TOE framework elements used on Artificial Intelligence implementation in the accounting and audit sector

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ABSTRACT

The purpose of this article is to clarify the way technological, organizational, and environmental contexts influence the Artificial Intelligence solutions implementation by the accounting and audit companies in Europe. The technological, organizational and environmental contexts were not enough studied in accounting and audit field but are becoming more and more important in the future. The applied methodology was based on a deductive approach and the instrument for collecting the data was a structured interview, to which it has answered 62 top financial specialists from 18 European countries, in companies with more than 10 years of experience in the accounting and audit sector. In the literature review the compatibility, relative advantage, employees' competencies, organizational readiness, top management support, and industry pressure are positively influencing the Artificial Intelligence implementation and in this research the conclusion is the same. The security, complexity, resources and governmental regulations are negatively influencing the Artificial Intelligence implementation but, in our research, we found a positive impact of them on the accounting and audit sector. The large organizations were considered in the literature review as being prepared to implement Artificial Intelligence but in our research, we found that also SMEs have implemented Artificial Intelligence solutions.

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INTRODUCTION

Artificial Intelligence (AI) comes with considerable benefits for accounting and audit sector, such as: the efficiency and effectiveness of work, increased data accuracy, more data used for decision making process, reduced time spend on repetitive activities. (Sutton et al., 2016; Yao et Jin, 2023). Beside the several benefits brought by AI in accounting and audit sector there are also some disadvantages spotted by researchers during the years such as: ethical concerns, job reduction or even job displacement, no creativity, security concerns. (Fulop et al., 2023). In terms of integration of AI solutions in accounting and audit sector there are a limited number of studies in the last few years. In recent years researchers studied the integration of AI solutions in business but there is still a research gap for the implementation of AI solutions in accounting and audit sector. (Chukwuani et al., 2020). At European level the AI implementation is more and more encouraged by several initiatives such as: a communication related to the European approach to AI, a review on the Coordinated plan on AI and Regulatory framework proposal on AI. (European Commission)

The problem for this research is represented by the number of researches made on the technological, organizational and environmental contexts on the AI solutions implementation on the accounting and audit sector of activity.

There is a lack of research on the implementation of AI solutions in the accounting and audit sector, using the TOE framework, due to the novelty of the subject. Few articles relate to the adoption of technology in audit sector using TOE framework but are related to other technologies than AI (Ahmi et al. 2014; Siew et al., 2020; Rosli et al., 2012, 2013; Widury et al., 2016). One study is related to AI implementation in banking and insurance companies in Germany. (Kruse et al., 2019) Another study is on the implementation
of AI in financial services using the TOE framework, using on an interview applied to the representatives of Romanian accounting companies and AI service providers. (Mihai, 2023)

The research objective that we have focused on is to understand the way a company in the accounting and audit domain can successfully implement AI solutions, by taking into consideration the most important factors. Those factors are represented by the Technological Organizational Environmental framework elements. The current paper answers this research objective by applying the deductive theory to analyze the results of a structured interview. By using the deductive approach, the authors start from the theory and based on it is developing hypotheses, then collect the data, analyses them and accept or reject the hypotheses. (Nola and Sankey, 2014).

The interview follows the structure of the Technology-Organisation-Environment Framework (TOE). This theory takes into consideration the technological, organizational, and environmental contexts, when the company representatives decide to implement a new project (Tornatzky and Fleischer, 1990). Even if in more developed countries the research on AI solutions implementation is vast there is no specific research on this topic, related to the accounting and audit companies from European countries. Therefore, we have considered this gap one of the motivations for our research effort. (Hasan, 2022). The importance of this research is also correlated to the European AI strategy (Annoni et.al. 2018). In January 2024 the European Commission launched an AI innovation package, which aim is to offer support to SMEs and to AI start-ups.

The main contribution of this study consists of a comprehensive analysis of the most important elements of TOE and their applicability for accounting and audit companies, which implemented or are willing to implement AI solutions. Another important area of interest is to disclose how this instrument (TOE) is reshaping companies’ activities and employees’ skills in order to accommodate the implementation of AI solutions.

The originality of this study is based on the target population involved (audit and accounting specialists) and on the elements of the TOE framework used for the interview configuration (top management support, security, compatibility, industry pressure).

This paper has five parts. The following part is based on a detailed literature review of the most relevant papers related this subject, respectively the TOE framework elements in line with the three research objectives addressed from which derives the 11 hypotheses for the 11 elements of TOE framework: compatibility, security, relative advantage, complexity, resources, organizational size, employees’ competencies, organizational readiness, support from the top management, industry pressure, governmental regulations. The second segment is dedicated to the methodology and the instruments used to analyzes the results. The following part of the article presents the results of the study and the discussions based on the obtained results, with relevant example. The last part is providing conclusions based on the most important findings.

**Literature Review**

**Theoretical and Conceptual Background**

**Artificial intelligence in accounting and audit**

The concept of Artificial Intelligence (AI) refers to technologies that make machines “intelligent”. AI solutions utilize automation to replicate or enhance human intelligence with the scope of improving the analysis together with decision-making abilities of technologies. AI solutions allow time-consuming and complicated tasks to be completed in a more efficient way. It serves as a catalyst in various industries for internal structural transformation, providing managers with tools that ease the complexity of the decision-making process (Huang, 2018; Ukpong, Udoh and Essien, 2019).

