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ORGANIZACIJA

Organizacija (Journal of Management, Informatics and Human Resources) is an interdisciplinary peer-reviewed journal which is open to contributions of high quality, from any perspective relevant to the organizational phenomena.

The journal is designed to encourage interest in all matters relating to organizational sciences and is intended to appeal to both the academic and professional community. In particular, journal publishes original articles that advance the empirical, theoretical, and methodological understanding of the theories and concepts of management and organization. The journal welcomes contributions from other scientific disciplines that encourage new conceptualizations in organizational theory and management practice.

We welcome different perspectives of analysis, including the organizations of various sizes and from various branches, units that constitute organizations, and the networks in which organizations are embedded.

Topics are drawn, but not limited to the following areas:

- organizational theory, management, development, and organizational behaviour;
- human resources management (such as organization & employee development, leadership, value creation through HRM, workplace phenomena etc.);
- managerial and entrepreneurial aspects of education;
- business information systems (such as digital business, decision support systems, business analytics etc.);
- enterprise engineering (e.g., organizational design, business process management, enterprise transformation paradigms etc.);
- papers that analyse and seek to improve organizational performance.

Organizacija (Revija za management, informatiko in človeške vire) je interdisciplinarna recenzirana revija, ki objavlja visoko kakovostne prispevke z vseh vidikov, ki so pomembni za organizacijske procese in strukture.

Revija je zasnovana tako, da spodbuja zanimanje za različne vidike v zvezi z organizacijskimi vedami in je namenjena tako akademski kot strokovni skupnosti. Revija objavlja izvirne članke, ki spodbujajo empirično, teoretično in metodološko razumevanje teorij in konceptov managementa in organizacije. Pozdravljamo tudi prispevke iz drugih znanstvenih disciplin, ki spodbujajo nove koncepte v organizacijski teoriji in praksi. Objavljamo članke, ki analizirajo organiziranost z različnih vidikov, so usmerjeni na organizacije različnih velikosti in iz različnih sektorjev, na enote, ki sestavljajo organizacije, in na mreže, v katere so organizacije vpete.

Teme so pokrivajo predvsem naslednja področja:

- organizacijska teorija, upravljanje, razvoj in organizacijsko vedenje;
- management človeških virov (kot so organizacija in razvoj zaposlenih, vodenje, ustvarjanje vrednosti s pomočjo človeških virov, organizacijski pojavi na delovnem mestu itd.);
- vodstveni in podjetniški vidiki izobraževanja;
- poslovni informacijski sistemi (kot so digitalno poslovanje, sistemi za podporo odločanju, poslovna analitika itd.);
- podjetniški inženiring (npr. organizacijsko oblikovanje, upravljanje poslovnih procesov, paradigme preoblikovanja podjetij itd.);
- članki, ki analizirajo organizacijsko uspešnost in prizadevanja za izboljšanje le-te.

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The Dual Role of Innovation in Manufacturing: Enhancing Sustainability and Employment Opportunities

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Background and Purpose: The purpose of this study is to investigate how various types of innovation impact sustainability measures within manufacturing companies; these sustainability measures include minimizing raw material usage, reducing energy consumption, and optimizing waste management. The research further evaluates the linkage between innovation types and job creation, focusing on how innovation fosters new employment opportunities and enhances sustainability in the manufacturing sector.
Methodology: The methodology involves a hierarchical regression analysis conducted on a sample of 1,570 manufacturing companies in Colombia using SPSS software. This approach aims to quantitatively assess the effectiveness of innovation, sustainability, and employment policies in these industrial organizations.
Results: The findings of the study reveal significant insights into the innovation policies of industrial companies and their management of environmental sustainability. These results underscore the practical implications of embracing innovation and sustainability for long-term benefits, despite the immediate costs.
Conclusion: This research provides a comprehensive examination of the diverse types of innovation and their consequential impacts on sustainability and employment in the manufacturing sector. Additionally, it suggests directions for future research that could further refine and enhance innovation and sustainability practices within this industry.

Keywords: *Innovation, Sustainability, Employment, Manufacturing sector*

1 Introduction

In the manufacturing sector, one of the great difficulties is establishing innovation and sustainability as two complementary elements in all its processes and achieving a constant generation of employment that remains the same as innovation is made. In this dilemma and challenge, the operational areas such as production, warehouse, purchasing, inventory, and distribution, among others, are the ones that suffer the most when it comes to hiring human resources since they need more human resources hired permanently. Then, an employee's learning can quickly vanish from one year to another or even months. This situation highlights the constant complication for innovation managers. For example, the generation of disruptive innovations must avoid displacing hired personnel and change the sector's course towards more sustainable practices.

In a much more competitive environment, with high

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levels of uncertainty and dynamism that force organizations to transform continuously (Hysa et al., 2020), innovation and human resources become the elements that make a well-defined competitive strategy possible, which helps organizations in the sector generate products with substantial improvements.

The Colombian manufacturing sector represents one of the sectors with the most remarkable economic dynamics for the country (Velez, 2023, 2021) . Understanding how the types of innovation in the manufacturing sector are related to sustainability practices and how the generation of employment can influence this relationship allows us to understand the competitive situation of the industrial sector (Føre et al., 2022, , where constant and improved development of products, processes, and methods occurred. However, it is also a social practice that allows creating environmental awareness through human resources to develop solid practices in environmental terms (Khan et al., 2024), increasingly demanded by customers from all manufacturing sectors globally. Therefore, this article aims to explain the effects of the types of innovation on sustainability practices and the moderating effect of employment.

This research is significant in this context since these types of innovation, ranging from production, product, organizational methods, and commercial improvements, need more evidence in the Colombian manufacturing sector. Few studies of this relationship have been disseminated in the Colombian context, establishing the relationship between sustainability and innovation will be the first contribution of this research. The second contribution corresponds to the difference between the types of innovation: product, commercial method, process, and organizational method (Azmat et al., 2023, OECD, 2018). The third contribution of this study will be to define how the generation of employment can influence the relationship between types of innovation and sustainability practices.

2 Literature Review

The process of innovation within organizations is multifaceted, comprising several phases. Initially, organizations engage in the search for ideas that can be transformed into business opportunities, typically derived from consumer needs (Mahr et al., 2014). This is followed by the creation of prototypes and the subsequent market placement of these innovations, which are crucial for adapting the organizational strategy. Such strategies are aimed at developing products, methods, and processes that revolutionize both the operational approach and the value offered to customers. Consumer needs vary significantly between countries and even among individuals within the same region (Stock et al., 2017).

Innovation capacity, according to Yang et al. (2018), is an intangible asset vital for organizations. It is not confined solely to research and development but is also influenced by the immediate organizational context which shapes its development and utilization as a competitive advantage. Innovation here is viewed as a dynamic capability that is essential for creating new competencies within an organization.

Moreover, the role of innovation extends beyond mere creativity (Sok & O'Cass, 2015; Valaei et al., 2017); it involves the dissemination and implementation of ideas (Wu & Chiu, 2015). For an organization that has been active in the market over a prolonged period, integrating innovation into its strategic framework is likely to yield significant long-term performance benefits (Kim et al., 2018). The Oslo Manual (OECD, 2018) defines several innovation types, including those pertinent to the manufacturing sector such as production and organizational methods, commercial, and product innovations.

The relationship between sustainability practices and innovation is also gaining attention. Brem & Ivens (2013) explored this through a propositional analysis, highlighting how reverse and frugal innovations influence sustainability. Liu et al. (2018) demonstrated how innovation systems within the wireless mobile technology sector foster sustainability. Conversely, Zhu et al. (2016) indicated that corporate social responsibility pressures firms to adopt sustainable practices (Babič et al., 2023, Afum et al., 2020), enhancing their performance (Lund-Thomsen et al., 2016) even if it sometimes comes at the expense of financial outcomes.

Additionally, energy usage, crucial for economic growth, is often studied in the context of environmental policy-driven technological innovations (Hepburn et al., 2018, Tang & Tan, 2014). In the Colombian manufacturing sector, the connection between innovation and sustainability remains under-explored, especially the impact of innovation on energy use and its implications for sustainability.

The utilization of production waste also represents a significant sustainability practice. Organizations are increasingly adopting strategies to reduce their ecological footprint through the effective use of waste from production processes (Lozano & Lozano, 2018). This not only supports sustainability but also enhances production efficiency by leveraging lost materials (Ajemigbitse et al., 2019; Qi et al., 2018) and other alternative resources (Munda et al., 2018).

Finally, the use of new materials and the optimization of processes are essential for the manufacturing sector. As the industry evolves, reducing raw material usage

[1] This paper is part of my doctoral dissertation at Universidad de Valencia. It is available at https://roderic.uv.es/items/30141ecf-f1ae-4eb0-9633-304c782b1014, but it has not previously been published in paper format.

(Mikulčić et al., 2016), enhancing material efficiency, and evaluating product life cycles (Sameer & Bringezu, 2019) become increasingly important, especially when customer requirements are stringent (Franco et al., 2019). These practices reflect the sector's ongoing commitment to innovation and sustainability, crucial for maintaining competitiveness and achieving long-term sustainability goals.

Some industries present new scopes with better materials, including recycling inputs, currently known as a circular economy or bioeconomy (D'Amato et al., 2018, Pedersen et al., 2018). The sectors with the most significant environmental impact constantly seek to reduce said impact and seek alternative raw material sources. The cost associated with privileged raw materials in the Colombian context can make companies lose competitiveness. Therefore, industries are trying to permanently reduce raw materials by optimizing or using materials from other sources.

One of the most common cycles currently used to decide on the best option in materials and processes for the elaboration of a product, from the environmental and social approach, corresponds to the social life cycle of the product (Lenzo et al., 2018), that allows establishing the best path for the production process of the good to be offered. The dynamics of the industry have changed with the new technological advances; they help it be more efficient in using raw materials, which in the long term generates better sustainability practices (Sicoli et al., 2019) for the industry. Therefore, innovation in different forms can help the organization consolidate using less raw material as a tool for long-term environmental sustainability, especially when considering a decision that cuts across manufacturing processes.

The generation of employment in manufacturing companies has multiple implications; on the one hand, the motivation of employees to feel job security, especially in a turbulent time like the current one, promises to generate better results in productivity (Callea et al., 2016; Belenzon & Schankerman, 2015) where the employee generates better results both in quality of work and in their commitment (psychological contract) with their functions (Grund & Thommes, 2017).

These implications for employment have been transferred to the relationship between employment and sustainable practices and innovation. Within sustainable practices, some authors recognize that human resources are a fundamental link to achieving sustainability practices, mainly because of the generation of employment with good working conditions (Yadav, 2019) and a strengthening in the technical capacity of the human resource (Gupta et al., 2020) better levels of commitment are obtained for the fulfillment of the objectives associated with sustainability.

The relationship between innovation and sustainability, under the effects of employment, has yet to be studied in this context, and most similar studies in other environments find complex and opposite results (Rubio & Abril, 2024, Stubbs, 2019; Mirvis & Googins, 2018). In this study, establishing how employment can moderate the relationship between types of innovation and sustainability practices is of interest for employment policy in Colombia, at a time when employment has fallen in some sectors due to the Covid-19 situation and the effects that the pandemic has in terms of the transformation of employment.

The industrial sector promises important discoveries in better, more efficient, technology-intensive forms of production, but not greener (Roy, 2015). Most of the production generated by the manufacturing sector generally makes intensive use of electrical energy, with very few movements towards new forms of energy. In Colombia, the problem is more complex; using electricity is mostly the only option available to entrepreneurs. Think of other forms of production with cleaner energy; they represent very high costs. However, some companies prefer to invest in better forms of production based on reducing water resources or using ecological materials.

It is possible to affirm that the industrial sector is at the crossroads of sustainability (Gerstlberger et al., 2016). Invest in innovating, but innovating in what is less expensive, for example, in production methods that reduce energy use from imported technology. Production methods have been widely studied; traditionally, production improvements and manufacturing innovations (Fabrizio & Tsolmon, 2014) are made from basic adaptations to significant investments, depending on the sector, the type of organization, and the dynamics of competitors. Modifications that are even suggested by the operators of the industrial machines, starting from the supervisor, are substantial improvements in changes of parts, process management, use of the machine, or broader projects with labor implications such as massive dismissals when replacing operators by technologically modified machines that allow optimal work to be carried out with less personnel.

Energy consumption for the manufacturing sector is, in addition to water, one of the most expensive and essential resources for the production process; therefore, industries have been looking for different ways to develop cleaner processes based on investment in research, technology, and patents among others, but the effect of different types of innovation on sustainability practices is not clear; consequently, it is intended to study:

H1a: Innovation in production methods positively affects sustainability practices in manufacturing companies.

New production methods are the order of the day; however, the organization's ability to integrate these tools with human resource training for this purpose (Crespi et al., 2019), trained in terms of the tool as a support and not as its replacement (Pazouki et al., 2018), are challenges for organizations (Scerbo, 2018) in the manufacturing sector. The execution of these production methods is only possible from the investment in computer equipment,

communication, and technological activities that favor the renewal of traditional forms of production and, therefore, allow the generation of more innovative processes that respond to the demands of the environment (Sabherwal et al., 2019), the requirements of customers and the pressure of competition.

These new production methods may cause the industry to need more significant hiring of human resources, which achieves a positive learning curve over time, thus determining that its capacity for innovation from production methods is solid enough to compete in environments of more significant uncertainty. Previous studies show that industrial organizations have better sustainability practices when a more conscious, collaborative, and permanent learning production process is carried out (Khurana et al., 2019). Consequently, the following hypothesis is studied:

H1b: Innovation in production methods in interaction with employment positively affects sustainability practices in manufacturing companies.

The development of novel goods has become a classic form of innovation for manufacturing companies, especially for those seeking to gain market share based on the specific characteristics of the product; generally, this type of innovation requires a great deal of learning for the firm (Ghasemzadeh et al. al., 2019). In addition to the challenges in terms of levels of innovation that the firm is willing to undertake, such as incremental and radical (Jugend et al., 2018), which help it develop better products for a more demanding customer, some authors state that the product innovation as a classic type of innovation has at least three aspects: the first associated with the possibility of building open innovation (Zhu et al., 2019) in a positive relationship with other institutions and organizations that collaborate to make innovation possible in product, second the positive effect on implicit absorption capacity in the development of new products (Gomes & Wojahn, 2017), which allows the organization to understand the information of its environment and turn it into opportunities for the company, the third element the connection with sustainability, which motivates the development of ecological products, with positive environmental impacts that have transformed the way of designing products (Buhl et al., 2019) and services.

In this last sense, organizations have been building new areas in charge of researching and developing more organic, less polluting products with less waste, which have focused on a fundamental idea: product innovation can help the company create more sustainable practices (Teixeira & Junior, 2019), from better use of resources, reduction of water use, use of renewable energies, recycling and use of waste, among many others, which is why the following hypothesis arises:

H1c: Product innovation positively affects sustainability practices in manufacturing companies.

Product innovation as it is developed in manufacturing organizations has been mobilizing towards a green economy, which has been widely studied; the development of these innovative and sustainable products should remain in the hands of a committed human resource (Alam et al., 2024, Ogbeibu et al., 2020; Grabara et al., 2020, Mousavi et al., 2018) with the idea of sustainability, care for the environment; so it would not be surprising that an organization that is innovative in product and also creates employment to complement this development of new products, should generate better sustainability practices from a well-trained human resource that is more aware of its ability to create sustainable products; therefore, the hypothesis arises:

H1d: Product innovation in interaction with employment positively affects sustainability practices in manufacturing companies.

The development of internal processes not related to production allows industrial companies to create improvements that save costs for companies, elements such as savings in time and bureaucracy in the work scheme of each department, the development of dynamic selection processes, inventory management, purchasing, and supplier management, access to information, intranet development are examples of this (Walker et al., 2015). Over the years, innovation in industrial companies was believed to be only technological. However, with the prevailing need to manage internal processes quickly, organizations realized that the key to success was not only in the technological innovation of the production process, which corresponded to organizational methods with basic technological (Fartash et al., 2018) and non-technological tools (Mun, 2018), which help improve productivity and performance.

Some preliminary analyses show interesting organizational innovation results, indicating that a leader can generate better results in the team when performing transformational leadership than transactional leadership (Jia et al., 2018). In other words, employees will feel freer to innovate and create as their leader or team leader allows them to make changes to the way they work in the organization, allowing them to propose ideas for the improvement of internal procedures, which in turn allows the company to be more successful, based on incremental and radical innovations designed for the organization from the mind of the employee (Sajjad et al., 2020). Other authors go further, explaining that innovation in the organizational method is mainly related to the organization's ability to develop high-performance teams (Edmondson & Harvey, 2018), while other authors consider that the effect of innovation in the organizational method is given by the type of contract that the employees have, that is, that employees contracted continuously in the company improve their quality of life, and therefore, can have better effects on innovation, previous studies in Spain, Germany, and France (Duhautois et al., 2018) show that the quality of work can have significant effects when it comes to innovating, companies in the industrial sector, in particular, can be favored by the positive feelings of the worker towards the com-

pany, the greater the feeling of a job that allows a good quality of life, the employee develops a greater capacity for innovation. Previous studies (Ayodele et al., 2020) affirm that organizational innovations can be an opportunity for the environment, which is not only convenient for companies but also for their employees; consequently, the following hypotheses are studied:

H1e: The number of innovations in organizational methods positively affects the sustainability practices of manufacturing companies.

H1f: The number of innovations in organizational methods in interaction with employment positively affects the sustainability practices of manufacturing companies.

Commercial innovation, also known as marketing innovation, has proven to be a type of innovation with important results for the improvement of business sustainability (Quaye & Mensah, 2019), especially because it allows the development of packaging with a positive ecological impact, placing the promotion and pricing in a novel way (Grigorescu et al., 2020). The Oslo Manual (OECD, 2018) originally included some product and process practices within commercial innovations. However, with the update of the manual in 2018, new studies show that commercial innovation practices are specially designed to develop a system of promotion, place, and price that allows the consumer to express his opinion regarding what he receives. The current client is more demanding regarding respect for the environment by companies at a global level, which has transformed commercial innovation into a very meticulous practice in terms of the use of natural resources, design of the entire chain, improvements in the use of packaging materials (Regattieri et al., 2018), to offer what the customer wants, primarily through more ecological practices.

Few studies directly relate business innovation to sustainability (Dada et al., 2024, Fiore et al., 2017). Therefore, it is important to recognize that commercial or marketing innovation requires intensive use of research and development, as well as technology (Chege & Wang, 2020), so organizations in the manufacturing sector that innovate commercially undoubtedly require personnel trained that allows them to achieve this type of innovation, which generally translates into better sustainability practices, thanks to the ability of human resources to develop, based on creativity, marketing improvements in accordance with the demands of the environment, especially of an environmental nature, such as packaging and materials. In the literature, there is no study that directly relates marketing innovation with sustainability practices and the moderation of employment, particularly in Latin American contexts such as the one in this study; it seeks to cover this gap in research with the following hypotheses:

H1g: Commercial innovation positively affects the sustainability practices of manufacturing companies.

H1h: Commercial innovation in interaction with employment positively affects the sustainability practices of manufacturing companies.

Consequently, for industrial companies in Colombia, it is necessary to understand whether the dynamics of innovation added to the hiring of personnel (Wikhamn, 2019) help organizations to have sustainable practices, which in the long term translates as a virtuous process of innovation and environmental responsibility.

The relationship between innovation and sustainability in manufacturing has been a topic of extensive research, but there are still some gaps in the literature, particularly in the Colombian manufacturing sectors. While previous studies have focused on the effects of innovation on employment and sustainability separately, the combined impact of these factors needs further exploration. This is especially relevant in Colombia, where the economic landscape is rapidly changing, and environmental concerns are growing. To complicate matters further, the specific role of different types of innovation, such as process, product, organizational, and commercial innovations, and their combined effect on sustainable practices and employment generation, has not been thoroughly investigated in developing countries.

Therefore, this study aims to address the gaps in the existing literature by examining how various forms of innovation influence sustainability and employment simultaneously in the Colombian manufacturing sectors (see table 1). The study will explore the different types of innovation, their effects on sustainable practices and employment generation, and their combined impact on the Colombian economy's growth and environmental sustainability. The study's findings could provide valuable insights for policymakers and stakeholders to promote economic growth and environmental sustainability in the region. By filling the research gaps, this study could contribute to a better understanding of the relationship between innovation, sustainability, and employment in developing countries, particularly in the Colombian manufacturing sectors.

3 Methodology

For this analysis, the EDIT Technological Development and Innovation Survey has been taken with data from 2017 - 2018 created by the National Administrative Department of Statistics (DANE). The selected sample was 1570 Colombian manufacturing companies that responded to the EDIT. The survey is characterized by cataloging the subsectors of the industrial sector by an ISIC Revision 4 classification, which corresponds to international codes. The companies in the sample have a minimum of 2 employees and a maximum of 4,181, and the sectors to which they belong are diverse, grouped into five major manufacturing categories: food and textile products, wood and paper, petroleum, pharmaceutical, chemical and rubber, metallurgy and electronics, machinery, and transportation.

Table 1: Hypotheses

Hypothesis
H1a: Innovation in production methods positively affects sustainability practices in manufacturing companies.
H1b: Innovation in production methods in interaction with employment positively affects sustainability practices in manufacturing companies.
H1c: Product innovation positively affects sustainability practices in manufacturing companies.
H1d: Product innovation in interaction with employment positively affects sustainability practices in manufacturing companies.
H1e: The number of innovations in organizational methods positively affects the sustainability practices of manufacturing companies.
H1f: The number of innovations in organizational methods in interaction with employment positively affects the sustainability practices of manufacturing companies.
H1g: Commercial innovation positively affects the sustainability practices of manufacturing companies.
H1h: Commercial innovation in interaction with employment positively affects the sustainability practices of manufacturing companies.

Table 2: Industry Types

Group Number	**Industry**
Group 1	Food and Textile Products
Group 2	Wood and Paper
Group 3	Petroleum, Pharmaceutical, Chemical, and Rubber
Group 4	Metallurgy and Electronics
Group 5	Machinery and Transportation

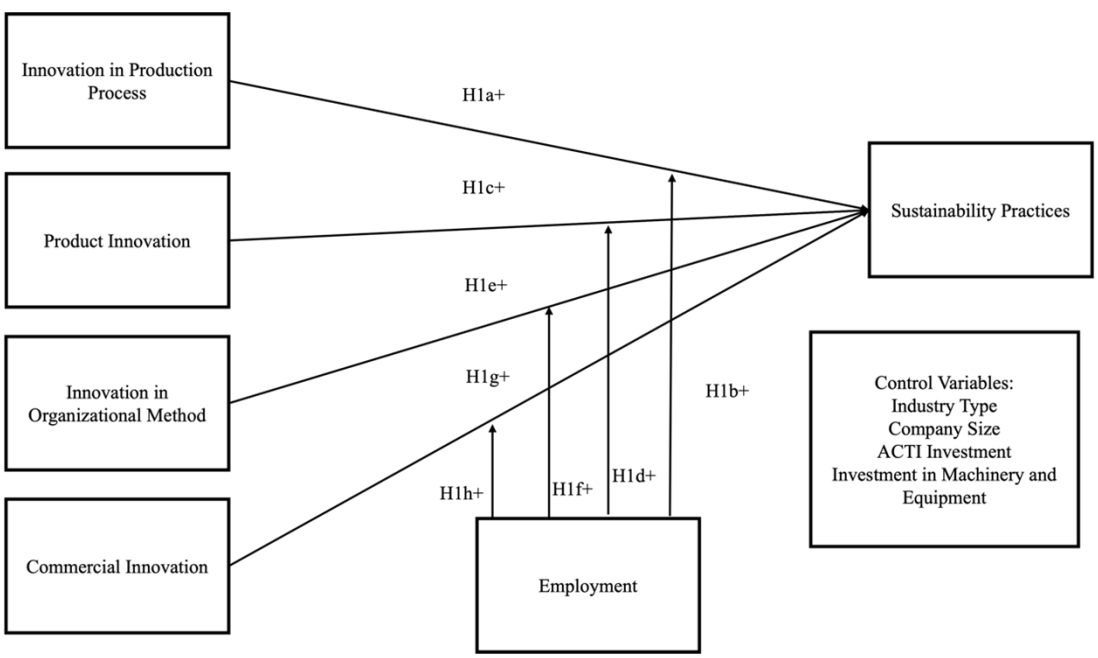

Figure 1: Construct

Within the control variables, the type of industry (Lützner et al., 2016; Betts et al., 2015; Wu & Chiu, 2015) and the size of the company (Forés & Camisón, 2016), recognizing whether the differences between companies can have an effect on sustainability practices. (See table 2).

