonstrated in this study, enhance profitability by reducing manual reporting costs, improving operational efficiency, and fostering stronger stakeholder relationships, particularly in the context of sustainability reporting.

In a more specific way, using AI in accounting involves setting guidelines and standards to ensure fairness, transparency, and accountability. Also, a series of risks must be considered, including data security, professionalism in the use of AI, reliability of results, and, finally, compliance with copyright, etc., which we mention in this study. Accounting professionals and consultants in the financial field must participate through professional judgment in synthesizing data, completing analysis, and presenting and disseminating results. The accounting profession actively participates in the application of the latest technologies in the context of placing a special emphasis on sustainability and social responsibility. Its evolution leads to the improvement of technical skills for data analysis, presentation, and the disclosure of information. In the context of the integration of AI and other innovative technologies, the role of the accounting professional and accounting firms is changing, and they must focus on the strategic impact they can have on their clients' businesses. Finally, accounting teams can include people with expertise in various areas such as digital marketing, data analysis, or the use of AI.

6. Conclusions

This study aimed to explore the potential of chatbot technology to enhance sustainability reporting and financial management in Romania. Guided by the research questions, the authors used a mixed-method approach to collect and analyze data from Romanian accounting and consultancy firms. The outcomes of this study contribute to the existing field of knowledge. The authors emphasize analyzing the relationship between total assets, profit, and equity to identify areas for improvement in asset allocation and management and to develop strategies to increase the efficiency of asset utilization and reduce costs. This study contributes to the literature by showing a strong positive relationship between immobilized assets, equity, and profit, indicating that companies investing in long-term assets, such as infrastructure and sustainable resources, tend to experience higher profitability and equity.

The outcomes of this study highlight several theoretical implications. One of them is the importance of balancing financial and sustainability goals, considering ESG factors, and optimizing asset utilization for sustainable growth. This study underscores the importance of long-term asset investment for enhancing firm performance and also emphasizes the need to balance financial and sustainability goals. By considering environmental, social, and governance factors, firms can optimize asset utilization and achieve sustainable growth. The findings align with theoretical frameworks such as the Resource-Based View, Stakeholder Theory, and Contingency Theory, suggesting that long-term asset investment should be performed in specific firm and industry contexts. This has implications for academic research in areas like sustainable finance, accounting, and strategic management, as well as for practitioners seeking to make informed investment decisions.

For managers, this highlights the importance of balancing asset investments not only with operational efficiency and financial strategy but also with sustainability goals. This includes considering the environmental, social, and governance impacts of these investments. The key takeaway is that while investing in immobilized assets can enhance profitability and financial health, the long-term effectiveness and sustainability of these investments depend on firm-specific and industry-specific factors. Companies should ensure that their asset utilization is optimized for sustainable growth and aligned with ESG objectives, incorporating responsible resource use, minimizing environmental impact, and fostering social responsibility. Through this, firms can achieve both financial success and sustainable development, addressing the expectations of stakeholders and contributing to a more sustainable economy. Moreover, artificial intelligence has penetrated all fields of activity in the field of accounting services. This process also includes the accounting education of professionals.

A primary limitation of this study is its focus on the Romanian market, where the adoption of chatbots and other digital technologies is still emerging. From this, a key limitation of this study is its focus on a selected country, where specific market and cultural

conditions may influence the adoption and perception of chatbot technology. Factors such as digital infrastructure, regulatory frameworks, and cultural attitudes toward automation in Romania may differ significantly from those in other regions, which could limit the generalizability of the findings. This study is intended as an exploratory analysis within a regional context, and, while the results offer valuable insights, further research is needed to determine how these findings might apply in other markets with different economic and cultural dynamics. Also, as a result, the potential long-term savings and the benefits of AI chatbots, particularly in terms of scalability and 24/7 availability, may be underestimated. A more extensive analysis would require a specialized sample, including companies that have extensively implemented AI chatbots, to fully capture their impact on communicating sustainable aspects, customer service, and operational efficiency. In this ideal context, further study om the existence of chatbots and a quality assessment could provide additional insights.

Further research could focus on quantifying the impact of chatbots on specific stakeholder engagement metrics, such as response time and satisfaction rates. Additionally, employing longitudinal studies to track the scalability and cost-effectiveness of chatbot implementations over extended periods would provide deeper insights. Comparative analyses across different emerging markets would also help generalize the findings and identify regional variations in adoption patterns.

The study contributes to the literature by being one of the first to explore chatbot applications in sustainability reporting within an emerging market context. It provides actionable insights for organizations aiming to improve reporting accuracy, timeliness, and stakeholder engagement through AI technologies. Future work should focus on developing industry-specific frameworks for chatbot integration, accounting for unique regulatory, infrastructural, and cultural factors in emerging markets.

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