In recent years this subject became of significant interest for both academics and business environment. AI solutions are far from being fully developed; therefore, creativity and innovation can be embedded in different ways in this project. In addition to the impact on the technological way of doing business, AI solutions will also have a great impact on organizational culture and on people’s professional lives of people (Gregory, 2019).

The adoption of AI started decades ago and became present when the companies started to use computers. AI represented in this study is seen as an improvement in the quality of accounting services’ quality, due to the possibility of the intelligent systems to overtake human tasks and even to reach decisions independently (Stancheva, 2014).

Managers have a problem finding specialists in AI solutions. Instead of hiring AI specialists, which are rare and expensive, companies choose to improve the skills of their existing employees (Awang et al., 2022).

Accounting and audit represent critical roles which ensure credibility, reliability, and financial stability of a company. In the past those activities imply human expertise and manual processes. (Feliciano and Quick, 2022) Once the information technology (IT) appeared and has grown the way in which accounting and audit was performed has changed as well. (Al-Hattami, 2022).

Huang (2018) showed that using the technology helped the audit to become more efficient, more accurate and less costly and that it offered more time to auditors to focus on more important tasks. Several studies prove that accounting and audit have evolved tremendously due to AI implantation. (Jamwal et al., 2021, Enholm et al., 2022, Munoko et al., 2020)
AI solutions have significantly changed the accounting profession by increasing efficiency, data quality and accuracy. (Manita et al., 2020)

In this research, we have taken into consideration AI solutions which are performing the following activities: invoice processing and expense management, business intelligence, decisions making, data analysis, forecasting, pricing analysis, auditing, regulatory, financial and business research and assisted strategic planning.

AI has become popular in financial services due to its extended applicability in the accounting and audit sectors (Kruse et al., 2019).

Implementation of technological solutions using the TOE Framework

In this study, the TOE framework is applied to understand the adoption of AI solutions in the accounting and audit sector. This framework was developed by Tornatzky and Fleischer in 1990. They wanted to explain the contributing factors in the decision-making process, in the adaptation of a new technology at the organizational level. These two researchers sustain that, in addition to technology, there are other relevant factors involved in the adoption of innovation (Tornatzky and Fleischer, 1990). This framework brings together the three contexts, technological, organizational, and environmental, to investigate the implementation and adoption of new technological solutions by the firm.

TOE framework context

In the TOE framework, the technological context refers to internal and external solutions which are required when a new technology is implemented.

The technological context of AI solutions is related to the ease of use, compatibility with existing technology, and functional advantages. Previous research showed that incompatibility with existing software and hardware was a significant barrier to implementing AI solutions. Furthermore, if the new solutions have a complex interface or represent complicated process different from the current one, employees will resist using it, regardless of the benefits that will emerge (Siew, Rosli and Yeow, 2020).

The organizational context in case of TOE framework refers to the culture and organizational structure and top management support, which can impact the acquisitions, support, and utilization of a new technology. The structure of the organization can also influence the dissemination of corporate policies, the development of AI solutions, and the expectations for the implementation of AI solutions, including the new roles and skills necessary for adoption. In previous research, it is mentioned that employees follow a decision when support is guaranteed (Stancheva-Todorova, 2018; Siew Rosli and Yeow, 2020). When the organization provides the necessary support, the employees perform very well the assigned tasks (Nam et al., 2020). They are outperforming when they are encouraged or their actions are permitted and, eventually, rewarded. (Abdulwah et al., 2024)

The environmental context in the TOE framework refers to the external technological and social support for the adoption of a new technology, in this case AI solutions (Ahmi et al., 2014; Siew, Rosli and Yeow, 2020). In other fields, research related to the influence of AI solutions has become an important topic for ongoing research (Chatterjee et al., 2021). A competitor that uses AI solutions may influence other entities to also use them, to stay competitive (Ahmi, Saidin and Abdullah, 2014). Adopting new technologies to remain competitive has been a way to survive in current period.

Relevance of the TOE framework for research objectives

The details of the research objectives are provided below, together with the hypothesis for this study.

Technology context in TOE framework

The first research objective is to understand how is the implementation of AI dependent on the technological context. The following elements that can contribute to this objective belong to technological context and are most frequently used:

Compatibility

Technology compatibility is the way in which the use of a specific technological solution is consistent with the needs of a specific sector in which it is implemented. This definition of an element is adapted from Goodhue and Thompson (1995). This compatibility represents one of the most important factors when a company decides to implement a new technological solution. It is considered a positive factor when it comes to the adoption process of new technology (Ahmi, Saidin and Abdullah, 2014; Siew, Rosli and Yeow, 2020, Zhang et al., 2020, Chatterjee et al., 2021). The compatibility of AI with current company systems depends on the nature of the systems, the level of integration required, and the objectives of AI implementation.