According to the survey, the third control variable used was the investment in scientific, technological, and innovation activities in millions of pesos (Biswas et al., 2018; Saidani et al., 2017) adopted from previous studies on innovation. The fourth control variable corresponded to investment in machinery and communication equipment in millions of pesos (Wu et al., 2015; Gawer & Cusumano, 2014). A natural logarithm was applied to both variables.

The independent variables included the four types of innovation: the number of innovations in organizational methods (Damanpour & Aravind, 2012; Camisón & Villar, 2014; Mas-Verdu et al., 2016; Azar & Ciabuschi, 2017; Cho et al ., 2019; OECD, 2018), number of production method innovations according to survey data (Matt et al., 2015; OECD, 2018), number of product innovations (Gomes & Wojahn, 2017; Buhl et al., 2019; Oslo Manual, 2018) and number of commercial innovations (Quaye & Mensah, 2019; Grigorescu et al., 2020; OECD, 2018).

The dependent variable (see Figure 1) corresponds to sustainable practices (Zhu et al., 2016), which takes the arithmetic mean of three variables: reduction in energy consumption (Hepburn et al., 2018; Tang & Tan, 2014), use of waste (Gupta et al., 2019; Ajemigbitse et al., 2019; Qi et al., 2018), and decrease in the use of raw material (Lenzo et al., 2018; Sameer & Bringezu, 2019, Sicoli et al., 2019, with a measure of high, medium, and null.

As a moderating variable, the increase in employed personnel was measured by the difference in personnel hired in 2018 and 2017 (Balsmeier & Woerter, 2019; Mauno & Ruokolainen, 2017; Giuliano et al., 2017).

4 Results

The sample consisted of a total of 1570 manufacturing firms. The selection included both small and medium-sized enterprises (SMEs) and large corporations, allowing for a broad perspective on the innovation applied across different industries, which were analyzed in 5 different groups: food and textile products, wood and paper, petroleum, pharmaceutical, chemical, and rubber, metallurgy and electronics, machinery and transportation. The sample allows for identifying how these innovation practices contribute to sustainability and employment in the manufacturing sector. The results of this research reflect a significant trend toward sustainability-oriented innovation across all groups of firms.

The multiple regression analysis was conducted after taking into consideration the assumptions. The maximum inflation value of the variance factor was found to be 2.8, which is within the acceptable range. The study's findings are presented in two tables: Table 3 provides the descriptive statistics and the correlation matrix, while Table 4 presents the regressions for the dependent variable sustainable practices.

The study found that the control variables introduced in Model 1 could explain 2.9 of the variance of sustainable practices (see Table 4). It was also observed that the sector type significantly impacts sustainability practices. Specifically, the food and textile products and wood and paper sectors were found to be significant and negative, indicating that companies in these sectors have lower sustainability practices. This finding can be valuable for policymakers and industry stakeholders who can use this insight to incentivize these industries to invest in sustainability.

However, the metallurgy and electronics, machinery, and transport sectors did not show any significant results, meaning no conclusions could be drawn about greater or lesser sustainability practices in these sectors. The study also found that the company size variable was insignificant, indicating that a variation in company size does not necessarily imply that the organization has better sustainability practices.

Interestingly, the study found that while investment in scientific and innovation activities was not significant, the investment variables in machinery and equipment were significant. This result suggests that manufacturing companies in Colombia with the highest investment in machinery and equipment tend to have better sustainability practices. This finding proves that research and development alone are not enough for industrial companies to achieve sustainability goals. It requires intensive use of machinery and equipment in their production processes, which may also be necessary.

Overall, this study provides valuable insights into the factors that impact sustainability practices in different sectors and highlights the need for policymakers and industry stakeholders to incentivize sustainability efforts, especially in the food, textile, and wood and paper sectors

Model 2 consists of several independent variables, including innovation in the production process (H1a), product innovation (H1c), organizational method innovation (H1e), and commercial innovation (H1g). These variables are significant and positive, indicating that the hypotheses mentioned are confirmed, explaining that the different types of innovation positively impact sustainability practices. For H1a: Innovation in production methods positively affects sustainability practices in manufacturing companies, table 4 shows a significant positive relationship between innovation in production methods and sustainability practices ($\beta = 0.177$, $p < 0.01$). This confirms that production method innovation directly enhances sustainability practices.

Table 3: Descriptive statistics

		Minimum	Maximum	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Dependent Variable Sustainable Practice	1	3	1,70	0,57	1												
2	Variable Control Sector1 Food and Textile Products	0	1	0,37	0,48	-0,08**	1											
3	Variable Control Sector2 Wood and Paper	0	1	0,07	0,25	-0,03	-0,21**	1										
4	Variable Control Sector 3 Oil, Pharmaceutical, Chemical and Rubber	0	1	0,26	0,44	0,05	-0,45**	-0,16**	1									
5	Variable Control Sector4 Metallurgy and Electronics	0	1	0,16	0,36	0,05	-0,33**	-0,12**	-0,25**	1								
6	Variable Control Sector5 Machinery and Transport	0	1	0,15	0,36	0,01	-0,32	-0,12**	-0,25**	-0,18	1							
7	Control Variable Company Size	2	4181	251,56	421,59	0,08**	0,13**	-0,06*	-0,06*	-0,05	0,00	1						
8	Variable Control Log ACTI Investment	0,00	7,74	1,79	2,41	0,10**	-0,13**	-0,03	0,07**	0,07	0,04	0,46**	1					
9	Variable Control Log Investment in Machinery and Equipment	0,00	7,68	2,88	2,65	0,15**	-0,00	0,01	-0,02	0,02	-0,01	0,35**	0,38**	1				
10	Independent Variable Innovation in Production Process	0	1	0,61	0,49	0,16**	0,05	0,01	-0,07**	0,04	-0,02	0,07**	0,03	0,27**	1			
11	Independent Variable Commercial Innovation	0	1	0,30	0,46	0,04**	0,05**	-0,04	-0,05	-0,01	0,03	0,07**	0,04	-0,03	-0,09**	1		
12	Independent Variable Innovation in Organizational Method	0	1	0,28	0,45	0,10**	0,00	0,04	-0,01	-0,02	0,00	0,09**	0,13**	0,06*	-0,01	0,10**	1	
13	Independent Variable Product Innovation	0	1	0,35	0,48	0,11**	-0,12**	-0,07*	0,12**	0,02	0,04	0,16**	0,28**	0,14**	-0,10**	0,01	0,03	1
14	Moderator Occupied Staff Increase	0	2	1,09	0,93	-0,01	0,10**	0,03	0,01	-0,12	-0,04	-0,05	-0,06**	0,01	-0,01	0,00	-0,02	-0,04

*p < 0.05, **p<0.01

Table 4: Hierarchical Regression Analysis

Dependent Variable Sustainability Practices				
	Model 1	Model 2	Model 3	Model 4
Variable Control Food Sector and Textile Products	-0,108*** (0,037)	-0,112*** (0,037)	-0,113*** (0,037)	-0,116*** (0,037)
Variable Control Wood and Paper Sector	-0,100* (0,061)	-0,098* (0,06)	-0,099* (0,06)	-0,098* (0,061)
Variable Control Metallurgy and Electronics Sector	0,012 (0,046)	0,003 (0,045)	0,005 (0,045)	0,002 (0,045)
Variable Control Machinery and Transport Sector	-0,030 (0,046)	-0,034 (0,045)	-0,033 (0,045)	-0,037 (0,045)
Control Variable Company Size	0.000 (0.000)	0.000 (0,000)	0.000 (0,000)	0.000 (0,000)
Variable Control Log Investment ACTI	0,004 (0,007)	0,000 (0,007)	0,000 (0,007)	0.000 (0,007)
Variable Control Log Investment in Machinery and Equipment	0,029*** (0,006)	0,019*** (0,006)	0,019*** (0,006)	0,018*** (0,006)
Independent Variable Innovation in Production Process		0,177*** (0,03)	0,177*** (0,03)	0,107**(0,045)
Independent Variable Commercial Innovation		0,064** (0,031)	0,064** (0,031)	0,034 (0,047)
Independent Variable Innovation in Organizational Method		0,105*** (0,032)	0,105*** (0,032)	0,122*** (0,048)
Independent Variable Product Innovation		0,106*** (0,031)	0,106*** (0,031)	0,077* (0,046)
Moderator Occupied Staff Increase			0,006 (0,015)	0,005 (0,058)
Commercial Interaction_Increase_Personal				0,03 (0,033)
Interaction Process_Increment_Staff				0,066** (0,031)
Interaction Organizational_Increase_Personal Method				-0,014 (0,033)
Interaction Innovation_Product_Increase_Personnel				-0,027 (0,032)
Constant	1,645*** (0,003)	1,494*** (0,038)	1,487*** (0,042)	1,549*** (0,051)
R2	0,029	0,061	0,060	0,061
Change in R2	0,032***	0,034***	0,000	0,003

*p < 0.10, **p<0.05, ***p<0.01; standard deviation in parentheses

While product innovation has a positive and significant effect on sustainability ($\beta = 0.106$, $p < 0.01$) in Table 4. This indicates that product innovation contributes positively to sustainability, confirming H1c: Product innovation positively affects sustainability practices in manufacturing companies.

About H1e: The number of innovations in organizational methods positively affects sustainability practices. innovation in organizational methods had a significant positive effect on sustainability ($\beta = 0.105$, $p < 0.01$), as shown in Table 4, confirming that organizational innovations directly enhance sustainability practices.

For H1g: Commercial innovation positively affects sustainability practices in manufacturing companies. Commercial innovation had a significant positive effect ($\beta = 0.064$, $p < 0.05$), as presented in Table 4, confirming its positive impact on sustainability.

Model 3 includes all the main effects, whereas model 4 introduces the moderation effects between the four types of innovation and employment, which is measured in the increase in employed personnel. The model explains 6.1% of the variance of sustainable practices. The results show that the only significant and positive interaction is between innovation in the production process and an increase in employed personnel. As a result, hypothesis H1b is confirmed, while hypotheses H1d, H1f, and H1h are rejected.

For H1b: Innovation in production methods in interaction with job creation positively affects sustainability practices. The interaction effect between innovation in production methods and job creation was positive and significant ($\beta = 0.066$, $p < 0.05$), as shown in Table 4. This confirms that combining innovation in production methods with increased employment enhances sustainability.

In the case of H1d: Product innovation in interaction with job creation positively affects sustainability practices. The interaction between product innovation and job creation was not significant ($\beta = -0.027$), indicating that the combination does not significantly affect sustainability, leading to the rejection of this hypothesis.

About H1f: The number of innovations in organizational methods in interaction with job creation positively affects sustainability practices. The interaction between organizational innovations and job creation was not significant ($\beta = -0.014$), resulting in the rejection of this hypothesis.

Also, the interaction between commercial innovation and job creation was not significant ($\beta = 0.003$), leading to the rejection of the hypothesis H1h: Commercial innovation in interaction with job creation positively affects sustainability practices.

In summary, the confirmation and rejection of the hypotheses are based on the hierarchical regression analysis in Table 4, which provides the coefficients and significance levels necessary to evaluate the effects of various types of innovation on sustainability practices and their interaction with employment.

Table 5: Summary of hypothesis and results

Hypothesis	Result
H1a: Innovation in production methods positively affects sustainability practices in manufacturing companies.	Confirmed
H1b: Innovation in production methods in interaction with employment positively affects sustainability practices in manufacturing companies.	Confirmed
H1c: Product innovation positively affects sustainability practices in manufacturing companies.	Confirmed
H1d: Product innovation in interaction with employment positively affects sustainability practices in manufacturing companies.	Rejected
H1e: The number of innovations in organizational methods positively affects the sustainability practices of manufacturing companies.	Confirmed
H1f: The number of innovations in organizational methods in interaction with employment positively affects the sustainability practices of manufacturing companies.	Rejected
H1g: Commercial innovation positively affects the sustainability practices of manufacturing companies.	Confirmed
H1h: Commercial innovation in interaction with employment positively affects the sustainability practices of manufacturing companies.	Rejected

Therefore, manufacturing organizations that innovate in the production process and hire more personnel have better effects on sustainability practices (see table 5). Because they comply with social and environmental axes, which are a direct effect of innovation, this study fills a gap in the literature and provides a better understanding of the relationship between innovation, employment, and sustainability in industrial companies.

5 Discussion

During the last 30 years, Colombian industrial organizations have developed innovation from different perspectives, especially with a technological approach. However, in the last decade, a call has been made to care for the environment as part of the world agenda, tangentially modifying how innovation is implemented to the point that elements of environmental care have been included in the types of innovation in the Oslo Manual (OECD, 2018). Studies related to innovation and sustainability practices have shown that, depending on the context, the investment, and the types of innovation, companies can count on both practices: innovation and sustainability, developing a solid system of competitiveness based on the permanent reinvention and responsibility with the care of the environment as the axes of its planning. The results of this study confirm that various forms of innovation, including production processes, products, organizational methods, and commercial practices, positively impact sustainability practices; this finding reinforces the existing body of knowledge, emphasizing the vital link between innovation and sustainability. The study contributes to filling a research gap by providing empirical evidence to support this connection.

Also, recognizing the different forms that innovation can contribute to employment can help manufacturing organizations improve their strategies to recruit better employees and develop practices for sustainability; this research gives empirical evidence where some particular types of innovation in combination with employment are more effective to improve sustainability practices than others.

The confirmation of hypotheses H1a, H1c, H1e, and H1g indicates that innovation in production processes, products, organizational, and commercial methods directly impact sustainability practices. These results suggest that companies investing in any form of innovation will likely see improvements in their sustainability practices.

The confirmation of hypothesis H1b and the rejection of H1d, H1f, and H1h highlight the unique importance of innovation in production processes when combined with employment. This result indicates that although all forms of innovation benefit sustainability, innovation in production processes, especially when accompanied by an increase in personnel, has the most significant positive impact on sustainability practices. It explains that better capabilities developed thanks to human resources, improving efficiency, and more socially responsible production practices. However, it also creates a challenge for companies that do not transform the material into tangible products; some services companies that depend on new marketing and organizational methods to create a difference in the market should develop better strategies to connect innovation with sustainability, but also with employment, because in their case is possible that both types of innovation reduce personnel and do not allow to develop a better employment, this the traditional dichotomous experience about innovate without decreasing employees.

In the case of the manufacturing sector, the unique effectiveness of the combination of innovation in production processes and employment in improving sustainability practices suggests a model where not only technological or process innovation matters, but also how innovation affects labor structure and employment growth. This may imply that effective sustainability strategies need to consider both innovation and the social impact of that innovation, including employment.

6 Conclusion

Innovation, with its many forms, has become a fundamental tool for developing better processes and radically new products; however, innovation currently requires a significant investment in environmental components that promote sustainability, especially since the manufacturing sector requires intensive use of non-renewable materials and resources.

For organizations in the manufacturing sector, the empirical evidence of this analysis is an incentive since it allows them to recognize that carrying out innovation processes and creating jobs can help build more ecological processes, totally transforming the impact that manufacturing has on the ecological environment. In practice, Colombian industrial organizations consider innovation necessary but only sometimes profitable, especially due to the costs associated with the innovation process, while sustainability seems to be sacrificed every time investment in innovation is considered.

To a certain extent, entrepreneurs consider that they must decide between innovating or being sustainable in environmental terms, so this research can demonstrate to these companies and their managers that innovation has very positive effects on sustainability, that far from being isolated paths, they can complement each other and generate jobs. In addition, they can help in the long term to boost the economy from the new employees who can now consume, creating a positive economic, social, and environmental circle for all those involved.

From a theoretical perspective, in the resources and capacities approach, the theory can advance from understanding innovation as a capacity with different associated resources that must be obtained, shaped, and combined so that each organization can obtain the expected results. From the innovation approach, it can be established that the context affects the forms of innovation; in the present study, it is explained that the innovation in production processes and the investment in machinery and equipment predominates in the organizations of developing countries, for what studying innovation from the context and not only from the practices, would be a step forward breaking with the traditional focus of innovation studies. This relationship also underscores the significance of capital-intensive technologies in achieving sustainability goals. The outcome of this study sheds light on the crucial role of technology and equipment in promoting sustainability in manufacturing, which adds to the existing literature on the subject.

This study delves into the relationship between innovation and sustainability in the manufacturing sector and presents several novel findings. The study provides empirical evidence that different types of innovation, including process, product, organizational, and commercial innovations, can simultaneously contribute to sustainable practices and employment. This finding is particularly significant for Colombian contexts, as this linkage has not been explored enough in this region.

The analysis's results unequivocally demonstrate that innovation in production methods (H1a), products (H1c), organizational methods (H1e), and commercial innovation (H1g) significantly enhances manufacturing companies' sustainability practices. These findings underscore the pivotal role of embracing diverse forms of innovation as a strategic tool to support environmental sustainability within the manufacturing sector.

Additionally, the confirmation of hypothesis H1b emphasizes that the interaction between innovation in production methods and employment further strengthens these sustainable benefits, reinforcing the idea that production innovations accompanied by employment have a more pronounced positive effect on ecological practices.

On the other hand, the hypotheses exploring the interaction of job creation with product innovation (H1d), organizational methods (H1f), and commercial innovation (H1h) were rejected, indicating that in these cases, the combination of these innovations with employment did not significantly impact sustainability practices. This result suggests that although innovations in these areas may enhance sustainability independently, they only sometimes complement employment effects. Therefore, companies are challenged to balance innovation and employment growth within the context of their sustainability strategies.

This study's innovative approach connects the dots between different forms of innovation and their combined effects on sustainable practices, which can guide local manufacturers in their strategic planning and implementation. The study shows that a holistic approach to innovation can lead to enhanced sustainability outcomes that comply with environmental regulations and contribute to long-term economic sustainability through employment.

Nevertheless, this research has a limitation regarding the context from which the data is extracted; they are not completely generalizable results, given that the country of origin can modify the industry's behavior. It is also essential to recognize that the data is taken in a particular time range, so it would be interesting to carry out a longitudinal study to establish the evolution of these variables and their relationships. Finally, a qualitative analysis among the interest groups of these organizations could help to understand how innovation and sustainability are related from the perspective of other industry agents.

The research presents some interesting areas for future analysis. For instance, it does not delve into the type of knowledge and learning that is acquired (Brunswicker & Vanhaverbeke, 2015). It would be worthwhile to explore the human resource associated with various types of innovation and its effects on organizational learning. Additionally, it is essential to examine how the cultural and economic context can impact the types of innovation and the organizational learning curve.

In addition, future studies could include how the types of innovation can generate better organizational policies regarding human resources, especially to attract the right human talent that allows a better development of sustainable practices in all innovation processes in the industrial sector. The present study should be complemented with a cross-country analysis (Jandhyala & Phene, 2015; Crowley & Bourke, 2017), where the country effect and the cultural effect on the types of innovation and their effects on various sustainability practices are compared.

The practical implications of this study are significant for industry stakeholders. Policymakers can use these insights to support initiatives that foster diverse innovation within the manufacturing sector. Manufacturing firms can use these findings to tailor their strategic operations to ensure that innovation efforts align with economic and environmental goals. This can improve their competitive edge and operational efficiency in the global market.

For innovation policymakers, the study highlights that when companies innovate in their production process and increase the number of employed personnel, it leads to better sustainability practices; policymakers should encourage companies to innovate while creating employment opportunities. This can be done through various initiatives such as economic incentives, labor market policies, and workforce development programs. Also, policymakers can foster collaboration and knowledge-sharing among manufacturing organizations, research institutions, and government to improve sustainability performance in industrial companies.