From the literature review we generated the following hypothesis, linked to the first objective:

H1: Compatibility is positively influencing the AI solutions implementation in accounting and audit sectors. (Vitali and Giuliani, 2024)
Security

Security is one of the most important factors when a company decides to adopt a new technology. Security represents a concern when it comes to technology adoption and can negatively influence the decision to implement new technologies (Kulkarni and Patil, 2020). Based on the literature review the following hypothesis has emerged:

H2: Security is negatively influencing the AI solutions implementation in accounting and audit sectors. (Zhu et al., 2024)

Relative advantage

Relative advantage represents the degree to which an innovation is considered suitable for a specific domain. If the new technology is perceived to have more operational and strategic value added than the existing working practices, it will be adopted. AI and robotics are seen as technologies that provide several useful benefits, for example an operational advantage (Ahmi, Saidin and Abdullah, 2014; Siew, Rosli and Yeow, 2020, Kulkarni and Patil, 2020, Chatterjee et al., 2021).

Thus, the third hypothesis derives:

H3: Relative advantage is positively influencing the AI solutions implementation in accounting and audit sectors. (Norzelan et al., 2024)

Complexity

Complexity represents the degree to which a technology is perceived as difficult to implement and understand. If AI solutions are less complex and easy to integrate into current architectures, there will be better chances that they can be implemented. This is a factor that is usually mentioned in the literature as being a major obstacle to AI implementation and is one of the most important in previous TOE studies (Siew, Rosli and Yeow, 2020; Rosli, Yeow and Eu-Gene, 2020; Nam et al., 2020).

Based on these findings the fourth hypothesis was generated:

H4: Complexity is negatively influencing the AI solutions implementation in accounting and audit sectors (Zhang et al., 2023).

Organizational context in TOE framework

Using the organizational context, the second research objective is to understand how the implementation of AI is dependent on the organizational context. (Yao and Jin, 2023) The following elements of the organizational context are the most frequently used:

Resources.

Resources are of three types: financial, human, and technical. Financial resources represent an important element that a company considers when implementing new technologies. Company representatives are looking for a positive return on investment (ROI) when they decide whether they implement a new solution or not, and this could be determined by a revenue increase, a cost saving, or improvement of customer experience (Nam et al., 2020; Kulkarni and Patil, 2020).

Human resources refer to their IT competencies. IT competency represents an important factor in the adoption of technology (Siew, Rosli and Yeow, 2020; Kulkarni and Patil, 2020).

Technical resources refer to the existing IT infrastructure in a company that can support the implementation or development of a new technology. (Chatterjee et al., 2021).

Thus, the following research hypothesis was generated:

H5: Need it resources are negatively influencing the AI solutions implementation level in accounting and audit sectors. (Han et al., 2023)

Organizational Size

Size plays a significant role for companies willing to adopt AI solutions. Most researchers believe that larger organizations are more prepared to adopt AI because they have better financial, human, and technological potential. Larger companies can absorb initial costs and potential risks, and this is the reason why they tend to be more innovative when it comes to technological evolution. Big companies are now developing their own AI solutions after collaborating with external suppliers. (Reddy, Yasaswi and Kumar, 2019).

The six hypothesis that was used in the present paper is:

H6: Larger organizations in the accounting and audit sectors are more inclined to implement AI solutions. (Sutton et al., 2016)

Employees’ competencies

IT competencies represent the level of skills and knowledge available within an organisation, as an important resource to be used in technology implementation. This factor is one of the most important found in the literature of technology innovation and adoption (Nam et al., 2020).
Based on that, the following hypothesis is tested:

**H7:** Employees competencies are positively influencing the AI solutions implementation in accounting and audit sectors. (Sutton et al., 2016)

**Organizational readiness**

Organizational readiness refers to current professional experience and skills in AI, changing process competencies, hierarchical structures and readiness to change, agility to adjust firms’ resources, e.g. Financial, human, technical. Organizational readiness refers to the readiness to successfully adopt a project (Chatterjee et al., 2021).

Thus, the following hypothesis was issued:

**H8:** Organizational readiness is positively influencing the AI solutions implementation in accounting and audit sectors. (Zhang et al., 2022)

**Support from the top management**

Top management support refers to the involvement of top management in the technological adoption, in a specific sector. Management support has been consistently one of the most important factors when a company decides to implement a new technology. Support from top management positively influences technology implementation in all sectors and has a crucial role in the success of the project (Rosli, Yeow and Eu-Gene, 2013; Ahmi, Saidin and Abdullah, 2014; Chukwudi et al., 2018; Siew et al., 2019; Chatterjee et al., 2021; Stjepic et al., 2021).

Related to this topic we formulated the following hypothesis:

**H9:** Top management support is positively influencing the AI solutions implementation in accounting and audit sectors. (Goto, 2023)

**Environmental context in TOE framework**

Using the environmental context, the third research objective is to understand how is the implementation of AI dependent on the environmental context.

The following elements of the environmental context are the most frequently used.

**Industry pressure**

Competition influences the rate of technology adaptation because new technologies have the potential to increase competitiveness on the market. If a company manages to gain an important position on the market due to technology implementation, then all competitors need to adapt to the new technology to remain competitive. Because this factor is generally used in TOE Framework research, it is also included in this article, in order to investigate its impact on the adoption of AI technologies (Pumplun, Tauchert and Heidt, 2019, Nam et al., 2020; Nguyen, Le and Vu, 2022).

Research hypothesis 10 is based on these findings:

**H10:** Industry pressure is positively influencing the AI solutions implementation in accounting and audit sectors. (Gao and Han, 2021)

**Governmental Regulations**

The impact of government regulations refers to legislative instability. Legal requirements must be considered when a company decides to implement a new technology. For example, today companies need to use client data to improve their services and products, while complying with GDPR requirements. (Pumplun, Tauchert and Heidt, 2019).