Literature

Afum, E., Osei-Ahenkan, V. Y., Agyabeng-Mensah, Y., Owusu, J. A., Kusi, L. Y., & Ankomah, J. (2020). Green manufacturing practices and sustainable performance among Ghanaian manufacturing SMEs: the explanatory link of green supply chain integration. Management of Environmental Quality, Vol. 31 No. 6, pp. 1457-1475. https://doi.org/10.1108/MEQ-01-2020-0019

Ajemigbitse, M. A., Cannon, F. S., Klima, M. S., Furness, J. C., Wunz, C., & Warner, N. R. (2019). Raw material recovery from hydraulic fracturing residual solid waste with implications for sustainability and radioactive waste disposal. Environmental Science: Processes & Impacts, 21(2), 308-323. https://doi.org/10.1039/C8EM00248G

Alam, S., Zhang, J., Shehzad, M. U., Boamah, F. A., & Wang, B. (2024). The inclusive analysis of green technology implementation impacts on employees age, job experience, and size in manufacturing firms: empirical assessment. *Environment, Development and Sustainability*, *26*(2), 4467-4486. https://doi.org/10.1007/s10668-022-02891-6

Ayodele, B. V., Alsaffar, M. A., & Mustapa, S. I. (2020). An overview of integration opportunities for sustainable bioethanol production from first-and second-generation sugar-based feedstocks. Journal of Cleaner Production, 245, 118857. https://doi.org/10.1016/j.jclepro.2019.118857

Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. International Business Review, 26(2), 324–336. https://doi.org/10.1016/j.ibusrev.2016.09.002

Azmat, F., Lim, W. M., Moyeen, A., Voola, R., & Gupta, G. (2023). Convergence of business, innovation, and sustainability at the tipping point of the sustainable development goals. *Journal of Business Research*, *167*, 114170. https://doi.org/10.1016/j.jbusres.2023.114170

Babič, S. F., Biloslavo, R., & Kodrič, B. (2023). Relationship between environmental reports and environmental performance: a case of the processing industry in the republic of Slovenia. *Organizacija*, *56*(4), 309-323. https://doi.org/10.2478/orga-2023-0021

Balsmeier, B., & Woerter, M. (2019). Is this time different? How digitalization influences job creation and destruction. Research Policy, 48(8), 103765. https://doi.org/10.1016/j.respol.2019.03.010

Belenzon, S., & Schankerman, M. (2015). Motivation and sorting of human capital in open innovation. Strategic Management Journal, 36(6), 795-820. https://doi.org/10.1002/smj.2284

Betts, T. K., Wiengarten, F., & Tadisina, S. K. (2015). Exploring the impact of stakeholder pressure on environmental management strategies at the plant level: what does industry have to do with it?. Journal of Cleaner Production, 92, 282-294. https://doi.org/10.1016/j.jclepro.2015.01.002

Biswas, R. K., Kabir, E., & Rafi, R. B. R. (2018). Investment in Research and Development Compared to Military Expenditure: Is Research Worthwhile?. Defence and Peace Economics, 1-12. https://doi.org/10.1080/10242694.2018.1477235

Brem, A., & Ivens, B. (2013). Do frugal and reverse innovation foster sustainability? Introduction of a conceptual framework. Journal of Technology Management for Growing Economies, 4(2), 31-50. https://doi.org/10.15415/jtmge.2013.42006

Brunswicker, S., & Vanhaverbeke, W. (2015). Open innovation in small and medium-sized enterprises (SMEs): External knowledge sourcing strategies and internal organizational facilitators. Journal of Small Business Management, 53(4), 1241–1263. DOI: 10.1111/jsbm.12120

Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M., & Süßbauer, E. (2019). Design thinking for sustainability: Why and how design thinking can foster sustainability-oriented innovation development. Journal of cleaner production, 231, 1248-1257. https://doi.org/10.1016/j.jclepro.2019.05.259

Callea, A., Urbini, F., Ingusci, E., & Chirumbolo, A. (2016). The relationship between contract type and job satisfaction in a mediated moderation model: The role of job insecurity and psychological contract violation. Economic and Industrial Democracy, 37(2), 399-420. https://doi.org/10.1177/0143831X14546238

Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of technological innovation capabilities and firm performance. Journal of business research, 67(1), 2891-2902. https://doi.org/10.1016/j.jbusres.2012.06.004

Chege, S. M., & Wang, D. (2020). The influence of technology innovation on SME performance through environmental sustainability practices in Kenya. Technology in Society, 60, 101210. https://doi.org/10.1016/j.techsoc.2019.101210

Cho, H., Lee, P., & Shin, C. H. (2019). Becoming a sustainable organization: focusing on process, administrative innovation and human resource practices. Sustainability, 11(13), 3554. https://doi.org/10.3390/su11133554

Crespi, G., Tacsir, E., & Pereira, M. (2019). Effects of innovation on employment in Latin America. Industrial and Corporate Change, 28(1), 139-159. https://doi.org/10.1093/icc/dty062

Crowley, F., & Bourke, J. (2017). The influence of human resource management systems on innovation: Evidence from Irish manufacturing and service firms. International Journal of Innovation Manage-

ment, 21(01), 1750003. https://doi.org/10.1142/S1363919617500037

D'Amato, D., Veijonaho, S., & Toppinen, A. (2018). Towards sustainability? Forest-based circular bioeconomy business models in Finnish SMEs. Forest Policy and Economics, 101848. https://doi.org/10.1016/j.forpol.2018.12.004

Dada, M. A., Obaigbena, A., Majemite, M. T., Oliha, J. S., & Biu, P. W. (2024). Innovative approaches to waste resource management: implications for environmental sustainability and policy. *Engineering Science & Technology Journal*, *5*(1), 115-127. https://doi.org/10.51594/estj.v5i1.731

Damanpour, F., & Aravind, D. (2012). Managerial innovation: Conceptions, processes and antecedents. Management and organization review, 8(2), 423–454. https://doi.org/10.1111/j.1740-8784.2011.00233.x

Dane. (2018). Technological Development and Innovation Survey EDIT. Available in: https://www.dane.gov.co/index.php/estadisticas-por-tema/tecnologia-e-innovacion/encuesta-de-desarrollo-e-innovacion-tecnologica-edit Consultado el 2 de marzo de 2019.

Duhautois, R., Erhel, C., Guergoat-Larivière, M., Mofakhami, M., Obersneider, M., Postels, D., Antonio, J. I, De Bustillo, R. M. & Pinto, F. (2018). The employment and job quality effects of innovation in France, Germany and Spain: evidence from firm-level data. QuInnE Working Paper WP5-3 Volltext. Retrieved from https://hal.archives-ouvertes.fr/hal-02613444

Edmondson, A. C., & Harvey, J. F. (2018). Cross-boundary teaming for innovation: Integrating research on teams and knowledge in organizations. Human Resource Management Review, 28(4), 347–360. https://doi.org/10.1016/j.hrmr.2017.03.002

Fabrizio, K. R., & Tsolmon, U. (2014). An empirical examination of the procyclicality of R&D investment and innovation. Review of Economics and Statistics, 96(4), 662-675. https://doi.org/10.1162/REST_a_00412

Fartash, K., Davoudi, S. M. M., Baklashova, T. A., Svechnikova, N. V., Nikolaeva, Y. V., Grimalskaya, S. A., & Beloborodova, A. V. (2018). The Impact of Technology Acquisition & Exploitation on Organizational Innovation and Organizational Performance in Knowledge-Intensive Organizations. Eurasia Journal of Mathematics, Science and Technology Education, 14(4), 1497-1507. https://doi.org/10.29333/ejmste/84835

Fiore, M., Silvestri, R., Contò, F., & Pellegrini, G. (2017). Understanding the relationship between green approach and marketing innovations tools in the wine sector. Journal of cleaner production, 142, 4085-4091. https://doi.org/10.1016/j.jclepro.2016.10.026

Forés, B., & Camisón, C. (2016). Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size?. Journal of Business Research, 69(2), 831-848. https://doi.org/10.1016/j.jbusres.2015.07.006

Føre, H. M., Thorvaldsen, T., Osmundsen, T. C., Asche, F., Tveterås, R., Fagertun, J. T., & Bjelland, H. V. (2022). Technological innovations promoting sustainable salmon (Salmo salar) aquaculture in Norway. *Aquaculture Reports*, *24*, 101115. https://doi.org/10.1016/j.aqrep.2022.101115

Franco, J. C., Hussain, D., & McColl, R. (2019). Luxury fashion and sustainability: looking good together. Journal of Business Strategy, 41(4), 55-61. https://doi.org/10.1108/JBS-05-2019-0089

Gawer, A., & Cusumano, M. A. (2014). Industry platforms and ecosystem innovation. Journal of Product Innovation Management, 31(3), 417-433. https://doi.org/10.1111/jpim.12105

Gerstlberger, W., Knudsen, M. P., Dachs, B., & Schröter, M. (2016). Closing the energy-efficiency technology gap in European firms? Innovation and adoption of energy efficiency technologies. Journal of Engineering and Technology Management, 40, 87-100. https://doi.org/10.1016/j.jengtecman.2016.04.004

Ghasemzadeh, P., Nazari, J. A., Farzaneh, M., & Mehralian, G. (2019). Moderating role of innovation culture in the relationship between organizational learning and innovation performance. The Learning Organization, 26 (3), 289-303. https://doi.org/10.1108/TLO-08-2018-0139

Giuliano, R., Kampelmann, S., Mahy, B., & Rycx, F. (2017). Short notice, big difference? The effect of temporary employment on firm competitiveness across sectors. British Journal of Industrial Relations, 55(2), 421-449. https://doi.org/10.1111/bjir.12236

Gomes, G., & Wojahn, R. M. (2017). Organizational learning capability, innovation and performance: study in small and medium-sized enterprises (SMES). Revista de Administração (São Paulo), 52(2), 163-175. https://doi.org/10.1016/j.rausp.2016.12.003

Grabara, J., Hussain, H. I., & Szajt, M. (2020). Sustainable University Development through Sustainable Human Resources and Corporate Entrepreneurship: The Role of Sustainable Innovation and Work Environment. Amfiteatru Economic, 22(54), 480-495. DOI: 10.24818/EA/2020/54/480

Grigorescu, A., Maer-Matei, M. M., Mocanu, C., & Zamfir, A. M. (2020). Key Drivers and Skills Needed for Innovative Companies Focused on Sustainability. Sustainability, 12(1), 102. https://doi.org/10.3390/su12010102

Grund, C., & Thommes, K. (2017). The Role of Contract Types for Employees' Public Service Motivation. Schmalenbach Business Review, 18(4), 377-398. https://doi.org/10.1007/s41464-017-0033-z

Gupta, N., Poddar, K., Sarkar, D., Kumari, N., Padhan, B., & Sarkar, A. (2019). Fruit waste management by pigment production and utilization of residual as bioadsorbent. Journal of environmental management, 244, 138-

143. https://doi.org/10.1016/j.jenvman.2019.05.055

Gupta, H., Kusi-Sarpong, S., & Rezaei, J. (2020). Barriers and overcoming strategies to supply chain sustainability innovation. Resources, Conservation and Recycling, 161, 104819. https://doi.org/10.1016/j.resconrec.2020.104819

Hepburn, C., Pless, J., & Popp, D. (2018). Policy Brief—Encouraging Innovation that Protects Environmental Systems: Five Policy Proposals. Review of Environmental Economics and Policy, 12(1), 154–169. Recuperado de https://ora.ox.ac.uk/objects/

Hysa, E., Kruja, A., Rehman, N. U., & Laurenti, R. (2020). Circular economy innovation and environmental sustainability impact on economic growth: An integrated model for sustainable development. *Sustainability*, *12*(12), 4831. https://doi.org/10.3390/su12124831

Jandhyala, S., & Phene, A. (2015). The role of intergovernmental organizations in cross-border knowledge transfer and innovation. Administrative Science Quarterly, 60(4), 712–743. https://doi.org/10.1177/0001839215590153

Jia, X., Chen, J., Mei, L., & Wu, Q. (2018). How leadership matters in organizational innovation: a perspective of openness. Management Decision, 56(1), 6-25. https://doi.org/10.1108/MD-04-2017-0415

Jugend, D., Araujo, T. R. D., Pimenta, M. L., Gobbo Jr, J. A., & Hilletofth, P. (2018). The role of cross-functional integration in new product development: differences between incremental and radical innovation projects. Innovation, 20(1), 42-60. https://doi.org/10.1080/14479338.2017.1364971

Khan, A. N., Mehmood, K., & Kwan, H. K. (2024). Green knowledge management: A key driver of green technology innovation and sustainable performance in the construction organizations. *Journal of Innovation & Knowledge*, *9*(1), 100455. https://doi.org/10.1016/j.jik.2023.100455

Khurana, S., Haleem, A., & Mannan, B. (2019). Determinants for integration of sustainability with innovation for Indian manufacturing enterprises: Empirical evidence in MSMEs. Journal of Cleaner Production, 229, 374-386. https://doi.org/10.1016/j.jclepro.2019.04.022

Kim, D., Chiou, J. S., & Calantone, R. (2018). Strategic orientations, joint learning, and innovation generation in international customer-supplier relationships. International Business Review, 27(4), 838-851. https://doi.org/10.1016/j.ibusrev.2018.01.007

Lenzo, P., Traverso, M., Mondello, G., Salomone, R., & Ioppolo, G. (2018). Sustainability performance of an Italian textile product. Economies, 6(1), 17. https://doi.org/10.3390/economies6010017

Liu, G., Gao, P., Chen, F., Yu, J., & Zhang, Y. (2018). Technological innovation systems and IT industry sustainability in China: A case study of mobile system innovation. Telematics and Informatics, 35(5), 1144–1165. https://doi.org/10.1016/j.tele.2018.01.012

Lozano, F. J., & Lozano, R. (2018). Assessing the potential sustainability benefits of agricultural residues: Biomass conversion to syngas for energy generation or to chemicals production. Journal of cleaner production, 172, 4162-4169. https://doi.org/10.1016/j.jclepro.2017.01.037

Lund-Thomsen, P., Lindgreen, A., & Vanhamme, J. (2016). Industrial clusters and corporate social responsibility in developing countries: what we know, what we do not know, and what we need to know. Journal of Business Ethics, 133(1), 9-24. https://doi.org/10.1007/s10551-014-2372-8

Lützner, R., Friedli, T., Budde, L., & Noflatscher, S. (2016). Performance effects of factory-within-a-factory designs. 23rd EurOMA Conference. Trondheim, Norway. Recuperado de https://www.alexandria.unisg.ch/248702/1/Full%20Paper_EurOMA_PWP.pdf

Mahr, D., Lievens, A., & Blazevic, V. (2014). The value of customer cocreated knowledge during the innovation process. Journal of Product Innovation Management, 31(3), 599-615. https://doi.org/10.1111/jpim.12116

Mas-Verdu, F., Ortiz-Miranda, D., & García-Álvarez-Coque, J. M. (2016). Examining organizational innovations in different regional settings. Journal of Business Research, 69(11), 5324-5329. https://doi.org/10.1016/j.jbusres.2016.04.132

Matt, D. T., Rauch, E., & Dallasega, P. (2015). Trends towards Distributed Manufacturing Systems and modern forms for their design. Procedia CIRP, 33, 185-190. https://doi.org/10.1016/j.procir.2015.06.034

Mauno, S., & Ruokolainen, M. (2017). Does Organizational Work–Family Support Benefit Temporary and Permanent Employees Equally in a Work–Family Conflict Situation in Relation to Job Satisfaction and Emotional Energy at Work and at Home?. Journal of Family Issues, 38(1), 124-148. https://doi.org/10.1177/0192513X15600729

Mikulčić, H., Klemeš, J. J., Vujanović, M., Urbaniec, K., & Duić, N. (2016). Reducing greenhouse gasses emissions by fostering the deployment of alternative raw materials and energy sources in the cleaner cement manufacturing process. Journal of cleaner production, 136, 119-132. https://doi.org/10.1016/j.jclepro.2016.04.145

Mirvis, P., & Googins, B. (2018). Engaging employees as social innovators. California Management Review, 60(4), 25–50. https://doi.org/10.1177/0008125618779062

Mousavi, S., Bossink, B., & van Vliet, M. (2018). Dynamic capabilities and organizational routines for managing innovation towards sustainability. Journal of Cleaner Production, 203, 224-239. https://doi.org/10.1016/j.jclepro.2018.08.215

Mun, S. B. (2018). The Impact of Non-technological Innovation on the Performance of Product Innovation. Journal of Korea Technology Innovation Society, 21(1), 331–353. Retrieved from https://www.koreascience.or.kr/article/JAKO201812470012912.page?&lang=en

Munda, S., Shivakumar, B. G., Rana, D. S., Gangaiah, B., Manjaiah, K. M., Dass, A., Layek, J & Lakshman, K. (2018). Inorganic phosphorus along with biofertilizers improves profitability and sustainability in soybean (Glycine max)–potato (Solanum tuberosum) cropping system. Journal of the Saudi Society of Agricultural Sciences, 17(2), 107-113. https://doi.org/10.1016/j.jssas.2016.01.008

OECD/Eurostat. (2018). *Oslo manual: Guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing, Paris/Eurostat, Luxembourg. https://doi.org/10.1787/9789264304604-en

Ogbeibu, S., Emelifeonwu, J., Senadjki, A., Gaskin, J., & Kaivo-oja, J. (2020). Technological turbulence and greening of team creativity, product innovation, and human resource management: Implications for sustainability. Journal of Cleaner Production, 244, 118703. https://doi.org/10.1016/j.jclepro.2019.118703

Pazouki, K., Forbes, N., Norman, R. A., & Woodward, M. D. (2018). Investigation on the impact of human-automation interaction in maritime operations. Ocean Engineering, pp. 153, 297–304. https://doi.org/10.1016/j.oceaneng.2018.01.103

Pedersen, E. R. G., Gwozdz, W., & Hvass, K. K. (2018). Exploring the relationship between business model innovation, corporate sustainability, and organisational values within the fashion industry. Journal of Business Ethics, 149(2), 267-284. https://doi.org/10.1007/s10551-016-3044-7

Qi, X., Fu, Y., Wang, R. Y., Ng, C. N., Dang, H., & He, Y. (2018). Improving the sustainability of agricultural land use: An integrated framework for the conflict between food security and environmental deterioration. Applied Geography, 90, 214-223. https://doi.org/10.1016/j.apgeog.2017.12.009

Quaye, D., & Mensah, I. (2019). Marketing innovation and sustainable competitive advantage of manufacturing SMEs in Ghana. Management Decision, 57(7), 1535-1553. https://doi.org/10.1108/MD-08-2017-0784

Regattieri, A., Gamberi, M., Bortolini, M., & Piana, F. (2018). Innovative solutions for reusing packaging waste materials in humanitarian logistics. Sustainability, 10(5), 1587. https://doi.org/10.3390/su10051587

Roy, R. (2015). Consumer Product Innovation and Sustainable Design: the evolution and impacts of successful products. New York, NY. Routledge.

Rubio-Andrés, M., & Abril, C. (2024). Sustainability oriented innovation and organizational values: a cluster analysis. *The Journal of Technology Transfer*, *49*(1), 1-18. https://doi.org/10.1007/s10961-022-09979-1

Sabherwal, R., Sabherwal, S., Havakhor, T., & Steelman, Z. (2019). How Does Strategic Alignment Affect Firm Performance? The Roles of Information Technology Investment and Environmental Uncertainty. MIS Quarterly, 43(2). https://doi.org/10.25300/MISQ/2019/13626

Saidani, W., Msolli, B., & Ajina, A. (2017). Research and development investment and financing constraints: The case of Japan. Research in International Business and Finance, 42, 1336-1342. https://doi.org/10.1016/j.ribaf.2017.07.070

Sajjad, M., Riaz, A., Chani, M., & Hussain, R. (2020). Innovations in Human Resources Management: Mediating Role of Intrinsic Motivation. Marketing and Management of Innovations, 1, 110-120. http://doi.org/10.21272/mmi.2020.1-08

Sameer, H., & Bringezu, S. (2019). Life cycle input indicators of material resource use for enhancing sustainability assessment schemes of buildings. Journal of Building Engineering, 21, 230-242. https://doi.org/10.1016/j.jobe.2018.10.010

Scerbo, M. W. (2018). Theoretical perspectives on adaptive automation. In Human Performance in Automated and Autonomous Systems (pp. 57-84). Boca Ratón, Florida. Routledge.

Sicoli, G., Bronzetti, G., & Baldini, M. (2019). The Importance of Sustainability in the Fashion Sector: ADIDAS Case Study. International Business Research, 12(6), 41-51. doi:10.5539/ibr.v12n6p41

Sok, P., & O'Cass, A. (2015). Examining the new product innovation–performance relationship: Optimizing the role of individual-level creativity and attention-to-detail. Industrial Marketing Management, pp. 47, 156–165. https://doi.org/10.1016/j.indmarman.2015.02.040

Stock, T., Obenaus, M., Slaymaker, A., & Seliger, G. (2017). A model for the development of sustainable innovations for the early phase of the innovation process. Procedia Manufacturing, 8, 215-222. https://doi.org/10.1016/j.promfg.2017.02.027

Stubbs, W. (2019). Strategies, practices, and tensions in managing business model innovation for sustainability: The case of an Australian BCorp. Corporate Social Responsibility and Environmental Management, 26(5), 1063–1072. https://doi.org/10.1002/csr.1786

Tang, C. F., & Tan, B. W. (2014). The linkages among energy consumption, economic growth, relative price, foreign direct investment, and financial development in Malaysia. Quality & Quantity, 48(2), 781-797. https://doi.org/10.1007/s11135-012-9802-4

Teixeira, G. F. G., & Junior, O. C. (2019). How to make strategic planning for corporate sustainability?. Journal of Cleaner Production, 230, 1421-1431. https://doi.org/10.1016/j.jclepro.2019.05.063

Valaei, N., Rezaei, S., & Ismail, W. K. W. (2017). Examining learning strategies, creativity, and innovation at

SMEs using fuzzy set Qualitative Comparative Analysis and PLS path modeling. Journal of Business Research, pp. 70, 224–233. https://doi.org/10.1016/j.jbusres.2016.08.016

Velez Osorio, I. M. (2023). Innovation investment and its impact on permanent employment. *Business: Theory and Practice*, *24*(2), 371–378. https://doi.org/10.3846/btp.2023.17263

Velez Osorio, I. M. (2021). Tipos de Innovación, Generación de Empleo y Sostenibilidad: Un Análisis de la Industria Colombiana. (Doctoral dissertation, Universitat de València). URI: https://hdl.handle.net/10550/79627

Wikhamn, W. (2019). Innovation, sustainable HRM and customer satisfaction. International Journal of Hospitality Management, pp. 76, 102–110. https://doi.org/10.1016/j.ijhm.2018.04.009

Wu, D., Rosen, D. W., Wang, L., & Schaefer, D. (2015). Cloud-based design and manufacturing: A new paradigm in digital manufacturing and design innovation. Computer-Aided Design, 59, 1-14. https://doi.org/10.1016/j.cad.2014.07.006

Wu, L., & Chiu, M. L. (2015). Organizational applications of IT innovation and firm's competitive performance: A resource-based view and the innovation diffusion approach. Journal of Engineering and Technology Management, 35, 25-44. https://doi.org/10.1016/j.jengtecman.2014.09.002

Walker, R. M., Chen, J., & Aravind, D. (2015). Management innovation and firm performance: An integration of research findings. European Management Journal, 33(5), 407-422. https://doi.org/10.1016/j.emj.2015.07.001

Yadav, M., Kumar, A., Mangla, S. K., Luthra, S., Bamel, U., & Garza-Reyes, J. A. (2019). Mapping the human resource focused enablers with sustainability viewpoints in Indian power sector. Journal of Cleaner Production, 210, 1311-1323. https://doi.org/10.1016/j.jclepro.2018.11.132

Yang, D., Wang, A. X., Zhou, K. Z., & Jiang, W. (2018). Environmental Strategy, Institutional Force, and Innovation Capability: A Managerial Cognition Perspective. Journal of Business Ethics, 159, 1147–1161. https://doi.org/10.1007/s10551-018-3830-5

Zhu, Q., Liu, J., & Lai, K. H. (2016). Corporate social responsibility practices and performance improvement among Chinese national state-owned enterprises. International Journal of Production Economics, pp. 171, 417–426. https://doi.org/10.1016/j.ijpe.2015.08.005

Zhu, X., Xiao, Z., Dong, M. C., & Gu, J. (2019). The fit between firms' open innovation and business model for new product development speed: A contingent perspective. Technovation, 86, 75-85. https://doi.org/10.1016/j.technovation.2019.05.005

Iris Maria Velez Osorio holds a bachelor's and a master's degree in organizational studies from Universidad del Valle, a master's in management from Tulane University, Louisiana, United States and a Ph.D. in Business from Universidad de Valencia, Spain. With over 17 years of teaching experience, she has authored numerous articles and conference papers, focusing on areas such as management, strategy, innovation, education, and corporate social responsibility.

Dvojna vloga inovacij v proizvodnji: izboljšanje trajnosti in zaposlitvenih možnosti

Ozadje in namen: Namen te študije je raziskati, kako različne vrste inovacij vplivajo na trajnostne ukrepe v proizvodnih podjetjih. Ti trajnostni ukrepi vključujejo zmanjšanje porabe surovin, zmanjšanje porabe energije in optimizacijo ravnanja z odpadki. Raziskava nadalje ocenjuje povezavo med vrstami inovacij in ustvarjanjem delovnih mest, pri čemer se osredotoča na to, kako inovacije spodbujajo nove zaposlitvene priložnosti in povečujejo trajnost v proizvodnem sektorju.
Metodologija: Metodologija vključuje hierarhično regresijsko analizo, izvedeno na vzorcu 1570 proizvodnih podjetij v Kolumbiji z uporabo programske opreme SPSS. Namen tega pristopa je kvantitativno oceniti učinkovitost inovacij, trajnosti in politik zaposlovanja v teh industrijskih organizacijah.
Rezultati: Ugotovitve študije razkrivajo pomemben vpogled v inovacijske politike industrijskih podjetij in njihovo upravljanje okoljske trajnosti. Ti rezultati poudarjajo praktične posledice sprejemanja inovacij in trajnosti za dolgoročne koristi, kljub takojšnjim stroškom.
Zaključek: Raziskava zagotavlja celovit pregled različnih vrst inovacij in njihovih posledičnih učinkov na trajnost in zaposlovanje v proizvodnem sektorju. Poleg tega predlaga smernice za prihodnje raziskave, ki bi lahko še izboljšale inovacijske in trajnostne prakse v tej industriji.