The following research hypothesis is tested:

**H11:** Governmental regulations are negatively influencing the AI solutions implementation in accounting and audit sectors. (Wang et al., 2024)

**Research and Methodology**

The authors decided to use a deductive approach for the research endeavor because it is considered to be the most appropriate to test how the TOE framework better influence the AI implementation process. In this way we could ground our analysis on the information already available on previous studies and contribute to the enhancement of the topic.

The originality of the study consists on the chosen elements of TOE framework, derived from the extensive literature review. The most used and relevant of these items are included in this research.

The main contribution of this paper is the assessment of the way in which AI solutions are implemented in accounting and audit sector of activity.
When using the deductive approach, the authors start from the theory and develop hypotheses based on it, then collect the data, analyses them and accept or reject the hypotheses. (Nola and Sankey, 2014).

A qualitative methodology allows subjects opinions to be identified and integrated into the research and fresh perspectives to be derived from this. Behavioral accounting has faced an important development in the last decades and has demonstrated its relevance, both for academics and professionals (Juma’h and Li, 2023). Based on the most used elements of the TOE framework the authors have formulated the hypothesis on the way these elements are impacting the implementation of AI solutions in a company.

An interview was conducted in June-August 2023. The interview objectives and hypothesis were formulated by the authors looking at the TOE elements presented in the literature review. The structured interview consists of four parts. The first part explores the positions of the respondents in companies in which they operate. The next three parts investigate the opinions of the respondents on the impact of the technological, organizational, and environmental context of the implementation of AI solutions, in the accounting and audit sector.

Table no. 1 is summarizing the links between research objectives, hypothesis and the interview structure.

<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Hypothesis</th>
<th>Interview’s questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Objective 1: To understand how is the implementation of AI dependent on the technological context.</td>
<td>H1: Compatibility is positively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>H2: Security is negatively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>7</td>
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<tr>
<td></td>
<td>Rosli, Yeow and Eu-Gene, 2013; Na et al., 2022</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H3: Relative advantage is positively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>H4: Complexity is negatively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>6</td>
</tr>
<tr>
<td>Research Objective 2: To understand how is the implementation of AI dependent on the organizational context.</td>
<td>H5: Need it resources are negatively influencing the AI solutions implementation level in accounting and audit sectors.</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>H6: Larger organisations in the accounting and audit sectors are more inclined to implement AI solutions.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>H7: Employee’s competencies are positively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>H8: Organisational readiness is positively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Siew, Rosli and Yeow, 2020; Phuoc, 2022</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H9: Top management support is positively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>12</td>
</tr>
<tr>
<td>Research Objective 23To understand how is the implementation of AI dependent on the environmental context.</td>
<td>H10: Industry pressure is positively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>(Kulkarni and Patil, 2020)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H11: Governmental regulations are negatively influencing the AI solutions implementation in accounting and audit sectors.</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Authors representation based on literature review

For the three main objectives we have developed with the help of literature review 11 hypothesis which contains the TOE most used elements. These elements have a positive or a negative influence on the implementation of AI in more sectors and in our case in accounting and audit sector will be validated with the responses from the financial specialists.
The primary data have been collected from 62 respondents, which are top financial specialists working in accounting and audit companies with more than 10 years of experience, from 18 European countries. We have started from a database with 650 accounting and audit companies from 27 European countries and at a 95% confidence level, 5% margin of error the ideal sample size would be 242 respondents. We have received answers from 18 countries. So, for the 18 countries we have 433 companies and an ideal sample size of 204 respondents. This represents our main study limitation. In order to address this limitation, we have conducted the interview only with top financial specialists. The respondents were selected from companies providing accounting and audit services, worldwide. When designing qualitative research, the influence of respondents’ background, education, experience and level of expertise is assumed to be significant. (Juma’h and Li, 2023). In this research, key people from companies with more than 10 employees have been targeted.

The respondents are: CFOs, CEOs, corporate controls managers, managing partners, team managers, financial managers, audit managers as we can see in Table no. 2.

<table>
<thead>
<tr>
<th>Table 2: Position of the respondents in the company</th>
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<tr>
<td>Count of No.</td>
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<td>---------------</td>
</tr>
<tr>
<td>Count of No.</td>
</tr>
<tr>
<td>less than 49</td>
</tr>
<tr>
<td>between 50 and 249</td>
</tr>
<tr>
<td>between 250 and 499</td>
</tr>
<tr>
<td>more than 500</td>
</tr>
<tr>
<td>Grand Total</td>
</tr>
</tbody>
</table>

Source: Authors representation based on the database

Using a structured interview, we managed to collect the responses from 62 company representatives from 18 European countries (see Table no. 3). Companies included in this study provides accounting and audit services and have between 10 and more than 500 employees. Table no. 3 presents the geographical distribution of the respondents:

<table>
<thead>
<tr>
<th>Table 3: Distribution of respondents by country.</th>
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</thead>
<tbody>
<tr>
<td>Count of No. /Country</td>
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<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Austria</td>
</tr>
<tr>
<td>Croatia</td>
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<tr>
<td>Denmark</td>
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<tr>
<td>Dubai</td>
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<tr>
<td>France</td>
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<tr>
<td>Germany</td>
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<tr>
<td>Irland</td>
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<tr>
<td>Italy</td>
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<tr>
<td>Malta</td>
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<tr>
<td>Netherlands</td>
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<td>Poland</td>
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<td>Portugal</td>
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<td>Romania</td>
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<td>Spain</td>
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<tr>
<td>Sweden</td>
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<tr>
<td>Switzerland</td>
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<tr>
<td>Turkey</td>
</tr>
<tr>
<td>United Kingdom</td>
</tr>
<tr>
<td>Grand total</td>
</tr>
</tbody>
</table>

Source: Author representation

The order embraced is the one presented in the literature review, and the results and discussion section is based on the main points of interest: compatibility, relative advantage, complexity, security, resources, organizational size, employee competencies, organizational readiness, top management support, industry pressure, and government regulations.
Findings and Discussions

Findings

The technological context analysis is related to the first research objective: to understand how is the implementation of AI dependent on the technological context.

In this respect, the perception of the respondents in connection with compatibility, relative advantage, complexity, and security was analyzed (Zemánková, 2019, Huang et al., 2022).

Compatibility

In this study executives’ attitudes on the compatibility of AI solutions with existing infrastructure was investigated. In most cases, respondents consider AI to be compatible with their existing systems. In few cases, five out of 62 the respondents considered that new AI is not compatible with existing systems. Compatibility is considered a positive factor for technology implementation, and the present study had reached the same conclusion. There are also alternatives for companies in which AI is not compatible with the existing infrastructure and programs to use cloud computing software as a service (SaaS) (Huang et al., 2022).

An example of successful integration of an AI solution is provided by a respondent: “In fact, AI solutions have been successfully integrated into our existing IT infrastructure, allowing seamless compatibility. Specifically, we have implemented AI-powered systems for automated data entry and financial analysis, enhancing the efficiency and accuracy of these processes.” (l8, financial manager).

In most of the cases the respondents do not find a problem with the compatibility of their systems. In these cases, the respondents even choose to develop a continuous improvement department. They Swork to develop AI solutions internally with the existing resources or they use cloud computing as a platform or as a service where they can save the data in a much more secure place.

Relative advantage

There are several advantages that AI can bring to the accounting and audit sector, which have been spotted by the company representatives. These advantages are operational and strategic. Operational advantages are related to the shorter processing time offered by AI solutions implementation and less errors. Using AI solutions will help the company increase operational capacity with the same number of employees or even fewer, in some circumstances. Strategic advantage refers to the opportunity to motivate employees to work for the respective company and to be proactive and motivated to make it thrive. It is also related to clients’ motivation to work with the companies using AI solutions, once they see that this is focused on offering highly qualitative services (Chatterjee et al.,2021).

“Thanks to AI solutions, accounting companies will be able to offer integrated services to their clients and grow their client database with the same number of employees” (l32, managing partner).

Complexity

The complexity of AI solutions can be seen as an opportunity for their business (70% of the respondents) or as a threat (the other 30% of the respondents).

The complexity of AI solutions can represent an opportunity for companies to grow by performing complex activities and providing several reports which can help the decision-making process. An example is the following: “Generally, AI is an opportunity at least for basic AI solutions, and if implemented properly, it can create added value”. (l37, CFO)

Complexity can also represent a threat if the employees responsible for the implementation and utilization of these solutions are not well prepared. In this case, the solutions cannot be used at their full potential or if they have issues in delivering the right results, untrained employees cannot find a way to fix it. “AI represents a threat in case employees are not prepared to work with these solutions when AI solutions return wrong results or when they return results too complex to be understood.” (l34, CEO)

There is a case of a company who decided to fire the employees from an entire department and to use an AI solution bought form an IT supplier. In few months the activity of that department faced considerable issues due to the fact that there was not an employee to verify the data in real time and to assure maintenance of the AI solution.

Security

If security is seen as a threat or an opportunity to grow, some companies can be prepared or less prepared for this subject. In most cases, the representatives do not consider AI solutions as being a security threat, and some of them have already taken the necessary steps to prepare for possible security threats (Vaisljeva et al. 2021). The last category uses well-trained internal or external IT teams to deal with data security. We have mentioned an examples below. Only a small group of respondents, 5 out of 62 are not ready to implement AI solutions for security reasons.

“No, I think if we had, no one would have used cloud archiving or any other online tool. Instead, we plan to use a careful approach and make sure that we limit potential threats to non-existent” (l2, managing partner).
The companies’ representatives which took of this research mentioned that they already used digitalization, automatization solutions and cloud computing and they did not face security problem. This is the reason for which they are open to try AI solutions.

**Organizational context analysis** is related to the second research objective: to understand how the implementation of AI is dependent on the organizational context.

For this topic, the main points of interest are the resources, the organization size, employees’ competencies, organization readiness, and top management support. (Huang et al., 2022).

**Resources**

In all answers financial resources are mentioned as a limiting factor because it is hard to find the necessary resources in general (financial, labor, technological) to implement AI solutions in an efficient way: “Financial costs are a setback. We did find contacts with various companies or entrepreneurs who know how to work with AI but are currently not so keen on investing in it.” (I2, financial manager)

The second limiting factor are the knowledge and skills that the team has in IT and their ability to work with AI solutions. Even if the company has the necessary financial resources to implement AI it is equally important to focus on the employees because they are using these solutions. Most companies prefer to train their current employees instead of hiring new ones.