Ključne besede: *Inovativnost, Trajnost, Zaposlovanje, Proizvodni sektor*

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Knowledge Management Factors as Building Blocks of Quality of Care in Healthcare Systems

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Purpose: The aim of the study was to review national and international professional literature on the impact of knowledge management factors on the quality of care in healthcare systems.
Methodology: A review of national and international professional literature was conducted using Scopus, CINAHL, ScienceDirect, and ProQuest databases to search for freely accessible scientific articles and doctoral dissertations. We searched for doctoral dissertations in the Slovenian language of the University of Primorska, the University of Ljubljana, the University of Maribor, and the electronic library of the Faculty of Organizational Studies in Novo Mesto. We further searched for doctoral dissertations in English in the PQDT Open database. We identified 201 articles and 9 doctoral dissertations. After the screening phase, we included 19 full-text articles in the study.
Results: We identified the following key knowledge management factors that impact the quality of patient care in the healthcare system: knowledge acquisition, knowledge sharing, knowledge application, knowledge storage, and leadership.
Conclusion: The literature review showed that the application of knowledge management factors contributes to more productive and efficient work within the healthcare system. Additionally, these knowledge management factors have a positive impact on the implementation of improvements, job performance, job satisfaction, and the quality of healthcare services.

Keywords: *Knowledge acquisition, Knowledge sharing, Knowledge application, Knowledge storage, Leadership*

1 Introduction

Knowledge management systems in healthcare facilitate the effective implementation of knowledge acquisition, utilization, and sharing, thereby facilitating knowledge flow (Gonçalves & Curado, 2023, p. 421). In the healthcare sector, including hospitals, clinics, pharmacies, and also among users, the significance of knowledge in conjunction with knowledge sharing, the reduction of administrative costs, and the enhancement of care quality is well known (Bose, 2003, p. 59). Knowledge management strategies are increasing the effectiveness of healthcare institutions (Karamitri, 2020, p. 1). Bose (2003, p. 63) researched knowledge management in healthcare systems and described the knowledge management cycle, which encompasses knowledge creation, structuring, dissemination, and application. Karltun et al. (2020, p. 214) found that by considering knowledge management mechanisms,

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1 Introduction

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Within the research, we identified key knowledge management factors that influence the quality of patient care.

2 Literature review

2.1 Knowledge

Knowledge has a significant impact on organizational culture, it creates success and contributes to organizational efficiency (De La Torre Sanclemente et al., 2019, p. 330). Avramchuk (2020, p. 22) has pointed out that there are two types of knowledge: knowledge already known within the organization (explicit) and knowledge that can be acquired through experiential learning (tacit). Knowledge is one of the most important values of any nation, crucial for achieving sustainability and competitiveness. Knowledge needs to be created, preserved, and nurtured, in other words, managed (Csath, 2020, p. 7). Knowledge management comprises both knowledge management processes and knowledge management systems. Knowledge management processes include knowledge creation, knowledge sharing, and knowledge application. Knowledge management systems include the systems, guidelines, processes, and procedures used for knowledge creation, storage, sharing, and reuse of knowledge (Ghosh et al., 2006, p. 74).

2.2 Knowledge management

The origins of knowledge management trace back to the 1990s, when Nonaka and Takeuchi (1995, p. 62) studied the success of Japanese companies in achieving creativity and innovation. They introduced the "Knowledge Spiral" model, which includes four modes of knowledge conversion: 1) from tacit knowledge to tacit knowledge: the socialization process; 2) from tacit knowledge to explicit knowledge: the externalization process; 3) from explicit knowledge to explicit knowledge: the combination process; and 4) from explicit knowledge to tacit knowledge: the internalization process. Socialization involves the dissemination of tacit knowledge among individuals through social interactions, such as collaborative work, spending time together, and informal gatherings. The processes of externalization, combination, and internalization are crucial steps in converting tacit knowledge into explicit knowledge and back into tacit form, facilitating the creation, combination, and utilization of knowledge at both individual and organizational levels. Internalization allows this explicit knowledge to be reintegrated into an individual's tacit knowledge base, fostering further processes of socialization and knowledge creation (Nonaka and Takeuchi, 1995, pp. 63-70).

As a response to social development, knowledge management models have evolved and adapted over the years. Managers who understand the significance of knowledge for organizational success should work towards developing a supportive knowledge management system (Stojanović-Aleksić, 2019, p. 1559), which, as a process, enables organizations to share, create, and consolidate knowledge to achieve their goals (Gold et al., 2001, p. 187). Knowledge management helps organizational leaders leverage employee knowledge for developing processes and technologies, support strategic decisions, drive innovation, and enhance competitiveness (Yan & Zhang, 2019, p. 205). The core of knowledge management is the objectification of knowledge within the work environment (Avramchuck, 2020, p. 23). There are significant differences in knowledge management practices among individual member states of the European Union. Csath (2021, p. 7) warns that a business system with weak knowledge management factors cannot be successful in the long term. Therefore, he emphasizes that each member of the European Union should balance the cultivation and development of human capital to maintain uniform growth and competitiveness.

2.3 Knowledge management in the healthcare systems

Knowledge management is well-known and developed in business environments, and it is also recognized in the healthcare system, where it represents a systematic approach to creating, managing, and sharing knowledge within healthcare organizations. This approach is based on the identification, capture, development, and effective use of knowledge to improve service quality, efficiency, and innovation in healthcare processes (Karamitri et al., 2020, pp. 11-12). Knowledge management is important in

business and in healthcare organizations that aim to leverage their intellectual resources and gain a competitive advantage in the market (Karamitri et al., 2020, p. 10). Future challenges in healthcare include patient-centered care, integration, clinical outcomes, the development and implementation of information technology, investment in people, training, and education (Pihlainen et al., 2019, p. 13). Rapid advancements in knowledge related to patient diagnostics and treatment highlight the need for developing knowledge management systems to support new information technology and treatment methods (Phan et al., 2022, p. 1). The World Health Organization also emphasizes the importance of knowledge management, identifying the following goals for its development (WHO, 2005, pp. 8-11): the use of information technology in the healthcare system; strengthening systematic knowledge management approaches in the healthcare system (assessment of needs, planning, and evaluation); enhancing national knowledge management programs; bolstering information technology infrastructure in healthcare institutions; human resource development; supporting knowledge transfer; promoting knowledge creation; and establishing knowledge hubs.

The use of knowledge management in healthcare institutions enhances organizational performance and quality of care, while also helping to reduce costs and errors (Ayatollahi & Zeraatkar, 2019, p. 113). Knowledge management has a significant impact on the financial status of healthcare institutions, leadership of these institutions, quality of care, patient safety, and it influences the methods of working, learning, development, and knowledge-seeking by healthcare professionals (Kosklin et al., 2023, p. 746). Knowledge represents a strategic resource in healthcare organizations, and knowledge management facilitates the successful overcoming of challenges in the healthcare system such as rising healthcare costs and improving the quality of care (Ayatollahi & Zeraatkar, 2019, p. 98).

3 Methodology

A systematic review of national and international literature was conducted using the databases Scopus, CINAHL, ScienceDirect, and ProQuest, to search for open-access scientific and professional articles, as well as doctoral dissertations. The search results were limited to Slovene, English, Serbo-Croatian, and Spanish languages.

Table 1: Inclusion and Exclusion Criteria

Criterion type	*Inclusion Criteria*	*Exclusion Criteria*
Topic	Studies related to factors of knowledge management	Studies not addressing factors of knowledge management
Research Type	Qualitative and quantitative research	Systematic literature reviews
Time Frame	Between 2014 and 2024	Older than 2014
Language	Slovene, English, Serbo-Croatian and Spanish	Other languages
Full-Text Availability	YES	NO

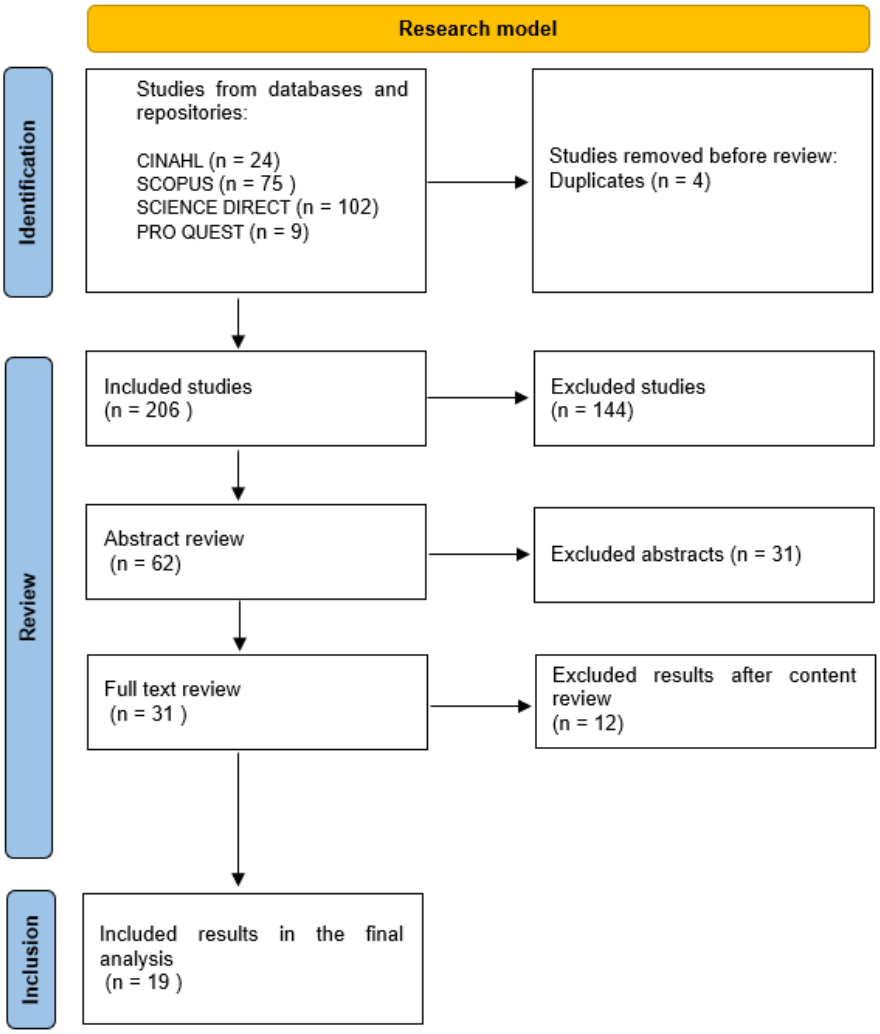

Figure 1: Research Model

We searched by title (TITLE-ABS-KEY) using the search terms "knowledge management," "model," "healthcare," and the conjunction AND. Doctoral dissertations in Slovene were searched in the repositories of the University of Primorska, University of Ljubljana, University of Maribor, and the electronic library of the Faculty of Organizational Studies in Novo Mesto, while dissertations in the English language were searched in the PQDT Open database. Inclusion and exclusion criteria are presented in Table 1.

The database search resulted in a total of 201 articles and nine doctoral dissertations (Figure 1). After removing duplicates, a further review was conducted based on combinations of titles, abstracts, and keywords. Following the screening phase, we reviewed 19 full-text documents to identify key factors in knowledge management and their impact on quality. Upon reviewing the existing literature, we did not find a comprehensive review of empirical studies on the influence of knowledge management factors on the quality of care in the healthcare system.

4 Results

The review of relevant literature included 19 empirical scientific articles, with key findings presented in Table 2.

Among the 19 articles included in the literature review, 11 authors utilized quantitative research methods, 7 employed qualitative methods, and one author opted for

Table 2: Key Findings from Empirical Studies on Knowledge Management in Healthcare

Authors	Methods	Findings
Aljazzazen & Schmuck (2021, pp. 267, 274)	Quantitative research (data analysis)	The research results confirm a statistically significant correlation between knowledge management factors and the implementation of improvements within the organization using the Lean Six Sigma method.
Aradati et al. (2019, pp. 1, 2, 5, 7)	Qualitative research (interview/observation)	The use of knowledge management tools contributes to more efficient and productive work in call centers for mental health support.
Bahar & Bahri (2017, pp. 80, 81)	Qualitative research (interview)	The findings of the study indicate that a focused knowledge management strategy within healthcare organizations helps physicians and nurses improve current clinical practices in a clinical environment.
Baptista et al. (2019, pp. 1, 6)	Observational, quantitative, descriptive research	The study demonstrated a positive impact on the efficiency of nurses perioperative decision-making through the implementation of an electronic system compared to written documentation.
Fadaie et al. (2023, pp. 1, 6, 7)	Quantitative research (data analysis)	The knowledge management processes positively impacted work performance and increased job satisfaction. However, there was no significant relationship found between knowledge sharing and increased job satisfaction.
Gonçalves & Curado (2023, pp. 421, 424, 427)	Quantitative research (data analysis)	The research found that knowledge management factors positively contribute to the accumulation of employees' knowledge and have a positive impact on the quality of care. Additionally, they negatively affect the occurrence of conflicts regarding workload allocation among healthcare workers. Knowledge hiding is positively associated with workload allocation conflicts and decreases the quality of care.
Karamat et al. (2019, pp. 1, 8, 9)	Quantitative research (data analysis)	The research results have shown that organizational and strategic barriers negatively impact the implementation of knowledge management, while government and healthcare system-related enablers positively influence the implementation of knowledge management.
Karamitri et al. (2020, pp. 10, 11, 12)	Quantitative research (data analysis)	The study confirmed that the questionnaire is reliable, valid, and suitable for collecting information on knowledge management processes in healthcare organizations and can contribute to the overall success of healthcare organizations.
Karltun et al. (2019, p. 205, 207, 213)	Combined research; document review, qualitative approach (semi-structured interviews), observation	The study found that hospital leaders with appropriate knowledge management infrastructure contribute to the improvement of healthcare quality.
Kejžar et al. (2023, pp. 4, 5, 8, 11)	Quantitative research (data analysis)	The study confirmed a statistically significant correlation between awareness of the importance of knowledge management and the quality of care in four nursing homes in Slovenia.
Leal et al. (2018, pp. 279, 288, 289)	Quantitative research (data analysis)	The research has shown that formal knowledge sharing positively influences job satisfaction.
Lee et al. (2014, pp. 1, 5, 7, 10)	Quantitative research (data analysis)	The research has shown that knowledge-sharing culture and organizational learning are key factors influencing the success of nursing. They measured effectiveness (desire, attitude) and the utilization of the healthcare process.
Lunden et al. (2018, pp. 6, 12, 15)	Qualitative research (interview)	The study found that leaders in healthcare organizations prioritize day-to-day knowledge management over promoting knowledge management and advance planning of knowledge management.
Pereira de Souza et al. (2020, pp. 6, 7, 9, 18)	Qualitative research (case study, semi-structured interview)	The study addresses how the ability to perceive, as a new element of knowledge management, includes sensemaking processes, knowledge creation, and decision-making. Information technology and the operation of the healthcare system were identified as supportive factors of knowledge management.
Popa & Ștefan (2019, pp. 6, 14, 15)	Quantitative research (data analysis)	The study has shown positive and statistically significant correlations between the knowledge management process and the quality of healthcare, as well as socio-economic outcomes at the organizational level.
Roohi et al. (2022, pp. 1, 3, 5, 9)	Qualitative research (semi-structured interview); conducted in two phases	A model was developed to assist healthcare system leaders in implementing knowledge management. They measured users' experiences, practitioner experiences, assessment of managerial decisions, capabilities, intentions, and the role, skills, and attributes of managers.

Table 2: Key Findings from Empirical Studies on Knowledge Management in Healthcare (continues)

Authors	Methods	Findings
Rodríguez Marino et al. (2022, pp. 1, 3, 7, 13, 14)	Qualitative research (semi-structured interview) Quantitative research (data analysis)	By implementing the knowledge generation and transfer model, call center agents were able to standardize work methods and increase service levels, reduce the average response time of the call center, and enhance efficiency (number of calls handled).
Silva et al. (2021, pp. 3, 7)	Qualitative research (semi-structured interview)	The research results have shown that the experience of the teaching and learning process among professors and students has a positive impact on research in terms of scientific principles, particularly regarding the ability to formulate research problems early and critical thinking.
Tehranineshat & Rakhshan (2018, pp. 5, 10)	Quantitative research (data analysis)	The study findings have indicated a statistically significant correlation between knowledge management and creativity among undergraduate and graduate students.

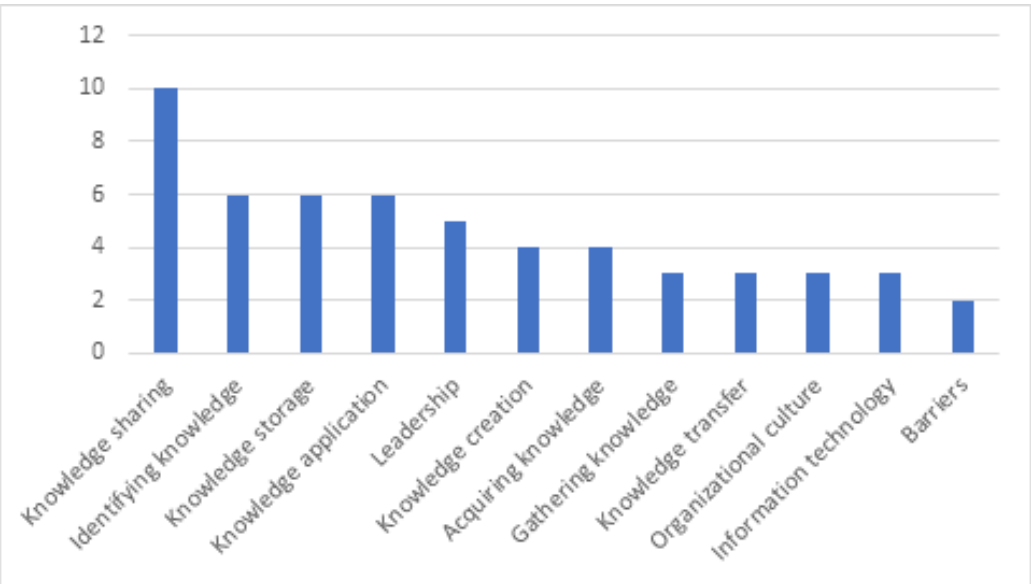

Figure 2: Frequency of the most mentioned knowledge management factors

mixed methods research. Nearly half (n = 9) of the studies were conducted in Asia, slightly fewer in Europe (n = 7), and South America (n = 3). The presented results are based on samples totalling 3,086 respondents, 271 interviewees, 991 call analyses, and 193 hours of observation.

In the articles, we identified knowledge management factors that the authors investigated. Among all knowledge management factors, knowledge sharing was described in half of the studies. This finding is consistent with a study of the Portuguese healthcare system (Leal et al., 2018, pp. 279-289), which identified knowledge sharing as one of the key factors of knowledge management and highlighted its significance in indicating employees' willingness to share their expertise.

In Figure 1, we depict the factors influencing knowledge management that authors most frequently studied: knowledge sharing, knowledge recognition, knowledge utilization, knowledge storage, leadership (where we combined variables such as management system, leadership culture, and innovative leadership), knowledge acquisition, and knowledge creation.

5 Discussion

Through the acquisition, collaboration, sharing, and development of healthcare workers' knowledge management contributes to the higher quality of healthcare (Popa & Ștefan, 2019, pp. 14-15). Knowledge management is not a linear process but a repetitive one, where individual phases intertwine to improve or achieve specific goals. The phases of knowledge acquisition, collection and anal-

ysis, and organization are particularly repetitive (Bahar & Bahri, 2017, p. 81). Pereira (2022, pp. 22-27) explored the relationships between the characteristics of knowledge and the connection between implementation methods and the realization of knowledge management characteristics. Knowledge creation, organization, sharing, and application are crucial for ensuring the quality of services in healthcare organizations, highlighting the importance of appropriate knowledge management. The findings emphasize the balance between evidence-based practice (explicit knowledge) and patient-centered (tacit knowledge) in both internal processes and overall performance. The complexity of clinical decisions, which should be based on knowledge exchange, is highlighted. While internal processes focus on improving communication and the efficiency of measures, overall performance emphasizes service quality and patient-centeredness. To improve the quality of healthcare in an organization, it is important to recognize and share the knowledge and experiences in the organization. Therefore, identifying the fundamental factors of knowledge management, which are applied to effectively manage and share specific professional knowledge, is crucial for improving the quality of healthcare (Lee et al., 2014, p. 10).

The process of knowledge management encourages and supports intra- and inter-organizational collaboration, which is crucial for preventing errors and ensuring the quality of care (Popa & Ștefan, 2019, pp. 14-15). Knowledge management has a significant impact on the implementation of business strategies for improving processes and quality, as well as reducing costs in organizations. Success depends on how well employees adapt to the standards of the new business strategy and how effectively they learn (Aljazzazen & Schmuck, 2021, pp. 267-279). Knowledge management contributes to the improvement of healthcare quality and socio-economic outcomes (Popa & Ștefan, 2019, pp. 14-15).

The quality of services depends on both informal and formal knowledge sharing; therefore, organizations should enhance the transfer of explicit knowledge and the sharing of tacit knowledge (Leal et al., 2018, pp. 279-289). A cross-sectional study by Popa and Ștefan (2019, pp. 15-16) shows that knowledge management factors have a direct impact on employee satisfaction, patient satisfaction, and patient health, thus indirectly influencing the quality of healthcare.

From the descriptions of less researched factors in knowledge management, we have identified several interesting findings. The factor “sensemaking” was recognized as an important element in efforts to achieve strategic goals and strengthen commitment. Collective sensemaking fosters professional development (Pereira de Souza et al., 2020, p. 11).

We have identified the following five key knowledge management factors based on a focused review of the literature from the past ten years on the impact of knowledge management factors on the quality of patient care in the healthcare system:

5.1 Identifying Knowledge / Knowledge Recognition / Knowledge Creation

Due to similar characteristics, we combined the factors “Knowledge Recognition,” “Knowledge Creation,” and “ Identifying knowledge “ under the collective term “Knowledge Identifying.” Information is gathered through direct observations, examinations, patient history, reports, and laboratory test results. Healthcare workers also acquire information from clinical guidelines, quick reference handbooks, and textbooks. Physicians and nurses determine which knowledge/information they need to perform interventions (assessment, diagnosis, treatment, monitoring, prognosis, and further referrals). Four types of knowledge/information have been identified in the clinical environment: personal knowledge and competencies; patients’ experiences of illness and health conditions; clinical evidence and professional guidelines; and technical knowledge. The process of analysis is followed by the documentation of useful information and knowledge (Bahar & Bahri, 2017, pp. 80-81).

5.2 Knowledge Sharing / Knowledge Transfer

The group of factors named “Knowledge Transfer” by the authors (Kejžar et al., 2023, pp. 4-11; Rodríguez Marino et al., 2022, pp. 1-14) has been merged with the variable “Knowledge Sharing” due to similar factors. The key purpose of knowledge management in organizations is to create conditions for effective knowledge sharing. The success or failure of knowledge management depends on how effectively employees in a healthcare organization share and utilize their knowledge (Lee et al., 2014, pp. 1-10). Healthcare workers exchange intellectual knowledge among themselves. There are various methods that physicians and nurses use to disseminate information. Informal methods include social networks and various applications, while more formal methods include professional training, meetings, and electronic communication (email, social networks) (Bahar & Bahri, 2017, p. 81). Research results among Portuguese healthcare workers have shown that formal knowledge-sharing practices increase employee satisfaction, organizational performance, and reduce turnover intention (Leal et al., 2018, pp. 279-289). For effective nursing, employees need to have a great deal of complex knowledge and skills, so it is crucial to recognize the knowledge and experience of individual nurses and share it throughout the organization (Lee et al., 2014,

pp. 1-10).

5.3 Knowledge Application

In the clinical environment, knowledge application is the process through which healthcare professionals develop solutions to problems in providing patient care. Based on their knowledge, they formulate a patient care plan according to the current condition, circumstances, and available resources. They make decisions about procedures, methods of implementation, and the involvement of other healthcare professionals (Bahar & Bahri, 2017, p. 81).

5.4 Knowledge Storage

The results of solving clinical problems are useful for future use, but unfortunately, this type of knowledge/information is mostly recorded in individuals' memories. Details such as patient information, medical reports, physical examination results, and the final diagnosis are recorded in the form of computer data or electronic medical records (Bahar & Bahri, 2017). Knowledge in healthcare organizations exists at various levels: the knowledge held by individual healthcare professionals, in databases, documented organizational procedures such as clinical guidelines, and standard operating procedures. Analysis shows that knowledge in the clinical work environment is primarily owned by individuals (i.e., clinical experts), as they are crucial in knowledge acquisition. Clinical experts in healthcare organizations collect knowledge in the form of information and documents and organize it in a simple and meaningful way so that the content is accessible to other employees (Bahar & Bahri, 2017, p. 81).

5.5 Leadership

Knowledge management in nursing is a complex task that requires leaders to have decision-making abilities and the use of various leadership styles and competencies. Therefore, clear guidelines and models are necessary to ensure systematic knowledge management (Lunden et al., 2018, p. 15). Knowledge management strategies help organizational leaders enhance the efficiency of hospitals and other healthcare facilities (Karamitri et al., 2020, pp. 10-12). In the daily work of nursing leaders, activities related to knowledge management focus on ensuring necessary competencies and responding to sudden changes. Leaders must make quick decisions and reallocate staff to ensure appropriate patient care. Knowledge management also involves knowledge transfer, guidance, and the development of a work culture for the near future, as well as long-term activities anticipating future knowledge needs. Nursing leaders often prioritize daily knowledge management activities over promoting knowledge and anticipating knowledge needs. Their activities are characterized by an "ad hoc" approach (Lunden et al., 2019, pp. 8-15).

The gap between knowledge and practice, as well as the delay or failure to implement research findings in practice and policy-making, is a contributing factor to the provision of low-quality services (Roohi et al., 2022, pp.1).

The primary goal of research on knowledge implementation in healthcare is to enhance the effectiveness of interventions, ultimately improving healthcare practice and resulting in better care and outcomes for patients and populations (Wensing & Grol, 2019, pp. 5).

The study (Kim & Tomprou, 2021, pp. 12 - 13) investigates the impact of data analytics training and comprehensive organizational changes on the successful implementation of healthcare data analytics. Through a quasi-experimental pre/post-test design, they demonstrated that coordinated interventions facilitate the development of employee goals, leading to improved learning and performance standards, as well as enhanced skills in using data analytics tools. The findings provide practice-oriented evidence highlighting the importance of well-designed training programs in empowering healthcare organizations to establish effective data analytics infrastructures, improve analytical skills, and optimize the use of new tools.

6 Conclusion

The purpose of the study was to identify key knowledge management factors influencing the quality of care in healthcare systems. Through a literature review, five key knowledge management factors were identified: identifying knowledge, knowledge sharing /knowledge transfer, knowledge application, knowledge storage, and leadership. Identifying knowledge in the healthcare environment is crucial for ensuring necessary knowledge and preserving the skills of employees through continuous education and training. Knowledge sharing among healthcare professionals is important for the effective operation of the institution, with knowledge exchanged through various methods, both formal and informal. Knowledge application in the clinical environment enables healthcare professionals to independently and safely perform tasks in providing patient care and making decisions on procedures and methods of implementation. Knowledge storage is an important factor in knowledge management, enabling the collection, analysis, and organization of information and knowledge for later use. Providing appropriate conditions for knowledge to circulate within organizations and systems is within the domain of leaders. Ensuring effective knowledge management is important for providing high-quality healthcare services, which directly impacts social welfare and sustainable development.

A review of the literature on knowledge management

factors in the healthcare system has shown that the use of these factors contributes to a more productive and efficient operation within the healthcare system. Additionally, knowledge management factors positively influence the implementation of improvements, work performance, job satisfaction, and the quality of healthcare. Theory and practice in healthcare management are constantly advancing, and the literature review indicates that knowledge management is necessary and socially beneficial. Ensuring high-quality healthcare services significantly contributes to social welfare by maintaining an active population into old age and ensuring a rapid response throughout the healthcare system to population needs. The research results are useful for both owners and managers in healthcare institutions who are constantly striving to improve working conditions and provide better quality healthcare. A review of professional literature serves as a basis for further research on the impact of knowledge management factors on the quality of care in the healthcare system. An effective knowledge management system is essential for the quality care of patients within the healthcare system. The challenge for healthcare leaders today is to establish a system that both enables and encourages employees to continuously stay updated with advancements and best practices in their professional field.

Literature

Aljazzazen, S., & Schmuck, R. (2021). The Impact of Knowledge Management Practice on Lean Six Sigma Implementation: The Moderating Role of Human Capital in Health Service Organisations. *International Journal of Operations and Quantitative Management*, *27*(3), 267–285. https://doi.org/10.46970/2021.27.3.5

Almansoori, A., AlShamsi, M., Salloum, S. A., & Shaalan, K. (2021). Critical Review of Knowledge Management in Healthcare. In *Studies in Systems, Decision and Control* (Vol. 295, pp. 99–119). Springer. https://doi.org/10.1007/978-3-030-47411-9_6

Aradati, M., Bilal, L., Naseem, M. T., Hyder, S., Al-Habeeb, A., Al-Subaie, A., Shahab, M., Sohail, B., Baig, M., Binmuammar, A., & Altwaijri, Y. (2019). Using knowledge management tools in the Saudi National Mental Health Survey helpdesk: Pre and post study. *International Journal of Mental Health Systems*, *13*(1). https://doi.org/10.1186/s13033-019-0288-5

Avramchuk, A. S. (2020). Transpersonal Knowledge Management as an Aspect of Workforce Development. In *Business Management Dynamics* (Vol. 10, Issue 02). www.bmdynamics.com

Ayatollahi, H., & Zeraatkar, K. (2019). Factors influencing the success of knowledge management process in health care organisations: a literature review. *Health Information and Libraries Journal*. https://api.semanticscholar.org/CorpusID:209463994

Bahar, N., & Bahri, S. (2017). Developing a Knowledge Management Process Model for Healthcare Organizations. In *PQDT - Global*. https://www.proquest.com/dissertations-theses/developing-knowledge-management-process-model/docview/2848781489/se-2?accountid=31309

Baptista, M., Vasconcelos, J. B., Rocha, Á., Silva, R., Carvalho, J. V., Jardim, H. G., & Quintal, A. (2019). The Impact of Perioperative Data Science in Hospital Knowledge Management. *Journal of Medical Systems*, *43*(2), 41. https://doi.org/10.1007/s10916-019-1162-3

Bose, R. (2003). Knowledge management-enabled health care management systems: capabilities, infrastructure, and decision-support. https://doi.org/10.1016/S0957-4174(02)00083-0

Csath, M. (2020). Knowledge Management in the European Union: Could It Improve Competitiveness? In *The IUP Journal of Knowledge Management: Vol. XVIII* (Issue 4). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=38129421/2

De La Torre Sanclemente, A., Molina, R. G., & Valencia, Y. V. (2019). Knowledge Management: Generating Value in Healthcare. In *Journal of Medical Systems* (Vol. 43, Issue 12). Springer New York LLC. https://doi.org/10.1007/s10916-019-1454-7

Fadaie, N., Lakbala, P., & Ghanbarnejad, A. (2023). Impact of knowledge management on job satisfaction and organizational performance among healthcare employees: A structural equation modeling approach. *Health Science Reports*, *6*(9). https://doi.org/10.1002/hsr2.1560

Ghosh, B., & Scott, J. E. (2007). Effective knowledge management systems for a clinical nursing setting. *Information Systems Management*, *24*(1), 73–84. https://doi.org/10.1080/10580530601038188

Gold, A., Malhotra, A., & Segars, A. (2001). Knowledge Management: An Organizational Capabilities Perspective. *J. of Management Information Systems*, *18*, 185–214.

Gonçalves, T., & Curado, C. (2023). Undesirable Knowledge Behaviours and Task Conflict in Hospitals: Effects on Quality of Care. *Proceedings of the European Conference on Knowledge Management, ECKM*, *1*, 421–429.

Karamat, J., Shurong, T., Ahmad, N., Afridi, S., Khan, S., & Khan, N. (2019). Developing Sustainable Healthcare Systems in Developing Countries: Examining the Role of Barriers, Enablers and Drivers on Knowledge Management Adoption. *Sustainability (Switzerland)*, *11*(4). https://doi.org/10.3390/su11040954

Karamitri, I., Kitsios, F., & Talias, M. A. (2020). Development and validation of a knowledge management questionnaire for hospitals and other healthcare organizations. *Sustainability (Switzerland)*, *12*(7). https://doi.org/10.3390/su12072730

Karltun, A., Sanne, J. M., Aase, K., Anderson, J. E., Fernandes, A., Fulop, N. J., Höglund, P. J., & An-

dersson-Gare, B. (2020). Knowledge management infrastructure to support quality improvement: A qualitative study of maternity services in four European hospitals. *Health Policy*, *124*(2), 205–215. https://doi.org/10.1016/j.healthpol.2019.11.005

Kejžar, A., Dimovski, V., & Colnar, S. (2023). The impact of knowledge management on the quality of services in nursing homes. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1106014

Kim, B. J., & Tomprou, M. (2021). The Effect of Healthcare Data Analytics Training on Knowledge Management: A Quasi-Experimental Field Study. Journal of Open Innovation: Technology, Market, and Complexity, 7(1), 60. https://doi.org/https://doi.org/10.3390/joitmc7010060

Kosklin, R., Lammintakanen, J., & Kivinen, T. (2023). Knowledge management effects and performance in health care: a systematic literature review. *Knowledge Management Research & Practice*, *21*(4), 738–748. https://doi.org/10.1080/14778238.2022.2032434

Leal, C. T., Marques, C. P., Marques, C. S., & Cruz, M. (2018). The influence of knowledge sharing on Portuguese healthcare organisations' performance. *International Journal of Knowledge-Based Development*, *9*(3), 279–293. https://doi.org/10.1504/IJKBD.2018.094897

Lee, E. J., Kim, H. S., & Kim, H. Y. (2014). Relationships between core factors of knowledge management in hospital nursing organisations and outcomes of nursing performance. *Journal of Clinical Nursing*, *23*(23–24), 3513–3524. https://doi.org/10.1111/jocn.12603

Lunden, A., Teräs, M., Kvist, T., & Häggman-Laitila, A. (2019). Transformative agency and tensions in knowledge management—A qualitative interview study for nurse leaders. *Journal of Clinical Nursing*, *28*(5–6), 969–979. https://doi.org/10.1111/jocn.14694

Nonaka, I., and Takeuchi, K. (1995).The Knowledge Creating Company. New York,NY: Oxford University Press

Pereira de Souza, V., Baroni, R., Choo, C. W., Castro, J. M. de, & Barbosa, R. R. (2020). Knowledge management in health care: an integrative and result-driven clinical staff management model. *Journal of Knowledge Management*, *25*(5), 1241–1262. https://doi.org/10.1108/JKM-05-2020-0392

Pereira, N. M. M., & de Matos Ferreira, J. J. (2022). Knowledge Management Performance in Health Organizations. In *PQDT - Global*. https://www.proquest.com/dissertations-theses/knowledge-management-performance-health/docview/2890431869/se-2?accountid=31309

Phan, A. C., Phan, T. C., & Trieu, T. N. (2022). A Systematic Approach to Healthcare Knowledge Management Systems in the Era of Big Data and Artificial Intelligence. *Applied Sciences (Switzerland)*, *12*(9). https://doi.org/10.3390/app12094455

Pihlainen, V., Kivinen, T., & Lammintakanen, J. (2019). Perceptions of future hospital management in Finland. *Journal of Health Organization and Management*, *33*(5), 530–546. https://doi.org/10.1108/JHOM-02-2018-0045

Popa, I., & Ștefan, S. C. (2019). Modeling the pathways of knowledge management towards social and economic outcomes of health organizations. *International Journal of Environmental Research and Public Health*, *16*(7). https://doi.org/10.3390/ijerph16071114

Rodríguez-Espíndola, O., Ahmadi, H., Gastélum-Chavira, D., Ahumada-Valenzuela, O., Chowdhury, S., Dey, P. K., & Albores, P. (2023). Humanitarian logistics optimization models: An investigation of decision-maker involvement and directions to promote implementation. *Socio-Economic Planning Sciences*, *89*, 101669. https://doi.org/https://doi.org/10.1016/j.seps.2023.101669

Roohi, G., Jahani, M. A., Farhadi, Z., & Mahmoudi, G. (2022). A knowledge implementation model in health system management based on the PARIHS model. *Health Research Policy and Systems*, *20*(1). https://doi.org/10.1186/s12961-022-00874-7

Silva, Í. R., Ventura, C. A. A., Costa, L. D. S., da Silva, M. M., da Silva, T. P., & Mendes, I. A. C. (2021). Knowledge management: connections for teaching research in undergraduate nursing. *Revista Brasileira de Enfermagem*, *74*. https://doi.org/10.1590/0034-7167-2020-1295

Stojanović-Aleksić, V., Erić Nielsen, J., & Bošković, A. (2019). Organizational prerequisites for knowledge creation and sharing: empirical evidence from Serbia. *Journal of Knowledge Management*, *23*(8), 1543–1565. https://doi.org/10.1108/JKM-05-2018-0286

Tehranineshat, B., & Rakhshan, M. (2018). The relationship between knowledge management and creativity in bachelor degree compared to master degree nursing students. *Investigacion y Educacion En Enfermeria*, *36*(3). https://doi.org/10.17533/udea.iee.v36n3e05

Valencia Rodríguez, M., & Ayora Piedrahita, C. X. (2022). Mejora del servicio call center a partir de la gestión del conocimiento. *VISUAL REVIEW. International Visual Culture Review / Revista Internacional de Cultura Visual*, *9*(Monográfico).

Wensing, M., & Grol, R. (2019). Knowledge translation in health: how implementation science could contribute more. BMC Medicine, 17(1), 88. https://doi.org/10.1186/s12916-019-1322-9

Xiang, Y., Zhang, P., & Wu, S. (2021). Content-Based Knowledge Quality Assessment and Its Application in Health Management System. *Journal of Shanghai Jiaotong University (Science)*, *26*, 116–128. https://doi.org/10.1007/s12204-021-2266-8

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Dejavniki upravljanja znanja kot gradniki kakovosti oskrbe v zdravstvenih sistemih

Namen: Namen raziskave je bil opraviti pregled domače in tuje strokovne literature, v kateri so avtorji obravnavali vpliv dejavnikov menedžmenta znanja na kakovost obravnave v zdravstvenih sistemih.
Metoda: Izveden je bil pregled domače in tuje strokovne literature v bazah podatkov Scopus, Cinahl, ScienceDirect in ProQuest v katerih smo poiskali prosto dostopne znanstvene članke in doktorske disertacije. Doktorske disertacije iz slovenskega jezikovnega področja smo poiskali v repozitorijih Univerze na Primorskem, Univerze v Ljubljani, Univerze v Mariboru ter v elektronski knjižnici Fakultete za organizacijske študije v Novem mestu, doktorske disertacije v angleškem jeziku smo iskali v bazi podatkov PQDT Open. Evidentirali smo 201 članek in devet doktorskih disertacij. Po fazi presejanja smo v raziskavo vključili 19 člankov dostopnih v polnem besedilu.
Rezultati: Identificirali smo naslednje ključne dejavnike menedžmenta znanja, ki vplivajo na kakovost obravnave uporabnikov v zdravstvenem sistemu: pridobivanje znanja, deljenje znanja, uporaba znanja, hranjenje znanja in vodenje.
Zaključek: Ugotovili smo, da uporaba dejavnikov menedžmenta znanja prispeva k produktivnejšemu in učinkovitejšemu delu v zdravstvenem sistemu. Prav tako dejavniki menedžmenta znanja pozitivno vplivajo na uvajanje izboljšav, delovno uspešnost, zadovoljstvo pri delu in kakovost zdravstvene oskrbe.

Ključne besede: *Pridobivanje znanja, Deljenje znanja, Uporaba znanja, Hranjenje znanja, Vodenje*

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Estimating the Determinants of Bank Profitability: Comparative Study for EU and US Banks

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Background/Purpose: This paper examines the significant differences in market returns between the US and EU banking sectors following the 2008 financial crisis. The analysis reveals that the profitability of US banks, measured by return on equity, is higher than that of European banks, partially explaining the observed differences in returns.
Methodology: The study employs two unbalanced panels of data for EU and US banks covering the period 2008-2022. Static and dynamic estimators were used to identify significant determinants of bank profitability that include the impact of the profitability trend in the observed period on future profitability.
Results: Based on a sample of 250 banks, operational efficiency, diversification, and risk were found to influence the profitability of banks in both regions. For European banks, past profitability, the share of deposits and loans in assets, and inflation were also found to exert influence. On the other hand, American banks exhibit a higher predictive power for these variables, confirming the differences in determinants between the two markets. Although risk partially explains the higher profitability of American banks, other results did not confirm the original hypothesis.
Conclusion: The main contribution of the paper is a direct comparison of the determinants of profitability for EU and US banks using static and dynamic models in the post-2008 financial crisis period. In addition, the existing methodology of static models with dynamic estimators has been extended by WLS models and robust estimators, and it was shown that there are certain determinants influencing their profitability that should be extended and subsequently examined.

Keywords: *Profitability, EU/US banks, Panel data, Static models, Dynamic estimators*

1 Introduction

This paper focuses on the banking sector in the United States of America and the European Union, as there has been a significant divergence in market returns between these sectors over the last fifteen years. Several studies have found that firm profitability, measured by return on equity (ROE) and return on assets (ROA), has a significant impact on stock price performance, i.e. market returns (Purnamasari, 2015; Sukmawati & Garsela, 2016). Research on banks has also confirmed the assumption that ROE/ROA partially explain banks' market returns, with ROE playing a greater role (Nurazi & Usamn, 2016; Hong-Kong, 2017). A further review of the literature motivated by the aforementioned research has revealed that American banks consistently demonstrate higher profitability in terms of ROE compared to European banks, which partially explains the difference in market returns. This paper

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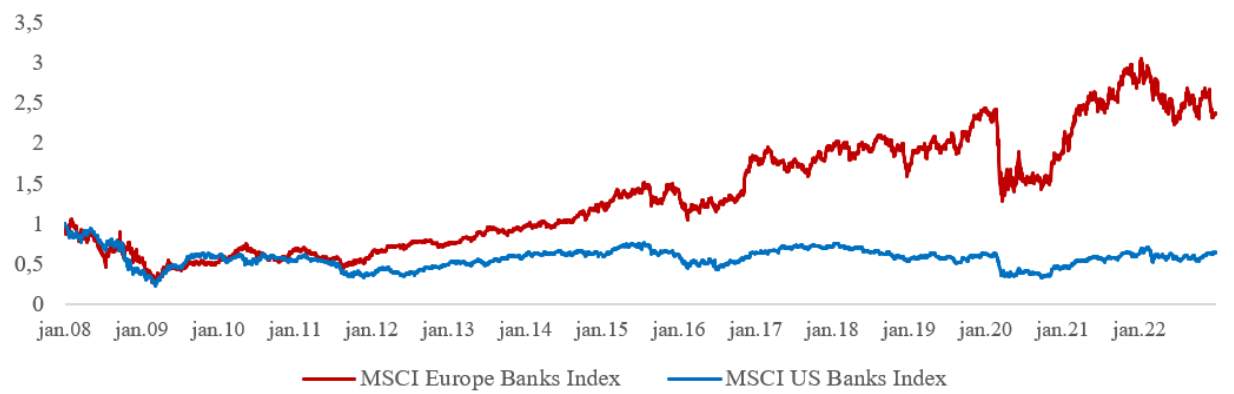
attempts to answer the question of unequal profitability between the two banking sectors.

The aim of the paper is to explore the reasons why American banks achieve higher profitability, identify the main determinants of profitability in the two banking sectors, and analyze the differences between them. A review of the literature has revealed that many papers do research into the determinants of profitability, though most do not focus on the banking sector. Research on banks reveals a notable lack of relevant literature. The research conducted focused on a single country, such as O'Connell (2023) for the UK, or the region (Messai et al., 2015; Căpraru & Ihnatov, 2014; Karadžić & Đalović, 2021; Petria et al., 2015), Europe (Bikker & Vervliet, 2018; Chukwuogor et al., 2021) or the US. The conclusions of the aforementioned studies highlight key profitability ratios approximated by ROE/ROA/NIM (net interest margin) and analyzed by more complex regression models such as OLS/POLS/GMM. The common goal of the research was to identify the determinants of profitability ratios. The results of the studies conducted show similarities, with minor variations depending on the time frame and the countries analyzed, and with certain variables having a significant impact on the results in most studies, regardless of whether they focus on the analysis of EU or US banks. Key variables include the ratio of capital to total assets, the ratio of liquid assets (cash/liquidity equivalents) to total assets, the ratio of deposits to assets, the size of the bank, the Herfindahl-Hirschman index, inflation, and interest rates. However, there is a lack of comparison in the literature between the European and US banking sectors in terms of the determinants and the extent to which they influence profitability. Therefore, this paper makes academic contributions on multiple levels. The first contribution is reflected in the research and identification of the determinants of profitability in the EU/US banking sector during the period 2008□2022. Another contribution lies in both the analysis of the differences in profitability determinants between the observed banking sectors and a possible answer to the question: Why do American banks achieve higher profitability than European banks?

The paper consists of 6 section. After the introduction, the paper provides a detailed explanation of the problem, including an overview of the specific features of the EU and US banking markets. A review of the literature highlights the main variables identified as determinants of bank profitability. Furthermore, the methodology used in the research is outlined, and the research results are presented and interpreted. The last section of the paper gives conclusions and recommendations for future research.