“Among these resources (financial, technological, labor), finding skilled labor resources with expertise in AI can often be considered the hardest. The demand for AI talent is high and there is a shortage of professionals with the necessary skills and experience” (I8, financial manager).

In addition, other companies lack the necessary IT infrastructure to install and use AI solutions. But in this situation, if there are still financial resources available, company’s representatives can opt for cloud computing to store AI solutions and the generated data. Cloud computing can be a good solution for companies which does not have the necessary infrastructure to store and process the data.

**Organizational Size**

In this research 27 small companies, 14 medium and 8 large and 13 very large companies were involved.

From the responses provided small companies are already using AI solutions for their operations, (44%) and it is considered an optimal decision, with impact on different KPIs. Even if in small entities, the top management is involved and is supporting the organization’s evolution, using the ultimate technologies, such as the AI solutions.

Medium companies, representing 22% out of the total, also use AI solutions in a small percentage, 15%. In the case of medium companies, it is not that hard to get the approval from the company’s representatives, but these entities usually lack the financial resources.

Large and very large companies, 34% of the respondents, use AI in a small percentage (20%) but have plans to implement AI solutions in the future. Usually in large companies it is harder to implement a new technology and for a project to be accepted and implemented it takes a year and a half or two. This is due to the hierarchical structure and the need for approvals from all the company representatives. An illustrative example for this is the following: “In corporations, due to the hierarchical organizational structure, it takes more than a year to adopt a new project because it needs to have the approvals from all the executives and this slows the project implementation process.” (I3, CEO) But once the project is approved the implementation will happened for sure.

**Employee’s competencies**

Employee competence is one of the most important factors in AI implementation mentioned by all the managers interviewed. In this study, companies prefer to train their employees instead of hiring new ones.

Skills are of three types: technological, social, and the way of thinking. (Kulkarni and Patil, 2020)

Technological skills refer to IT skills and programming knowledge which usually lack a lot in the case of employees in the financial field, but this weakness can be trained. “Currently, only a few of them have any knowledge of AI, so implementation would be done only by a team of well-prepared employees. However, with a bit of practice and some trainings, seniors can learn to use it.” (I2, financial manager).

Social skills are the second most important capabilities that employees need to master in a company that implements AI solutions. One of the responses that is representative in this respect is the following: “Human interaction is very important, at least for new companies that need support and consulting, not just a service to record invoices. This shows the need to become business consultants “(I20, CEO)”.

Employees also need to change the way they think, use analytical, critical, and strategic thinking to be flexible and open to change. The employees are the driver of change, and if they are not performing well, the clients will be affected, and the company will be
impacted in the end. On the other hand, if employees are proactive and willing to embrace change, they will bring more benefits to clients and will make them trust their company more.

Organizational readiness

In the case of organizational readiness, companies are of two types: prepared and less prepared for the implementation of AI solutions. Prepared companies are already highly digitalized and use automation programs and AI solutions (Vaisljeva et al. 2021). The less prepared companies are not fully digitalized, use only some automation solutions, but not to their full potential. When a company is constantly adopting new technologies, if these are successfully implemented and utilized, it is easier to implement AI solutions as well. In the case of companies that are not fully digitalized, it will be harder to implement AI solutions.

“About 20% of companies are interested. We are conservative. Technology is brought in by young people, but the decision-making power lies with people with more work experience, who are more conservative. People sometimes feel overwhelmed, impatient, not motivated to learn, look closely at the trials, and do the same thing as they did from the beginning “(l35, managing partner).

Top management support

The analysis of the responses showed that 66% of the top managers are supportive and only 34% are neutral to new projects.

The support of top management is the key to the successful implementation of the new project (Huang et al., 2022). There are two types of managers, supportive and neutral. The supportive top manager is the one who allocates the necessary resources for AI solutions. They are the ones who ensure the necessary training for the employees and keep employees motivated by supporting their transition to new skills and capabilities and are found in 87% of the cases.

“Yes, already supporting the use of internal and external AI software in IT departments and extending to accounting, HR, and other departments.” (l9, auditor)

There are companies in which the top management is not interested in offering their companies a chance to grow. They focus only on delivering results not on innovation and the good of the employees.

“In my company, yes, because they want to simplify processes and reduce overtime. Other companies for which I have worked are not interested in investing to help the employees.” (l37, managing partner)

The environmental context analysis is related to the third research objective: to understand how is the implementation of AI dependent on the environmental context

In this respect, industry pressure and government regulations were analyzed. (Huang et al., 2022).

Industry pressure

Industry pressure comes from competitors, customers, employees, and available resources (Siew, Rosli and Yeow, 2020).

Competitors who are already implementing AI solutions can offer more qualitative services and have the capacity to serve a greater number of clients.

Customers who know the advantages of technological solutions are willing to receive from their service providers solutions based on these technologies. An example of these two elements is the following: “First, the competition and then the customers and the need to be relevant to them, to respond to new requirements with correct and useful information.” (l6, managing partner)

Employees are willing to work in a job that requires fewer repetitive tasks and can grow in their career. The available AI solutions on the market can be easily customized for all company needs and at affordable prices.

The competitors which already implemented AI solutions have the ability and capacity of attaining more clients and to offer them better services as consultancy for important decision making as merging with other companies or business development.

Governmental Regulations

Government regulations can represent a threat, an opportunity, or they can be neutral about AI solutions. Governmental regulations have a neutral influence in cases where there are no regulations for AI implementation and was mentioned in 78% of the cases.

“Governmental regulations can present both challenges and opportunities for the implementation of AI solutions. While regulations can impose certain restrictions and compliance requirements, they can also provide a framework for responsible and ethical AI deployment “(l8, financial manager).

During the pandemic period the Government started the digitalization process which helped the accountants and auditors to interact in online with state institutions and this helped them to work more efficiently.
Discussions

The result of this study consists of an analysis of the way the TOE framework elements are impacting the audit and accounting companies which are implementing AI solutions. The 11 elements of the TOE framework used here to formulate the hypotheses are the most important elements based on the assessed literature (Kulkarni and Patil 2020; Siew, Rosli and Yeow, Huang et al., 2022). This study is focused on the analysis and presentation of all the necessary elements that an organization should consider, when a new technological project should or could be implemented, in this case an AI solution.

The elements of the TOE framework, having an impact for accounting and audit companies that implement AI solutions have been analyzed in the results and discussion sections and have been connected to the specific literature review.

The aim was to better understand how is the AI solutions implementation influenced by technological, organizational and environmental contexts in accounting and audit sector, by looking at 11 hypotheses grounded on the literature review. The majority of them has been validated and only few therer rejected (security, complexity, size of the company and governmental regulations).

This research was designed to test some hypothesis related to TOE framework and to see how they can influence AI implementation in the accounting and audit field.

Compatibility is considered in the literature as a significant factor when it comes to AI implementation (Rosli, Yeow and Eu-Gene, 2013; Ahmi, Saidin and Abdullah, 2014; Siew, Rosli and Yeow, 2020, Chatterjee et al.,2021). Based on our results, compatibility positively influences the level of AI implementation. Even in the cases where the existing infrastructure is not compatible, there is the option of using cloud computing to store AI solutions and the generated data. Therefore, in this case, the results of the literature are the same as the ones provided by the literature results. As a consequence, the first hypothesis “H1: Compatibility is positively influencing the AI solutions implementation in accounting and audit sectors” is accepted. Security is seen as a major threat when it comes to implementing AI solutions (Rosli, Yeow and Eu-Gene, 2012; Kulkarni and Patil, 2020). In our study, there were no respondents who considered security as a factor opposing the implementation of AI solutions. All companies from which responses have been collected have IT teams to defend security threads. In this case, our result is different from the literature, due to the fact that the company representatives understood this threat and found solutions to remediate this impediment.

Therefore, the second hypothesis, “H2: Security is negatively influencing the AI solutions implementation in accounting and audit sectors” is rejected on the base on the majority of respondents opinions. Relative advantage is represented by the operational and strategic values that AI brings to the company according to previous studies (Rosli, Yeow and Eu-Gene, 2013; Ahmi et al., 2014; Siew, Rosli and Yeow, 2020; Kulkarni and Patil, 2020; Chatterjee et al.,2021; Chenet al., 2022). We have found that AI is bringing several advantages to the company and its stakeholders such as: reduced time with repetitive tasks, higher accuracy, and a higher work efficiency.

“H3: Relative advantage is positively influencing the AI solutions implementation in accounting and audit sectors,” is accepted. Complexity is seen in previous studies as a major threat when implementing AI solutions (Siew et al., 2019; Rosli, Yeow and Eu-Gene, 2020, Nam et al., 2020). In this research, 30% of our respondents had specified complexity as being a threat and the rest as being an opportunity. All the reports and data generated by AI are helping the employees to offer better results to their clients. The high amount of data generated and the complexity of working with AI are seen as threats. In case of complexity, 70% of the respondents do not consider it as a threat, as in the literature, most probably because some of the studies are older and the technology is constantly and rapidly evolving, becoming easier to be applied and used.

The hypothesis “H4: Complexity is negatively influencing the AI solutions implementation in accounting and audit sectors” is rejected.

This section is offering the following contribution to research objective 1: AI implementation is dependent of the technological context, which is based on compatibility, relative advantage, security and complexity. The last two have also a positive impact on AI implementation.

The analysis of responses that contributes to the research objective two is providing the following highlights:

Resource types, e.g. financial, labor, and technological, are usually limited, for SMEs. (Siew et al., 2019; Kulkarni and Patil, 2020). In most cases related to this study, these resources are a limiting factor for the implementation of AI solutions, no matter the size of the company, Therefore, the hypothesis “H5: Need it resources are negatively influencing the AI solutions implementation in accounting and audit sectors” is accepted on the base of the responses collected.

Organizational size is also an important characteristic when it comes to AI implementation, and in previous research it was mentioned that large companies have the necessary resources to implement AI solutions, as compared to SMEs, who may lack them (Reddy, Yasaswi and Kumar, 2019). In the present research, all types of companies have implemented AI solutions in a small percentage.