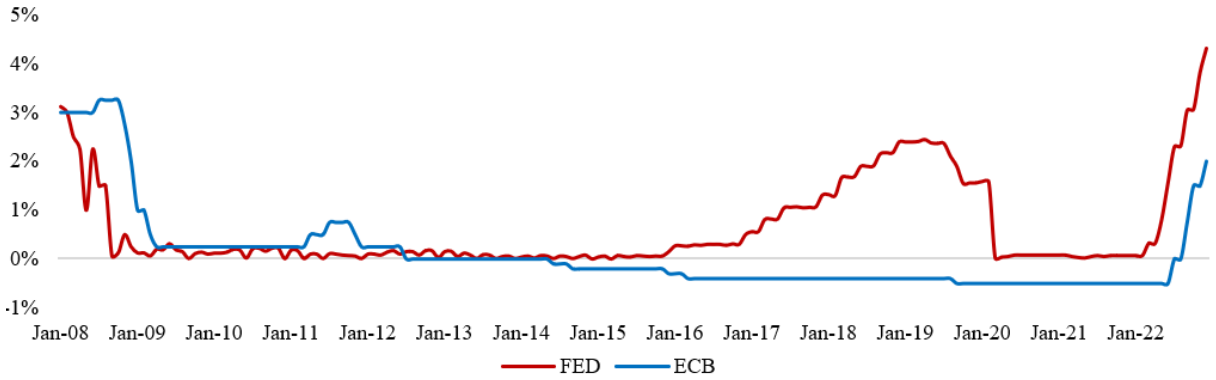
1.1 EU/US banking sector

The banking systems in the EU and the US have undergone numerous structural and regulatory changes since the 2008 crisis. The responses to the crisis in the US were similar to those in Europe, involving comparable instruments such as government guarantees, capital and liquidity injections, and asset protection. Monetary policy and bank rescue measures have also become increasingly interlinked (Stolz & Wedow, 2010). It can be argued that these measures have had a positive impact on American banks since the 2008 crisis, while simultaneously placing a burden on their European competitors (Weigand, 2015). In addition to their full recovery from the crisis between 2008 and 2022, American banks consistently achieved better market returns than European banks in 2008 (Figure 1).



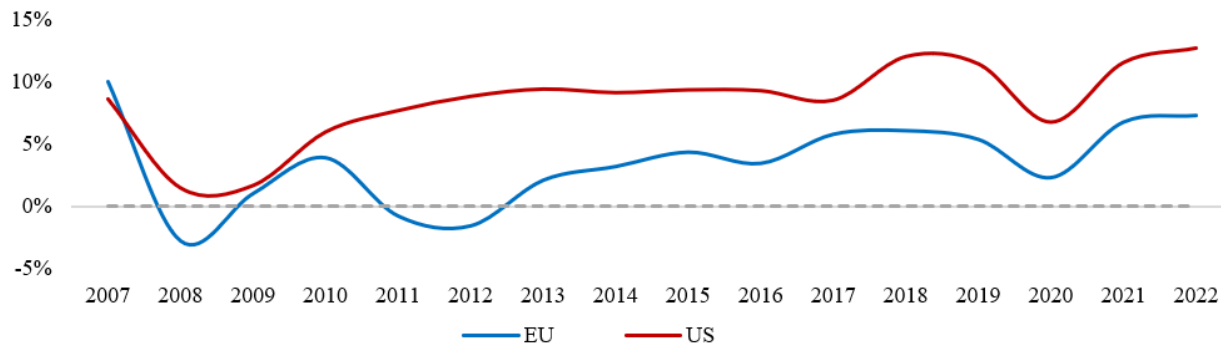
Source: Bloomberg (2023)

Figure 1: Normalized total market returns (with reinvested dividends) of EU and US banks



Source: ECB Data Portal, FRED economic data 2007–2020, BankRegData 2021–2022

Figure 2: Comparison of ROE of EU/US banks



Source: Bloomberg (2023)

Figure 3: ECB and FED interest rates in the period between 2008 and 2022

The question arises as to why the market rewards American banks so highly and penalizes their European counterparts. One of the key indicators important to investors is profitability, which is measured using various proxies, with return on equity as one of the basic indicators. When looking at the data for EU/US banks, it can be seen that American banks consistently achieve higher profitability than European banks (Figure 2).

The EU banking sector faces the challenge of being structurally less profitable than the US banking sector. This trend is reflected in the market valuation of European banks, where the price-to-book ratio of EU banks' capital has remained well below one over the last decade, and the market capitalization of European banks has declined relative to their US counterparts. This disparity can be explained by the structural differences between these two markets (EBF, 2023). This section of the paper aims to explain the observed structural differences affecting the profitability of EU/US banks. As banks' performance is largely dependent on the general macroeconomic situation, the most important factors are monetary policy and economic growth. Compared to the US, economic growth in the EU has been much slower. Over the past 15 years, GDP in the US has grown by an average of 1.6% per year, while GDP in the EU has increased by only around 1% per year. This slower economic growth in Europe has led to fewer lending opportunities, lower bank profits, and ultimately lower returns on capital and profitability (EBF, 2023).

Given the deflationary pressures and limited growth of the EU economy, this trend is also reflected in the macroeconomic policy of the ECB, whose interest rates are significantly lower than those of the FED (Figure 3). Although low interest rates and quantitative easing had a stimulating effect on the economy, they had a negative impact on

banks' interest income and margins (ECB, 2015).

In addition to macroeconomic factors, there are also structural differences in market composition. In particular, the EU banking sector is significantly less concentrated than its counterpart in the US. According to IMF estimates, the EU faces the challenge of an oversized banking sector, disproportionately large relative to the overall economy. This issue is evident in various indicators, including the ratio of banking assets to GDP. In the EU, this ratio stands at approximately 280%, compared to around 91% in the US. It is important to emphasize that these data should be interpreted taking into account the different structures of bank balance sheets. The difference in banking sector concentration is also reflected in the number of branches per employee. In Europe, for example, there are 44 branches per 100,000 inhabitants, compared to 26 in the US – nearly half as many (EUROFI, 2019). Another example of the difference in concentration is the consolidation process in the banking sector. The five largest US banks currently have a market share of around 40%, compared to a much lower share of 20% in the EU. This difference in banking sector concentration results in lower prices for European loans and banking services, but it also leads to higher operating costs for banks and limited opportunities to achieve economies of scale (Edelmann, 2021).

Although similar in theory, differences in banking regulations are one of the key factors contributing to differences in profitability. According to a study by the European Banking Federation (EBF, 2023) and the consulting firm Oliver Wyman, over the past three years, European banks have held an average of 3.1 percentage points more CET1 capital relative to risk-weighted assets (RWA) than American banks. Of this, 1.3 percentage points were reserved due to higher capital requirements under the European regulatory framework. Specifically, during the period 2020-2022, average capital requirements for European banks amounted to 10.9% of risk-weighted assets, compared to 9.7% in the US. Beyond formal regulatory requirements, European banks generally take a more cautious approach to capital management, maintaining a 1.8 percentage point higher CET1 capital. This conservative approach stems from both formal and informal pressure from regulators. European banks assume that the ECB expects additional safety capital and align with these expectations to maintain dividend stability and meet Pillar 2 requirements. Another aspect of this issue is raising capital. With a significantly weaker appetite for investment in Europe compared to the US , raising additional capital is both difficult and costly for European banks. As a result, European banks tend to hold additional capital as a hedge against uncertainty, while American banks often reach for new capital in turbulent times.

Finally, the differences also stem from the business models of the banks themselves. The distribution of assets between banks in the EU and the US highlight clear contrasts in their business focus. European banks are more focused on traditional lending, while American banks tend to concentrate more on investment banking and financial market trading. The observed difference is also reflected in the primary sources of income for each: European banks historically rely more on interest income, while American banks rely more on non-interest income such as fees, commissions, and market trading. Despite relatively small differences in the share of cash and cash equivalents in total assets (around 15%), European banks have a larger proportion of loans in their total assets compared to their American counterparts. This reflects the greater role of American banks in credit intermediation and points to different business models. American banks have historically acted as lenders and intermediaries, while European banks have retained a larger share of loans on their balance sheets, especially in 2021. For example, the share of loans in total assets at European banks was 58.4%, significantly higher than the 40.5% at their American counterparts. In contrast, US banks have a higher share of securities in total assets, reflecting their more active role in investment banking and trading. When analyzing the structure of funding sources, it is clear that American banks have a larger share of total deposits. In 2021, deposits accounted for around 60% of the total liabilities of US banks, compared to 47% for European banks. The lower proportion of deposits in Europe makes these banks more dependent on other liabilities, primarily through government and central bank deposits. These differences in balance sheet structure mean that the loan-to-deposit ratio is below 100% for US banks (69%), as they use deposits to finance various business activities other than lending, while this ratio is above 100% for European banks (+23%) (Di Vito et al., 2023).

2 Theoretical literature review

2.1 A theoretical review of the literature on profitability research studies in the EU/US

Numerous studies examine the determinants of bank profitability using individual examples or groups of countries. However, a review of the literature reveals a lack of studies on the determinants of EU/US bank profitability, especially in the period following the 2008 financial crisis. Therefore, this paper presents the most relevant studies on bank profitability in the EU/US that roughly correspond to the observation period covered in this paper. The first section of the paper refers to EU banks for which dynamic and/or static estimation models are used.

O'Connell (2023) analyzed the determinants of bank profitability in the UK using bank-specific, industry-specific and macroeconomic indicators in the period 1998-2018. Using the generalized method of moments (GMM) and

return on average assets (ROAA) as dependent variables, it was found that previous profitability, the capital-to-asset ratio (equity), the ratio of deposits to assets (funding), cash and other liquid assets to total assets (liquidity), income per employee (productivity), bank size to total assets, the 10-year bond rate, short-term interest rates, the consumer price index (CPI), and loan growth were found to be statistically significant variables. All variables, with the exception of funding and CPI, have a positive impact on profitability. The author finds that bank-specific factors and macroeconomic factors have the greatest impact on bank profitability, while industry-specific indicators do not significantly affect the profitability of UK banks.

Messai et al. (2015) also used a dynamic model of panel data analysis by applying the GMM model in analyzing the determinants of profitability in Western European countries. The analysis used a panel dataset from 15 countries over the period 2007-2011, analyzing the indicators in terms of operational efficiency, financial risk and macroeconomic indicators and their impact on profitability, as measured by the NIM/ROAA. The sample is divided into GIPSI countries, i.e. countries affected by the crisis, and other countries, which account for 62.11% of the sample. Compared to the whole sample and profitability measured by NIM, inflation, GDP growth, lagged NIM, and the ratio of net loans to total assets have the largest impact on profitability. Compared to the GIPSI countries, capital and liquidity, measured by the ratio of liquid assets to short-term financing, are additionally important. When profitability is calculated using ROAA, the share of loans in the private sector, lagROAA, capital and credit risk (measured as the ratio of non-performing loans to total loans) have a statistically significant impact on the entire sample. For the GIPSI countries, all variables except the share of loans in the private sector have a significant impact on profitability, as measured by ROAA. The authors found that the determinants of profitability depend on county category and that the equity ratio and credit risk are the most significant determinants of profitability.

Horobet et al. (2021) investigated the determinants of profitability in Central and Eastern European countries. A sample of 11 countries was analyzed in 2 stages using the GMM system over the period 2009-2018, focusing on macroeconomic variables and industry-specific indicators. ROA/ROE/NIM were used as dependent variables in the analysis. The authors claim that the government budget has a strong negative impact on bank profitability, as measured by ROE. In addition, inflation (measured by the harmonized index of consumer prices, HICP) shows a strong negative impact on ROE and a weak positive impact on NIM/ROA. Unemployment has a weak impact on profitability. Sector-specific indicators reveal that bank concentration (measured by the Herfindahl-Hirschman Index, HHI) and credit risk have the most significant and strongest negative impact on profitability. The proportion of loans in the private sector also has a strong and negative impact on ROA, and a weak and negative effect on ROA/NIM.

Căpraru & Ihnatov (2014) also investigated the determinants of profitability in Central and Eastern European countries for the period 2004-2011. Profitability was measured using ROAA/ROAE/NIM. The sample consisted of 143 commercial banks from 5 CEE countries and it was analyzed using POLS and POLS models with a "dummy" variable for the 2008 financial crisis. The results of the analysis show that management efficiency (measured by the cost-to-income ratio) has the strongest negative and statistically significant impact on all profitability measures. In addition, credit risk has a strong negative and significant impact on the profitability measures, with the strongest impact on ROE. In contrast, return on net assets (NIM) is in turn the only indicator influenced by a business mix (measured as the ratio of other operating income to assets). The size of the bank also has a significant impact on all profitability ratios (except ROE when a dummy variable was used), but this impact is weak. The only positive impact is seen in relation to equity, which has a strong impact on ROE and a weaker impact on ROA. The research has shown that inflation has a positive impact on ROA/ROE, while GDP growth has a weak positive impact on ROA. Factors such as liquidity risk (measured by the loan-to-deposit ratio) and concentration have no statistically significant impact on profitability, while the "dummy" model shows a significant negative impact on ROA/ROE, with the impact on ROE being significantly larger. The authors state that banks with a higher equity ratio have higher profitability, while large banks exhibit a lower NIM.

Karadžić & Đalović (2021) analyzed the determinants of profitability of large European banks using static and dynamic models. The sample is a balanced data panel consisting of 47 banks from 14 European countries in the period 2013-2018 that was analyzed using static models (FE/RE/pooled OLS) and a dynamic GMM model. The authors claim that POLS proved to be the best model. ROE was selected as a measure of profitability and as the dependent variable for the study. It was found that the concentration of the 5 largest banks, the HHI (which is the most significant), inflation, and GDP growth have a positive and significant impact on bank profitability, while EU membership has a negative and significant impact on bank profitability. The authors state that macroeconomic factors were found to be significant for profitability as measured by ROE, while bank-specific factors were not statistically significant. They also conclude that non-resident banks outside the EU are more profitable.

Petria et al. (2015) examined the determinants of bank profitability in the EU27 Member States using static estimation models. The sample consisted of 1,098 banks in the period from 2004 to 2011, which were summarized into panel data with dependent variables ROAE/ROAA.

The fixed effects (FE) model results show that credit risk, management efficiency, liquidity and the HHI have a significant negative impact on profitability (ROAE), while growth and a business mix have a significant positive impact. The results of the impact on ROAA are similar to ROAE with an additional significant positive impact of size and capital, while inflation has no significant impact on any of the profitability variables.

Bikker & Vervliet (2018) examined the profitability of banks in a period of low interest rates. The sample included all US commercial banks and savings banks in the period from 2001 to 2015, and the dependent variables NIM/ROE/ROA and profit. The authors state that the FE model is the appropriate method for estimating the determinants of profitability in the case of a static model and including the variable for previous profitability because it improves the OLS estimation. Using the POLS model with a lagged profitability variable has shown that in the case of ROE, the variables bank size, previous period profitability, diversification (measured as the ratio of non-interest income/total income), lending (measured as the ratio of total loans/total assets), inflation (measured by the CPI), real GDP growth, the square of the short-term interest rate, and the long-term interest rate have a positive and significant impact on the profitability of the banks in the observed sample. Capital, credit risk (provisions for unpaid loans/total assets), the TCR (measured as the ratio of risk capital to risk-weighted assets), and the short-term interest rate have a negative and significant impact on bank profitability. Credit risk has the strongest impact on ROE (a negative effect), i.e. in the case of NIM/ROA/profit, the previous period's profitability has a positive effect. The authors note that banks' operations were disrupted by the impact of low interest rates on the profitability of US banks, which led to a reduction in NIM.

It can be seen that studies in different parts of Europe with mixed samples led to relatively similar results regardless of the type and form of estimation. However, it should be noted that the literature analyzing the profitability of EU/US banks during the observed period is limited. In all the studies presented, the independent variables can be categorized into bank-specific variables, industry-specific variables, and macroeconomic variables. The selection of models is also specific to the region and the period under study, and it depends on the type of data sample, which is why there are differences in the selection of static and dynamic models. Based on the theoretical background and the classification of the variables, the variables were selected by category, as shown in Table 1.

2.2 A theoretical overview of the literature on research variables

Operational efficiency is the key to achieving a bank's profitability. A commonly used measure of operational efficiency is the ratio of non-interest expenses to total bank income (Buchory, 2015). Successful banks are distinguished from unsuccessful banks by good cost control and a good efficiency ratio. Accordingly, a high ratio of bank operating costs to revenues is associated with lower bank profitability (Petria et al., 2015), hence the hypothesis that the operating efficiency ratio has a negative relationship with profitability.

According to many researchers, bank liquidity, which is measured by the ratio of total loans to total assets, is very important in explaining bank profitability, and the literature usually finds a positive relationship between profitability and liquidity. A bank that holds a high proportion of liquid assets (i.e. a low proportion of loans) is less likely to make high profits, as loans are the primary source of income for banks (Abreu & Mendes, 2002). On the other hand, some studies have shown that a large loan portfolio can have a negative impact on bank profits, depending on the quality of the loan. Such a situation occurs in the case of a high-risk loan portfolio that can potentially lead to losses (Staikouras & Wood, 2004). In this study, such a risk was taken into account as part of the indicator for the risk associated with bank loans. Thus, it can be concluded from the above studies that the size of the loan portfolio has a significant impact on its profitability, and the direction of this impact depends on the quality of the loan portfolio. Despite the contradictory conclusions, the hypothesis is based on the existence of a positive relationship.

Funding as a ratio of deposits to total assets is one of the most important ratios in bank analysis that shows the stability of the bank's funding. The studies that have investigated this ratio are divided. Since banks are heavily dependent on deposits as a basic source of funding, a larger amount of deposits allows banks to have more funds available for lending. Lee & Hsieh (2013) state that additional deposits allow the bank to earn additional profits, while a low level of deposits has a negative impact on profitability. However, this thesis depends on the demand for loans. If a bank can place deposits in the form of loans, the ratio of deposits to total assets has a positive effect on profitability, otherwise it has a negative effect due to funding costs, such as interest on deposits (Menicucci & Paolucci, 2016). Taking into account the fact that the ECB has kept interest rates below those of the FED for a long time (indicating a lower demand for loans), the hypothesis is that funding is negatively correlated with profitability for European banks and positively correlated for American banks.

A bank's diversification reflects its independence from credit income, expressed by the ratio of the bank's non-interest income to total income. Research on this ratio has often yielded different conclusions. However, analyses that have examined this ratio in developed countries and regions such as the EU/US suggest that diversification of bank earnings generally has a positive effect on bank profitability. The positive impact arises from the reduction in business risk, lower dependence on credit demand and economies of scale for large banks (Chiorazzo et al., 2008;

Elsas et al., 2010; Sawada, 2013). The original hypothesis is that diversification of banks in both regions has a positive effect on bank profitability. The context described above, in which American banks have a higher proportion of non-interest income than European banks, must be taken into account, which may be a possible answer to the research question.

To account for the risk of a bank's loans in the analysis, the ratio of provisions for unpaid loans to total loans was used. Credit risk serves as a measure of asset quality, with a higher ratio indicating poorer asset quality and higher risk in the loan portfolio. Although the risk-return hypothesis suggests a positive relationship between risk and return, in this case poor credit quality can have a negative impact on bank profitability (Kosmidou 2008). Numerous studies have confirmed this hypothesis by showing that poor credit quality is one of the main factors in the reduction of margins, the inability to generate profits and even bank failure (Miller & Noulas 1997; Cooper et al., 2003; Duca & McLaughlin, 1990). Although most research shows that higher credit risk leads to lower profitability, there are some studies that disagree with this thesis. Boahene et al. (2012) state that higher credit risk leads to higher interest rates and commissions for the portfolio, which in turn leads to higher profitability. Despite some exceptions, the hypothesis aligns with the majority of research, suggesting that loan risk appetite has a negative correlation with bank profitability. It is important to note that after the 2008 crisis, European banks have consistently shown a much higher bank risk ratio than their American counterparts (Weigand, 2015), which may indicate one of the reasons why American banks achieve higher profitability.

In addition to the previously mentioned variables specific to the banking sector, the influence of the economic environment was also taken into account. This was achieved by using inflation as a macroeconomic variable. Many studies have shown different effects of inflation on the profitability of banks. Messai et al. (2015) state that inflation, as measured by the CPI, has a negative impact on bank profitability (NIM), while profitability, as measured by ROAA, has a positive impact on profitability in GIPSI countries. Horobet et al. (2021) identify inflation, as measured by the harmonized CPI, has a strong negative impact on ROE, while profitability, as measured by NIM/ROA, has a weak positive impact. O'Connell (2023) documents the negative impact of inflation on the profitability of UK banks. Căpraru & Ihnatov (2014), Karadžić & Đalović (2021), and Bikker & Vervliet (2018) report that inflation has a positive impact on bank profitability, while Petria et al. (2015) find in their study that inflation has no statistically significant impact on the profitability of EU27 banks. The hypothesis supports the findings that inflation has a positive impact on the profitability of EU/US banks.

To take account of competition and bank market saturation, the Herfindahl-Hirschman Index was used as a measure of bank concentration. When analyzing large European banks, Karadžić & Đalović (2021) identified a positive and significant correlation with the profitability of the banks analyzed. However, some other studies report different results. Horbert et al. (2021) and Petria et al. (2015) found that the degree of bank concentration has a significant and negative impact on profitability. To further analyze the effect of bank concentration and profitability, variables were introduced, such as a decomposed HHI measured separately for deposits and loans. The hypothesis states that the impact of concentration on profitability is negative.

3 Research methodology

3.1 Input data

The first step in data collection was a bank search, which was carried out using Bloomberg Terminal (2023) and LSEG Eikon (2023). Listed banks with a particular interest in the primary issue were separated to avoid redundancy, resulting in a total of 93,924 data. Banks were then selected according to the sector classification of the Global Industry Classification Standard, Banking Sector, which yielded 1,543 results. The geographic criterion was applied only to banks in the US and EU Member States, displaying 806 results. The size criterion segmented banks with a market capitalization exceeding €500 million to reduce the sample of small banks with missing data. Macroeconomic data were collected from the World Bank database. The search process resulted in a total of 250 banks, 138 (55%) of which were in the EU, with 1,549 observations, and 112 (45%) of which were in the US, with 1,962 observations. After removing outliers, the sample size is sufficiently large. The missing values for the banks in the EU/US are 0.66% and 5.89%, respectively, which according to Hair et al. (2009, p. 634), corresponds to less than 10% of the observations. The final sample closely resembles the population from which it was drawn, ensuring the relevance of the research in every aspect. The data are organized in an unbalanced panel structure.

3.2 Description of variables

The dependent variable is proxied profitability, using ROE. The independent variables were as follows: operational efficiency, the ratio of loans to total assets, the ratio of deposits to total assets, diversification of bank income, bank risk measured as the ratio of loan loss provisions to total loans, and inflation measured by the consumer price index. A control variable was used to control for differences in bank structure and administrative environment (Lee et al., 2014). Table 1 lists all variables along with their descriptions.