Thus, “H6: Larger organizations in the accounting and auditing sectors are more inclined to implement AI solutions” is rejected, because in their case too, AI solutions have been implemented in a small percentage.
Employees’ competencies represent one of the most important factors in AI implementation. In this study, companies prefer to train their employees instead of hiring new ones. Based on this, the seven hypotheses, “H7: Employee’s competencies are positively influencing the AI solutions implementation level in accounting and audit sectors” was accepted.

Organizational readiness refers to companies’ ability to adapt to new technological solutions (Ahmi, Saidin and Abdullah, 2014; Chatterjee et al., 2021). The analysis of the responses gathered helped us to conclude that 30% of the companies involved are ready to implement AI solutions and 70% consider that they are not ready or that they are partially ready.

The hypothesis “H8: Organizational readiness is positively influencing the AI solutions implementation in accounting and audit sectors” is therefore accepted.

The support of the top management has a positive influence in the case of implementing a new project, being an important success factor (Rosli, Yeow and Eu-Gene, 2013; Ahmi, Saidin and Abdullah, 2014; Siew et al., 2019; Chatterjee et al., 2021). Based on the results obtained, that confirms the conclusions from the main stream literature, the next hypothesis, “H9: Top management support is positively influencing the AI solutions implementation level in accounting and audit sectors” is accepted.

This section is offering the following contribution to research objective 2: AI implementation is based on the organizational context, which relays on employees’ competencies, organizational readiness and top management support. Resources can influence negatively this implementation.

Industry pressure comes in most cases from competitors (Nam et al., 2020; Nguyen et al., 2022). As part of the industry, there are also customers, employees, and the available resources, which are important factors to be taken into consideration. The results obtained are in line with the literature as of 90%, therefore the hypothesis 10 is accepted “H10: Industry pressure is positively influencing the AI solutions implementation level in accounting and audit sectors”.

Governmental regulations were considered a negative factor for AI implementation by previous researchers. In this research it is considered either a threat, an opportunity, or, mostly, neutral. This answer is different from other relevant research, due to the fact that the studies were older and the legislative framework changed. For example, in the COVID-19 crisis, the governments started to implement digitization projects which diminished the need of being present physically at legal entities. In conclusion the hypothesis “H11: Governmental regulations are negatively influencing the AI solutions implementation in accounting and audit sectors” is rejected, the respondents of this research did not consider that governmental regulations would stop them from implementing AI solutions.

The contributions to the objective three are: the environment context is influencing the AI implementation in accounting and audit firms, throughout the industry pressure. Government regulations do not have an impact on the AI implementation.

Conclusions

AI implementation is dependent of the technological context, which is based on compatibility, relative advantage, security and complexity and the last two have also a positive impact on AI implementation, contrary to literature review. AI implementation is based on the organizational context, which relays on employees’ competencies, organizational readiness and top management support. Resources need it can influence negatively this implementation.

Furthermore, the AI implementations are based on the environment context is influencing the AI implementation in accounting and audit firms, throughout the industry pressure. Government regulations do not have a negative impact on the AI implementation.

One of the most mentioned concerns related to the AI solutions implementation consist of the lack of necessary knowledge and skills for implementing and using them. In this research the executives are aware of the implications of AI solutions in business, therefore they received training and specific information from the company or they took the decision of being informed from outside the company sources.

There is also a need for different stakeholders’ involvement in preparing the employees for the new jobs’ requirements. The Universities should strive to better prepare the students for their future roles in accounting and audit. When a company wants to implement AI solutions the company representative need to look at the infrastructure of the company if it can support AI solutions and to take a decision whether to use cloud computing or not.

For security concerns the company representatives need to hire special employees to mitigate these risks.

There are several advantages AI will bring to the company but the representatives need to establish from the beginning some specific key performance indicators (KPIs) they want to obtain from the AI solutions. For the complexity of AI solutions, the company representatives need to hire specialized employees or to develop the skills of existing employees to work with AI solutions.

When the company representatives decide to implement AI solutions, they need to take into consideration the necessary resources: financial, human and technological.

They also need to offer training for employees in order to assure they have the necessary skills to work with AI solutions and they are able to offer the necessary maintenance and the continuance of work. The company representatives need to also assess the
organizational readiness for this kind of change and the availability of top management to support the change by allocating the necessary resources and supporting the employees in this transition. They also need to look at competition to see if they are using AI solutions and to adapt to the new trends in order to keep their clients satisfied with their services.

For the governmental regulations they need to continuously adapt to the changing legislation.

The authors’ intention is to continue the research of this topic in the future and to enlarge the perspective in this specific sector. Based on the conclusions provided by the current study, a questionnaire will be designed and applied to European accounting and audit companies to assess the methods of AI implementation in accounting and audit activities.

As a guideline for future research would be very useful for the literature to have a quantitative study based on questionnaire. This will validate the conclusions of this study.

The major limitation of this research is the number of respondents. Nevertheless, we that the respondents represented different significant companies on the market, out of which 35 are medium and large companies in the accounting and audit sector, with more than 10 employees. In addition, the respondents hold, in majority, managerial and executive positions in their companies and have more than 10 years of experience in the field, the experience and expertise of them being essential qualities on which we could build our scientific approach.

Another limitation could be the types of companies which were involved in this study because there was an aleatory way of receiving the responses. We did not have the power to control which type of company our respondents represent. This is why we have such a variety of types of companies based on the number of employees, from small companies to very large companies.

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