Table 1: List of variables

Variables	Definition	Measurement	Proxy
ROE	Profitability	Return on Equity	
OPEF	Operational efficiency	Non-interest expenses/Total income	Bank-specific
LTA	Liquidity	Total loans/Total assets	
DTA	Funding	Total deposits/Total assets	
DIV	Bank diversification	Non-interest income/Total income	
RISK	Bank risk	Provisions for unpaid loans/Total loans	
lagROE	Lagged profitability	ROE for the previos year	Control variable
INFL	Inflation	CPI	Macro specific
HHI_D	Herfindahl-Hirschman	Calculated with deposits	Industry-specific
HHI_L	Herfindahl-Hirschman	Calculated with loans	

Source: Authors

Certain transformations were applied to the data due to the unbalanced panel containing a whole series of negative values. A major problem was the presence of discontinuous data and values expressed as percentages, which yielded even smaller and more sensitive results after logarithmization. After logarithmization, some data sets appeared to follow a normal distribution. As a rule, the logarithmized values showed a lower R2, suggesting that the transformation of the data did not improve the results as expected, and that insufficient data contributed to achieving a normal distribution. The variables lagROE/Year were not transformed.

3.3 Models

Two unbalanced panels of data for EU/US banks covering the period between 2008 and 2022 were used for the analysis. Static and dynamic estimators were used to identify significant determinants of bank profitability that include the impact of the profitability trend in the observed period on future profitability.

3.3.1 Static models

Weighted least squares (WLS), fixed effects (FE) and random effects (RE) models were used to model the static models of profitability determinants. The equation of these models is as follows:

$$ROE_{i,t} = \beta_0 + \beta_1 OPEF_{i,t} + \beta_2 LTA_{i,t} + \beta_3 DTA_{i,t} + \beta_4 DIV_{i,t} + \beta_5 RISK_{i,t} + \beta_6 INFL_{i,t} + \beta_7 HHID_{i,t} + \beta_8 HHIL_{i,t} + \beta_9 HHIA_{i,t} + u_{i,t}, \quad (1)$$

where i=1,…N stands for individual banks, t=1,…T is the year in which the bank operates, while u_(i,t)= v_i+e_(i,t), where v_i and e_(i,t) describe unobservable individual effects and the error, respectively. The selection of the most optimal static model to determine profitability determinants is based on specific assumptions: (i) the significance of unobservable individual effects, and (ii) the existence of a correlation between unobservable individual effects and profitability determinants. Estimates were performed using FE/RE/FE AR(1)/WLS models.

3.3.2 Dynamic models

To express the dynamic component of the impact on profitability, i.e. the impact of previous profitability on current profitability, a residual variable of profitability was added and GMM models were used according to Nunes et al. (2009):

$$ROE_{i,t} = \beta_0 + \rho ROE_{i,t-1} + \beta_1 OPEF_{i,t} + \beta_2 LTA_{i,t} + \beta_3 DTA_{i,t} + \beta_4 DIV_{i,t} + \beta_5 RISK_{i,t} + \beta_6 INFL_{i,t} + \beta_7 HHID_{i,t} + \beta_8 HHIL_{i,t} + \beta_9 HHIA_{i,t} + v_i + e_{i,t}, \quad (2)$$

where ρ is the autoregressive coefficient: ρi,t−1 is the one-period lagged profitability at k parameter, and ρ is the speed of adjustment to the equilibrium. A value of $0<\rho<1$ implies the persistence of profitability in the industry but tends to return to the normality level. According to Islam & Nishiyama (2016), a value of ρ~0 (high speed) suggests a fairly competitive market, while ρ~1 (slow adjustment) implies a less competitive market. The bias in the above model arises from (i) correlations between individual effects with profitability in the previous period, and (ii) correlations between errors with profitability in the previous period.

4 Results

4.1 Descriptive statistics

Table 2 shows the results of the descriptive statistics, based on 3,511 observations from 250 banks over a 14-year period. The data reveal that bank profitability is asymmetric due to the inversely proportional relationship of the descriptive variables, with the EU banks showing considerable instability (SD>Mean). The minimum and maximum ROE values range from a significantly negative spectrum, particularly for EU banks, to uniformly positive values. This difference may indicate inadequate utilization of equity to generate profits. Examining the values of independent variables, the volatility of the EU/US banks is not particularly high due to (SD□Mean) with the exception of RISK/INFL/lagROE. These results show that the banking systems are well capitalized in accordance with Basel III requirements. Furthermore, the SD values are reasonably close to the average values.

4.2 Diagnostic tests

The following diagnostic tests were performed: (1) the normality test with the Shapiro-Wilk/SK test, (2) the linearity test with Pearson, (3) the Durbin-Watson statistic for autocorrelation together with the Breusch-Godfrey LM, (4) the test of multicollinearity assumption (VIF/ Collinearity diagnostic), (5) heteroscedasticity using the Breusch-Pagan/Cook-Weisberg test and the White test, and (6) cross- sectional independence test with the Friedman test. The data are not-normally distributed, heteroscedastic, and there is a problem of serial correlation between the errors, as suggested by Tables 2-4. Muhoro & Mungai (2018, p. 118) argue that financial data have elements of a non-normal distribution as they assume a random walk distribution due to leptokurticity of financial data and large tails.

A histogram was used to compare normal and logarithmic data to combine different variables. Extremely high VIF values were indicated by HH indices, especially for US banks, so variables greater than 10 were discarded. As a rule of thumb, a VIF value above 5 or a tolerance threshold below 0.2 is considered indicative of extreme collinearity with other explanatory variables (Mei et al. 2019, p. 79). Examining the relationship between the independent variables, the results indicate that multicollinearity is not a problem for the application of analysis techniques, as confirmed by the VIF test. Correlation coefficients represent the relationship between variables, whereby values above 0.6 may lead to collinearity, and all values above 0.8 are excluded from further tests (Kanwal & Nadeem, 2013). Autocorrelation tests confirm the problem of opposite serial correlation between the error terms. In the ROE model, the null hypothesis of no heteroscedasticity was tested for all regressors at a significance level of 5%. The chi-square value has a probability exceeding the 5% significance level. The tables above show that the p-values of the test for regression analysis are well below 0.05, indicating the presence of heteroscedasticity. We therefore reject the null hypothesis of constant variance.

Table 2: Descriptive statistics

Banks	EU banks					US banks				
Variables	*Observation*	*Mean*	*SD*	*Minimum*	*Maximum*	*Observation*	*Mean*	*SD*	*Minimum*	*Maximum*
$ROE_{i,t}$	1,549	.0484561	.488821	−17.3674	2.094116	1,962	.825075	.1311681	−2.64731	2.03696
$OPEF_{i,t}$	1,549	.4885356	.169918	0.00	2.016937	1,962	.5458557	.1536738	.037327	2.901267
$LTA_{i,t}$	1,549	.4633119	.311263	0.00	1.105257	1,962	.6527874	.1413227	0.00	1.127548
$DTA_{i,t}$	1,549	.6768399	.163048	0.00	.9875591	1,962	.7784505	.0876673	0.00	1.745949
$DIV_{i,t}$	1,549	.3434443	.134707	−.150606	.7744879	1,962	.2220765	.1224632	−.989310	.7868398
$RISK_{i,t}$	1,549	.0076857	.023395	−.013183	.6193898	1,962	.0049047	.0094046	−.007791	.1581937
$INFL_{i,t}$	1,549	.0204011	.021763	−.000616	.088337	1,962	.0235589	.0196978	−.003555	.080028
$HHID_{i,t}$	1,549	419.861	31.994	383.0633	493.4225	1,962	1,150.027	272.335	785.9392	1,637.471
$HHIL_{i,t}$	1,549	525.374	80.563	413.3352	712.512	1,962	931.9559	284.403	512.0234	1,444.076
$lagROE_{i,t}$	1,441	.0468008	.500757	−17.3674	2.094116	1,826	.0800583	.1352544	−2.64731	2.03696

The SK test for the univariate distribution of skewness (Prob>chi2), where H_0: Normal distribution. The test results shows that some of the variables are not normally distributed. Shapiro-Wilk W tests the hypothesis that the data originate from a normal distribution, where H_0: The data do not deviate significantly from the normal distribution. The results indicate that the data deviate from a normal distribution. Residuals of individual variables, regressed against ROE, according to the Shapiro-Wilk test, where H_0: The data do not deviate significantly from a normal distribution. The results confirm that the data deviate from a normal distribution. For example, ROE had a W test of $0.1231_{EU}(0.39786_{US})$, a V value of $824.056_{EU}(701.776_{US})$, a Z value of $16.917_{EU}(16.659_{US})$, and a *p-value* of 0.000 at a significance level of 5% (p<0.05), the test was statistically significant, so we rejected H_0 that all ROE values are normally distributed and accepted H_1 that all ROE values are not normally distributed at a significance level of 5%.

Source: Compiled by the author

Table 3: Diagnostic tests for EU banks

EU	ROE	OPEF	LTA	DTA	DIV	RISK	INFL	lagROE	Year	VIF
$ROE_{i,t}$	1.0000									
$OPEF_{i,t}$	**−0.1439***	1.0000								1.33
$LTA_{i,t}$	−0.0435	**−0.1481***	1.0000							1.07
$DTA_{i,t}$	**−0.0725***	**0.0932***	**0.1077***	1.0000						1.07
$DIV_{i,t}$	**0.1187***	**0.4305***	**−0.1104***	**−0.0678***	1.0000					1.36
$RISK_{i,t}$	**−0.1928***	**0.1148***	**0.1102***	**0.1292***	**−0.1524***	1.0000				1.13
$INFL_{i,t}$	−0.0041	−0.0345	**−0.0776***	0.0161	**−0.0584***	−0.0298	1.0000			1.20
$lagROE_{i,t}$	**0.0913***	0.0054	**−0.596***	**−0.0592***	0.0050	**−0.0841***	0.0087	1.0000		1.01
$YEAR_{i,t}$	0.0282	**0.3379***	−0.0151	**0.1140***	**0.3852***	**−0.1230***	**0.2205***	0.0257	1.0000	1.42
Breusch-Pagan/Cook-Weisberg White test Durbin-Watson Breusch-Godfrey LM test Friedman test		Ho: Constant variance Ho: Homoscedasticity H_0: No serial correlation H_0: No serial correlation			chi2(1)=4929.85; Prob>chi2=0.0000 chi2(44)=230.64; Prob>chi2=0.0000 d-statistic(9, 1441)=2.222298 chi2(1)=274.679; df(1); Prob>chi2=0.00 31.444; Pr=1.0000			Ha: Heteroscedasticity Ha: Heteroscedasticity Ha: Negative autocorrelation Ha: Autocorrelation Cross-sectional independence		Mean 1.20

*Significant at a 5% level. Source: Compiled by the author

Table 4: Diagnostic tests for US banks

US	ROE	OPEF	LTA	DTA	DIV	RISK	INFL	lagROE	Year	VIF
$ROE_{i,t}$	1.0000									
$OPEF_{i,t}$	**−0.3509***	1.0000								1.25
$LTA_{i,t}$	−0.0402	**−0.1801***	1.0000							1.21
$DTA_{i,t}$	0.0306	**0.1125***	−0.0223	1.0000						1.10
$DIV_{i,t}$	**0.1116***	**0.2603***	**−0.3938***	−0.0310	1.0000					1.34
$RISK_{i,t}$	**−0.4202***	0.0268	**−0.0470***	**−0.1210***	**0.0515***	1.0000				1.27
$INFL_{i,t}$	**0.1007***	**−0.1124***	**0.0094***	**0.0924***	**−0.0931***	**−0.1775***	1.0000			1.56
$lagROE_{i,t}$	**0.2773***	**−0.1617***	0.0032	0.0021	0.0195	**−0.2513***	**0.0686***	1.0000		1.12
$YEAR_{i,t}$	**0.2004***	0.0053	0.0434	**0.2510***	−0.0054	**−0.4358***	**0.4414***	**0.1905***	1.0000	1.84
Breusch-Pagan/Cook-Weisberg White test Durbin-Watson Breusch-Godfrey LM test Friedman test		Ho: Constant variance Ho: Homoscedasticity H0: No serial correlation H0: No serial correlation			chi2(1)=10296.13; Prob>chi2=0.0000 chi2(44)=1177.08; Prob>chi2=0.0000 d-statistic(9, 1826)=1.879363 chi2(1)=0.047; df(1); Prob>chi2=0.8285 84.618; Pr=0.9998			Ha: Heteroscedasticity Ha: Heteroscedasticity Ha: Positive autocorrelation Ha: Autocorrelation Cross-sectional independence		Mean 1.34

*Significant at a 5% level. Source: Compiled by the author

Table 5: Static panel model for EU banks

Indep. variab.	OLS	RE	FE	FE AR(1)	OLS#	RE#	FE#	WLS#
OPEF	−0.64978***(0.0887)	−0.64977***(0.08873)	−0.67940***(0.11274)	−0.41254**(0.1218)	−0.64978***(0.1299)	−0.64978***(0.1230)	−0.67940***(0.1825)	−0.29131***(0.0157)
LTA	−0.06335(0.04222)	−0.06335(0.04222)	−0.07006(0.06149)	−0.15718**(0.07493)	−0.06335(0.04262)	−0.06335(0.04262)	−0.07006*(0.04215)	−0.01459*(0.00795)
DTA	−0.06641(0.08200)	−0.06641(0.08200)	−0.37556*(0.20199)	−0.69353**(0.2820)	−0.06641(0.09689)	−0.06641(0.09690)	−0.37556(0.42850)	0.05479***(0.0142)
DIV	0.65040***(0.11209)	0.65040***(0.11209)	0.91764***(0.19034)	1.24798***(0.21994)	0.65040**(0.22359)	0.65040**(0.22360)	0.91764**(0.43394)	0.34039***(0.0190)
RISK	−2.75276***(0.5695)	−2.75276***(0.56954)	−0.26374(0.66214)	6.89702***(0.72696)	−2.75276*(1.07535)	−2.75276**(1.0753)	−0.26374(1.83694)	−3.96382***(0.1231)
INFL	−0.80826(0.63450)	−0.80826(0.63450)	−0.62374(0.65156)	0.28207(0.66849)	−0.80826*(0.43439)	−0.80826*(0.43439)	−0.62374(0.37767)	−1.99836*(1.04978)
lagROE	0.07638**(0.02542)	0.07638**(0.02542)	0.0045(0.02709)	−0.33736***(0.0263)	0.07638***(0.0179)	0.07638***(0.0179)	0.0045(0.01678)	0.099249***(0.0137)
YEAR	0.00627*(0.00377)	0.00627*(0.00377)	0.00602(0.00451)		0.00627*(0.00266)	0.00627**(0.00266)	0.00602*(0.00323)	−0.00195(0.00250)
Cons	−12.39485(7.56823)	−12.39485(7.56823)	−11.77801(9.03227)	0.12325(0.12570)	−12.39485*(5.3266)	−12.39485(5.32669)	−11.77801*(6.4104)	4.02585(5.03623)
Observations	1,441	1,441	1,441	1,333	1,441	1,441	1,441	1,333
Wald(χ^2)		145.37***				184.79***		
F(N(0,1))	18.17***		8.60***	46.38***	23.10***		8.10***	298.12***
LM(χ^2)		0.000***				0.000***		
Hausman(χ^2)		102.12***						
R^2	0.0922	0.0922	0.0661	0.0003	0.0922	0.0922	0.0661	0.6227

Significant at *10%, **5%, and ***1% levels; # - robust analysis corrected for autocorrelation and heterscedasticity. SD in brackets.
Source: Compiled by the author

Table 6: Static panel model for US banks

Indep. variab.	OLS	RE	FE	FE AR(1)	OLS#	RE#	FE#	WLS#
OPEF	−0.3853***(0.0219)	−0.38530***(0.02198)	−0.44740***(0.02784)	−0.37955***(0.03224)	−0.3853***(0.0383)	−0.38530***(0.042)	−0.4474***(0.0493)	−0.33175(0.01157)
LTA	−0.02965(0.01972)	−0.02965(0.01972)	−0.09340**(0.03108)	−0.07918**(0.03443)	−0.02965(0.02543)	−0.02965(0.03879)	−0.09340(0.07055)	−0.01695(0.00929)
DTA	0.09219**(0.03234)	0.09219**(0.03234)	−0.06298(0.05118)	−0.03191(0.05757)	0.09219**(0.03217)	0.09219*(0.05069)	−0.06298(0.06769)	0.048756(0.01224)
DIV	0.23979***(0.0240)	0.23979***(0.02406)	0.24786***(0.04122)	0.21891***(0.05451)	0.23979***(0.0482)	0.23979***(0.048)	0.24786**(0.0939)	0.220271(0.01123)
RISK	−5.30542***(0.3051)	−5.30541***(0.30514)	−5.86510***(0.31749)	−5.01592***(0.42327)	−5.30542**(1.5742)	−5.30541***(1.399)	−5.8651***(1.4131)	−6.72488(0.20297)
INFL	0.08129(0.15545)	0.08129(0.15545)	0.01032(0.15476)	0.04492(0.14170)	0.08129(0.13489)	0.08129(0.17692)	0.01032(0.20391)	0.441613(.346189)
lagROE	0.11453***(0.0194)	0.11453***(0.01945)	0.05134**(0.02016)	0.03146(0.02075)	0.11453(0.24489)	0.11453**(0.0405)	0.05134(0.03863)	0.081517(0.02191)
YEAR	−0.00062(0.00085)	−0.00062(0.00085)	−4.92e-06(0.00087)		−0.00062(0.00143)	−0.00062(0.00147)	−4.92e-06(0.0017)	−0.00383(0.00092)
Cons	1.45050(1.69674)	1.45050(1.69674)	0.41773(1.75068)	0.34158***(0.05341)	1.45050(2.85639)	1.45050(2.93700)	0.41773(3.51759)	7.942232(1.86176)
Observations	1,826	1,826	1,826	1,690	1,826	1,826	1,826	1,690
Wald(χ^2)		884.79***				362.44***		
F(N(0,1))	110.60***		98.05***	41.97***	36.01***		34.05***	396.17***
LM(χ^2)		0.000***				0.000***		
Hausman(χ^2)		334.17***						
R^2	0.3114	0.3275	0.3114	0.1742	0.3275	0.3275	0.3114	0.6340

Significant at *10%, **5%, and ***1% levels; # - robust analysis corrected for heterscedasticity only. SD in brackets.
Source: Compiled by the author

Table 7: Dynamic panel model for EU/US banks

	EU banks		US banks	
Independent variables	GMM (1991)	GMM system (1998)	GMM (1991)	GMM system (1998)
OPEF	–0.22120 (0.33210)	–0.69778* (0.38389)	–0.36111*** (0.03003)	–0.37802*** (0.03176)
LTA	0.12373 (0.11888)	0.03367 (0.22768)	–0.36111 (0.03004)	–0.06775 (0.11104)
DTA	–1.12986 (1.24602)	–0.97643 (1.28556)	0.10805 (0.17721)	0.09515 (0.16533)
DIV	0.85976 (0.64627)	1.13175 (0.81551)	0.21958** (0.17721)	0.16173** (0.07168)
RISK	–7.49689* (4.01809)	–7.74796*** (1.85808)	–5.26145*** (1.44885)	–5.22093** (1.46635)
INFL	–0.05621 (0.47881)	–0.21076 (0.69108)	–0.05566 (0.22535)	–0.10008 (0.22808)
lagROE	0.10393 (0.10519)	0.04679** (0.01428)	0.03135 (0.04103)	0.03656 (0.05126)
Year	–0.00026 (0.00452)	0.00092 (0.00707)	0.00102 (0.00242)	0.00098 (0.00220)
Cons	1.14707 (9.02808)	–1.15134 (14.14973)	–1.84648 (4.78517)	–1.72816 (4.36633)
Instruments	120	106	120	120
Observations	1,441	1,441	1,826	1,826
Wald(χ2)	40.09***		2588.20***	
F(N(0,1))		11.88***		282.54***
Sargan(χ2)	132.24		114.85	
Hansen(N(0,1))		106.2		131.39
m1(0,1)	–0.97	–1.11	–1.05	–1.07
m2(0,1)	0.54	1.79	0.92	0.96

*Significant at 10%, **5%, and ***1% levels. Robust SE in brackets.
Source: Compiled by the author

4.3 Static panel models

To determine the significance of unobservable individual effects, Nunes et al. (2009) specify the use of the Lagrange multiplier test, whose null hypothesis rests on the irrelevance of unobservable individual effects. If the hypothesis is rejected, the conclusion is that OLS does not explain the relationship between ROE and the determinants of bank profitability and that further modeling taking into account individual effects using the FE/RE model is required. The authors (2009) perform the Hausman test to test the existence of correlation between individual effects and determinants of profitability. The null hypothesis states that there is no correlation between individual effects and ROE. By rejecting the above hypothesis, it is assumed that the FE model is a model applied to explain the relationship between profitability and its determinants. In addition to the above tests, the Wald test was performed to test the significance of a set of coefficients in the selected models and the F-test was applied for the overall significance of the variables explaining ROE variance (Nunes et al., 2009).

Due to the presence of autocorrelation and heteroscedasticity, the OLS/FE/RE models are corrected (#), while the FE AR(1) estimator has no possibility of correction. The OLS/RE models have very similar results, but they do not have identical values with regard to the confidence in-

terval. In addition, AR(1) does not allow regression with a time-varying component due to problems with endogeneity and assumptions for panel data. By analyzing the presence of individual effects using the LM test, the hypothesis of the irrelevance of unobservable individual effects was rejected, indicating that the OLS model does not sufficiently explain the variance of the variables mentioned on the return on ROE. The hypothesis of the existence of a correlation between individual effects and profitability determinants was tested using the Hausman test and rejected, indicating that the FE estimator is a suitable model for future analyses. Due to the presence of heteroscedasticity, the WLS model was additionally implemented with the aim of weighting depending on the variance in order to remove the effect of heterogeneity of variance. WLS addresses the problem of heteroscedasticity by assigning different weights to observations based on the variance of their residuals. Observations with higher residuals have greater variability and conversely receive lower weights. INFL is selected as the weighting variable.

Based on the results, the most robust static estimators (FE#/WLS# models), which were corrected for autocorrelation and heteroscedasticity, were selected and presented in Tables 5-6.

4.4 Dynamic estimators

As a solution to the correlation between individual effects and profitability in the previous period, Arellano & Bond (1991) recommend using the first difference, which can eliminate this issue. Furthermore, the authors assume that the correlation between errors and profitability is eliminated by using previous profitability at different levels as a GMM instrument. Therefore, the dynamic models are based on the GMM estimator, which includes the first difference of equation (2) and different levels of previous profitability, as shown in Table 7.

The Sargan test was performed to test the validity of over-restrictions in the GMM method (Arellano & Bond, 1991), and the presence of first- and second-order autocorrelation (Nunes et al., 2009). The dynamic models are robust, with the Sargan and Hansen tests confirming the validity of the instruments. Furthermore, the hypotheses of no first- and second-order autocorrelation cannot be rejected.

4.5 Static panel models vs. dynamic estimators

Despite the observed differences in the results between the static and dynamic models, the recognized differences raise an additional question that requires further investigation and is beyond the scope of this paper. The analysis of static models with dynamic estimators revealed that the RISK variable has a negative effect on the profitability of European banks according to bothWLS# and dynamic estimators, while it is not statistically significant in the FE#model. The negative impact of RISK/OPEF on profitability is confirmed by static models and dynamic estimators, while the WLS# estimator for US banks confirms statistical insignificance for RISK/OPEF. Analyzing only static models, the profitability of European banks is influenced by OPEF/LTA/DIV, which is confirmed by FE#/WLS#models. In addition, the YEAR variable in the FE# model proved to be statistically significant, and the DTA/RISK/INFL/

lagROE variables showed significance through the WLS# model. In the case of the American banks, only the FE# model with the variables OPEF/DIV/RISK proved to be statistically significant.

5 Discussion

OPEF proved to be a significant variable influencing the profitability of banks in both regions. Similar results were obtained by Petria, Căpraru, and Ihnatov (2015), who found a negative impact of operational efficiency on ROAE using the FE model. The results of this study further confirmed that efficiency also impacts ROE, which confirms the original hypothesis. The research results indicate a greater negative impact of operational efficiency on EU banks compared to US banks within this sample. However, it is worth noting that, despite the differing impact, the US banks in this sample exhibit a higher average negative operating efficiency ratio. The LTA ratio has a negative and statistically significant effect on the profitability of EU banks, as evidenced by static modeling, which is not consistent with the original hypothesis. The positive effect is expected due to the assumption that a larger loan volume leads to higher profitability. Staikouras & Wood (2004) report similar findings, attributing the negative impact on profitability to the low quality of loans granted by the institutions. According to the statistical models, the DTA variable has a significant positive impact on the profitability of EU banks, which is not consistent with the hypothesis of this paper. However, the dynamic models confirm the hypothesis of the paper that the impact is positive in the US and negative in Europe. Nevertheless, the dynamic model result is not statistically significant, and as a result, the hypothesis is not confirmed.

DIV shows a positive and statistically significant impact on the profitability of EU/US banks. The assumption that diversification has a positive impact on profitability by reducing business risk and reliance on loans proved to be correct according to the results of Chiorazzo et al. (2008) and Elsas et al. (2010). Furthermore, the sample used in this research indicates that European banks have a higher degree of diversification than American banks,

which is not consistent with the assumptions of this paper. This result differs from previous studies, such as Di Vito et al. (2023), which found that US banks generate more non-interest income than European banks. Thus, although the results confirm the hypothesis that diversification has a positive impact on profitability, they do not confirm the assumption that American banks have a higher degree of diversification leading to higher profitability. This discrepancy may stem from the unique characteristics of the sample, which needs to be further investigated. The RISK hypothesis proved to be accurate and statistically significant, which is confirmed by the results of the static and dynamic models. The negative impact of bank risk on profitability was also found by Kosmidou (2008), Miller & Noulas (1997), Cooper et al. (2003), Duca & Mclaughin (1990). The findings confirm the assumption of this paper and partly explain the higher profitability of American banks, as according to this sample, American banks exhibit lower average credit risk compared to EU banks. lagROE was shown to be a statistically significant variable with a positive impact on the profitability of EU banks compared to the WLS model. Similar results were achieved in studies by O'Connell (2023) and Messai et al. (2015). The autoregressive coefficients ρ, interpreted based on Islam & Nishiyama (2016), suggest the persistence of profitability and a high speed of reaching equilibrium in a relatively competitive market. Analyzing the previous profitability of US banks yields conclusions similar to those for EU banks; however, these conclusions are not statistically significant.

Several variables showed statistical significance exclusively for European banks. The impact of INFL on ROE is not consistent with the hypothesis. The results of the static WLS model show a negative statistically significant impact on the profitability of EU banks. Negative results were also reported by Horobet et al. (2021) and Messai et al. (2015), while Căpraru & Ihnatov (2014), Karadžić & Đalović (2021) observed positive effects. INFL did not exhibit a statistically significant effect on the profitability of American banks, although Bikker & Vervliet (2018) argued the positive impact of inflation on the profitability of American banks.

6 Conclusions

The differences in the profitability of banks in the EU and the US have been observed over the last 15 years, but the underlying reasons remain unexplained. This paper attempts to explain the factors influencing bank profitability in the two regions and how these differ. To find a possible answer to this problem, an analysis of a total of 250 banks was conducted. The main determinants of bank profitability used in other relevant studies were examined and the analysis yielded satisfactory results.

Robust static models and dynamic estimators are found to be effective in estimating the determinants of profitability of EU/US banks during the observed period. The above models suggest that the profitability of European banks is determined by operating efficiency, the share of deposits and loans in total assets, diversification, risk, previous profitability and inflation. In particular, operating efficiency and risk exposure stand out as the most important variables, as they are statistically significant across most models. In contrast, the analysis revealed that the profitability of US banks is related to the level of operational efficiency, risk and diversification, and is partially consistent with the EU determinants uncovered. It is important to note that the variables analyzed exhibit greater predictive power for the profitability of US banks compared to their European counterparts, further highlighting the differences in the determinants of profitability between the two markets. The main contribution of the paper is the direct comparison of EU and US bank profitability determinants using static and dynamic models in the post-2008 financial crisis period. In addition, the existing methodology of static models with dynamic estimators was enhanced by incorporating WLS models and robust estimators. Although the research results did not fully explain the higher profitability of American banks compared to European banks, they highlighted specific determinants influencing their profitability that should be extended and subsequently examined. The bank risk hypothesis was confirmed, partially explaining why American banks have higher profitability. However, other statistically significant results observed in both regions neither confirm the original hypothesis nor explain the higher profitability of American banks.

Future research could revisit these variables in other time periods or test other variables in the same time period to possibly uncover other profitability determinants that explain the differences between the EU and the US. The post-COVID-19 era, marked by sharp increases in benchmark interest rates, presents a particularly interesting context for such analyses. Additionally, the context of digital transformation and its role in redefining profitability factors, as emphasized by Grujić & Vojinović (2024), should also be taken into account.

Literature

Abreu, M., & Mendes, V. (2002). Commercial bank interest margins and profitability: evidence from E.U. Countries, University of Porto Working paper Series, No. 122. doi: 10.12691/jfa-5-2-4

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

BankRegData. BankRegData 2021–2022. https://www.bankregdata.com/main.asp (Retrieved October 11, 2023).

Bikker, J. A., & Vervliet, T. M. (2018). Bank profitability and risk-taking under low interest rates. *International Journal of Finance & Economics*, *23*(1), 3–18. https://doi.org/10.1002/ijfe.1595

Bloomberg L.P. 2023. EQS{GO}. (Retrieved August 10, 2023)

Boahene, S. H., Dasah, J., & Agyei, S. K. (2012). Credit risk and profitability of selected banks in Ghana, *Research Journal of Finance and Accounting*, *3*(7), 6–15.

Buchory, A. H. (2015). Banking Profitability: How Does the Credit Risk and Operational Efficiency Effect?. *Journal of Business and Management Sciences*, *3*(4), 118–123. doi: 10.12691/jbms-3-4-3

Căpraru, B., & Ihnatov, I. (2014). Banks' Profitability in Selected Central and Eastern European Countries. *Procedia Economics and Finance*, *16,* 587–591. https://doi.org/10.1016/S2212-5671(14)00844-2

Chiorazzo, V., Milani, C., & Salvini, F. (2008). Income diversification and bank performance: Evidence from Italian banks. *Journal of Financial Services Research*, *33*, 181–203. doi:10.1007/s10693-008-0029-4

Chukwuogor, C., Anoruo, E., & Ndu, I. (2021). An empirical analysis of the determinants of the US banks' profitability. *Banks and Bank Systems*, *16*(4), 209-217. http://dx.doi.org/10.21511/bbs.16(4).2021.17

Cooper, M., Jackson, W., & Patterson, G. 2003. Evidence of predictability in the cross-section of bank stock returns, *Journal of Banking and Finance*, *27*(5), 817-850. https://doi.org/10.1016/S0378-4266(01)00263-1

Di Vito, L., Leite, J. M., & Fuentes, N. M. (2023). Understanding the profitability gap between euro area and US global systemically important banks (No. 327). ECB Occasional Paper.

Duca, J., & McLaughlin, M. M. (1990). Developments affecting the profitability of commercial banks, *Federal Reserve Bulletin*, *76*(7), 477-499.

EBF. (2023). The EU banking regulatory framework and its impact on banks and the economy. https://www.oliverwyman.com (Retrieved October 12, 2023).

ECB Data Portal. https://data.ecb.europa.eu (Retrieved October 11, 2023).

ECB. (2015). Financial Stability Review. https://www.ecb.europa.eu (Retrieved October 12, 2023).

Edelmann, C. (2021). Europe's banks can't ignore the M&A rush in fight with the US giants. Financial News. https://www.fnlondon.com (Retrieved October 12, 2023).

Elsas, R., Hackethal, A., & Holzhauser, M. (2010). The anatomy of bank diversification. Journal of Banking and Finance, *34*, 1274–1287. https://doi.org/10.1016/j.jbankfin.2009.11.024

EUROFI Secretariat. (2019). Fragmentation Issues in the EU Banking Sector. https://www.eurofi.net (Retrieved October 13, 2023).

Federal Reserve Bank of St. Louis. Economic Data. (Retrieved October 11, 2023).

Grujić, M., & Vojinović, Ž. (2024). Investing in blockchain technologies and digital assets: Accounting perspectives. Anali Ekonomskog fakulteta u Subotici, (00). doi:10.5937/AnEkSub2300032G

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. (2009). *Multivariate Data Analysis*. Pearson.

Hongkong, H. (2017). The effect of earning per share and return on equity on stock price (study on listed banks). *Accountability*, *6*(2), 20–25.https://doi.org/10.32400/ja.24807.6.2.2017.20-25

Horobet, A., Radulescu, M., Belascu, L., Belascu, L. A., & Dita, S. M. (2021). Determinants of Bank Profitability in CEE Countries:Evidence from GMM Panel Data Estimates. *Journal of Risk and Financial Management*, *14*(7), 307. https://doi.org/10.3390/jrfm14070307

Islam, M. S., & Nishiyama, S. I. (2016). The determinants of bank profitability: dynamic panel evidence from South Asian countries. *Journal of Applied Finance and Banking*, *6*(3), 77.

Kanwal, S., & Nadeem, M. (2013). The impact of macroeconomic variables on the profitability of listed commercial banks in Pakistan. *European Journal of Business and Social Sciences*, *2*(9), 186–201.

Karadžić, V., & Đalović, N. (2021). Profitability Determinants of Big European Banks. *Journal of Central Banking Theory and Practice*, *10*(2), 39–56. doi: 10.2478/jcbtp-2021-0013

Kosmidou, K. (2008). The determinants of banks' profits in Greece during the period of EU financial integration. *Managerial Finance*, *34*(3), 146–159. https://doi.org/10.1108/03074350810848036

Lee, C. C., & Hsieh, M. F. (2013). The impact of bank capital on profitability and risk in Asian banking. *Journal of International Money and Finance*, *32*(3), 251–281. doi: 10.1016/j.jimonfin.2012.04.013

Lee, C. C., Yang, S. J., & Chang, C. H. (2014). Non-interest income, profitability, and risk in banking industry: A cross-country analysis. *The North American Journal of Economics and Finance*, *27*, 48–67. https://doi.org/10.1016/j.najef.2013.11.002

LSEG Eikon. (2023). Bank company data. (Retrieved August 10, 2023)

Mei, C. L., Nsiah, T. K., Barfi, R., & Bonsu, M. O. A. (2019). Credit risk and bank profitability of commercial banks in Ghana. *International Journal of Research & Development*, *4*(12), 74–83. doi:10.36713/epra3836

Menicucci, E., & Paolucci, G. (2016). The determinants of bank profitability:empirical evidence from European banking sector. *Journal of Financial Reporting and Accounting*, *14*(1), 86–115. https://doi.org/10.1108/JFRA-05-2015-0060

Messai, A. S., Gallali, M. I., & Jouini, F. (2015). Determinants of Bank Profitability in Western European

Countries Evidence from System GMM Estimates. *International Business Research*, *8*(7) doi:10.5539/ibr.v8n7p30

Miller, S., & Noulas, A. (1997). Portfolio mix and large-bank profitability in the USA, *Applied Economics*, *29*(4), 505-512. http://dx.doi.org/10.1080/000368497326994

Muhoro, D. I., & Mungai, J. (2018). Real time gross settlement and financial performance of commercial banks in Kenya. *Journal of Economics and Finance*, *3*(1), 110–122.

Nunes, P. J. M., Serrasqueiro, Z. M., & Sequeira, T. N. (2009). Profitability in Portuguese service industries: A panel data approach. *The Service Industries Journal*, *29*(5), 693–707. https://doi.org/10.1080/02642060902720188

Nurazi, R., & Usman, B. (2016). Bank stock returns in responding the contribution of fundamental and macroeconomic effects. *Journal of Economics and Policy*, *9*(1), 134–149. doi:10.15294/jejak.v9i1.6386

O'Connell, M. (2023). Bank-specific, industry-specific and macroeconomic determinants of bank profitability: Evidence from the UK. *Studies in Economics and Finance*, *40*(1), 155–174. https://doi.org/10.1108/SEF-10-2021-0413

Petria, N., Căpraru, B., & Ihnatov, I. (2015). Determinants of Banks' Profitability: Evidence from EU 27 Banking Systems. *Procedia Economics and Finance*, *20*, 518–524. doi:10.1515/aicue-2015-0007

Purnamasari, D. (2015). The effect of changes in return on assets, return on equity, and economic value added to the stock price changes and its impact on earnings per share. *Research Journal of Finance and Accounting*, *6*(6), 80–90.

Sawada, M. (2013). How does the stock market value bank diversification? Empirical evidence from Japanese banks. *Pacific-Basin Finance Journal*, *25*, 40–61. https://doi.org/10.1016/j.pacfin.2013.08.001

Staikouras, C. K., & Wood, G. E. (2004). The determinants of European bank profitability, *International Business and Economic Research Journal*, *386*, 57–68. doi:10.19030/iber.v3i6.3699

Stolz, S. M., & Wedow, M. (2010). Extraordinary measures in extraordinary times. Public measures in support of the financial sector in the EU and the US. ECB Occasional Paper.

Sukmawati, F., & Garsela, I. (2016). The effect of return on assets and return on equity to the stock price. *In 2016 Global Conference on Business, Management and Entrepreneurship* (pp. 53–57). Atlantis Press. doi:10.2991/gcbme-16.2016.8

Weigand, R. (2015). A Tale of Two Banking Systems:The Performance of U.S. and European Banks in the 21st Century. *Electronic Journal*, *12*(1), 146–162. doi:10.2139/ssrn.2547758

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Ocena dejavnikov dobičkonosnosti bank: Primerjalna študija za banke EU in ZDA

Ozadje/Namen: Članek preučuje pomembne razlike v tržnih donosih med bančnima sektorjema ZDA in EU po finančni krizi leta 2008. Analiza razkriva, da je dobičkonosnost ameriških bank, merjena z donosom na kapital, višja kot pri evropskih bankah, kar delno pojasnjuje opažene razlike v donosih.
Metodologija: Študija uporablja dva neuravnotežena panela podatkov za banke EU in ZDA, ki zajemata obdobje 2008-2022. Statični in dinamični ocenjevalci so bili uporabljeni za identifikacijo pomembnih dejavnikov dobičkonosnosti bank, ki vključujejo vpliv trenda dobičkonosnosti v opazovanem obdobju na prihodnjo dobičkonosnost.
Rezultati: Na podlagi vzorca 250 bank so bile ugotovljene operativna učinkovitost, diverzifikacija in tveganje kot dejavniki, ki vplivajo na dobičkonosnost bank v obeh regijah. Za evropske banke so bili ugotovljeni tudi vplivi pretekle dobičkonosnosti, deleža vlog in posojil v sredstvih ter inflacije. Po drugi strani pa ameriške banke kažejo večjo napovedno moč za te spremenljivke, kar potrjuje razlike v dejavnikih med obema trgoma. Čeprav tveganje delno pojasnjuje višjo dobičkonosnost ameriških bank, drugi rezultati niso potrdili prvotne hipoteze.
Zaključek: Glavni prispevek članka je neposredna primerjava dejavnikov dobičkonosnosti za banke EU in ZDA z uporabo statičnih in dinamičnih modelov v obdobju po finančni krizi leta 2008. Poleg tega je bila obstoječa metodologija statičnih modelov z dinamičnimi ocenjevalci razširjena z WLS modeli in robustnimi ocenjevalci, kar je pokazalo, da obstajajo določeni dejavniki, ki vplivajo na njihovo dobičkonosnost in bi jih bilo treba razširiti in nadalje preučiti.

Ključne besede: *Dobičkonosnost, Banke EU/ZDA, Panelni podatki, Statični modeli, Dinamični ocenjevalci*

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Does Ownership Matter: Nexus Between Entrepreneurial Orientation, Network Capability, Financial Resources Diversity and Financial Performance of HGCs

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Background/Purpose: This paper aims to analyse the nexus between selected growth determinants and the financial performance of high-growth companies (HGCs) in relation to their ownership. In line with principal-agent theory, we try to determine if the differences exist between managers who are also (co)owners and those managers who are not (co)owners. Also, we analysed if additional equity-based compensation, through different growth determinants, could increase HGC's financial performance.
Methods: The study was conducted on a sample of 119 HGCs from the Republic of Slovenia and was carried out in 2022. The empirical analysis was performed using regression analysis based on exploratory factor analysis (EFA). Analysis was performed using IBM SPSS Statistics 27 software.
Results: Results showed that considering the importance of organisational networking capability for HGC's financial performance, there are statistically significant differences between owner-managers and managers, implying that ownership (and equity-based compensations) could positively shape HGC's financial performance. In addition, results show that when analysing the owners-managers group of HGCs, risk-taking and organisational networking capability positively and statistically significantly impact HGC's financial performance.
Conclusion: Our paper highlights the importance of organisational networking capability as a growth determinant through which equity-based manager compensations can positively influence HGCs' financial performance. The study contributes to diverse literature related to HGCs and contributes to relevancy for the policymakers aiming at enabling better financial performance of HGCs.

Keywords: *High-growth company, Entrepreneurial orientation, Network capability, Financial performance, Principal-agent theory, Equity-based compensation*

1 Introduction

HGC research is a heterogeneous and vastly diverse research area to which researchers and government policymakers have paid particular attention in recent years, as HGCs can contribute to prosperous future development. Based on Penrose's (1959) theory of the firm's growth, a company's growth is not inherent and can be constrained (Chen et al., 2019). Penrose (1959) understands growth as a process resulting from a knowledge-based team that

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learned how to identify and manage opportunities enabling growth. Due to this, the theory of the firm's growth has strongly marked the development of later theories, especially the resource-based theory (RBT) (Lau & Michie, 2024). RBT considers the company a set of heterogeneous, valuable, rare and immobile production resources that the competition cannot wholly emulate (Barney, 1991), thus forming a competitive advantage for the company. Additionally, possessing adequate and superior production resources will enable them to distinguish themselves from others through efficient and innovative applications of resources that will allow economic value creation (Barney et al., 2021), leading to higher financial performance. These resources can also cover social components and other tacit knowledge and could be directly related to our research model determinants – entrepreneurial orientation, network capability, and financial resources obtained. Companies seeking and trying to achieve growth must thus manage several growth determinants affecting their business and financial performance. The research model defined by entrepreneurial orientation (focus on risk-taking and innovativeness with proactiveness), organisational networking capability, external financial resources diversity and financial performance was developed to analyse some of these determinants. Further based on the principal-agent theory and possible differences between owners and managers, already pointed out by Smith (1776), the article aims to answer the main research question: "Do owner-managers and managers have different perspectives regarding selected HGCs growth determinants?" to determine if ownership (owner-manager vs. manager) of HGC could cause different levels of impacts between selected growth determinants and financial performance of HGC. With this, we want to contribute to previous findings suggesting that company performance is positively related to the percentage of equity held by managers (Bouras & Gallali, 2017), by determining for which growth determinants, equity-based manager compensation or ownership, can have a positive influence on HGC's financial performance. Previous studies on this topic are rare and subjected to heterogeneity, and our paper tries to fill this gap.

Results show that when analysing owners-managers group of HGCs, risk-taking as one of the critical entrepreneurial orientation determinants (Wach et al., 2023; Correa et. al., 2022; Putninš & Sauka, 2020) and organisational networking capability defended by Mu & Di Benedetto (2012), have a positive and statistically significant impact on HGCs financial performance. Compared to the owner-manager's group of HGCs, only risk-taking was found to have a statistically significant effect on financial performance in the manager's group of HGCs. Results also indicate that when considering the importance of organisational networking capability for HGC's financial performance, there are statistically significant differences between owner-managers and managers. Our paper complements rare previous research, supporting Mosleh Shirazi et al. (2013) findings.

The topic of differences between owner-managers and managers in relation to growth determinants and financial performance is in the high interests of policymakers and HGCs decision makers; as shown by Haubrich (1994), correct incentives for managers can significantly enhance a company's performance. The paper aims to verify previous theories and extend previous findings by focusing on selected growth determinants. With this, it contributes to and fills the research gap by determining for which growth determinants, equity-based manager compensation, can positively influence HGC's financial performance. In the best case, research on this topic is rare or non-existent at the moment. Our paper highlights the importance of organisational networking capability as a growth determinant through which equity-based manager compensations can positively influence HGCs' financial performance. The paper also has practical importance to HGC decision-makers seeking to achieve and sustain financial performance and their competitive advantage that enables growth in challenging high-growth environments, focusing on the growth determinants highlighted in the research.

2 Theoretical background

2.1 High-growth companies and growth determinants

The beginnings of studying company growth in entrepreneurial theory date back to the 1950s when Edith Penrose (1959) published the theory of the firm's growth, contributing to Birch's findings on the economic significance of small HGCs (Landström, 2010). HGC research is now a vastly diverse research field covering entrepreneurial behaviour, companies' main characteristics and impacts on economic development, growth and employment. HGCs are defined as a tiny proportion of all companies achieving high growth in the selected period. Despite numerous findings regarding the importance of HGCs for economic development and employment (Bisztray et al., 2023; Coad et al., 2022; Laur & Mignon, 2021; Santoleri, 2021), a generally accepted definition of them does not exist, as was shown thru Rocha & Ferreira (2022) bibliometric analysis. Differences arise as growth is a complex phenomenon, which is not inherently present as it's subject to different constraints (Chen et al., 2019). HGCs seeking to sustain growth and contribute to economic development must thus manage numerous factors that influence their growth and financial performance. One of these factors is the entrepreneurial orientation – involving at least innovativeness, risk-taking and proactivity (Miller, 1983), later completed with competitive aggressiveness and autonomy (Lumpkin & Dess, 1996) – which becomes the driving force of or-

ganisational tendencies to fulfil entrepreneurial activities, and thus one of the fundamental aspects of the study of entrepreneurship (Covin & Wales, 2012). Likewise, entrepreneurial orientation is also one of the critical determinants for the emergence and existence of HGCs (Sheppard, 2023; Sorama & Joensuu-Salo, 2023; Chaston & Sadler-Smith, 2012), as it originates from the assumption that entrepreneurial orientation is formed as a factor (variable or group of variables) based on which companies can be distinguished, based on their level of entrepreneurial orientation capacity, on more or less successful (Coivn & Wales, 2012: 677). Entrepreneurial orientation is one of the leading indicators of the company's ability to operate in an entrepreneurial way, as it is one of the critical dimensions of a company's entrepreneurial capacity (Alvarez-Torres et al., 2019). Thus, it can be one of the main determinants enabling high growth and fostering their financial performance.

The next one is organisational networking capability, which is the ability of a company to leverage its existing linkages (both strong and weak) and establish new connections (both strong and weak) with external entities to achieve resource (re)configuration and strategic competitive advantage (Mu & Di Benedetto, 2012), supporting their high-growth aspirations. If HGCs want to achieve and sustain high growth, financial resources and their adequacy will also be necessary. Insufficient or inadequate financial resources may lead to the inability to operate correctly or to reduce the realisation of business opportunities, leading to reduced growth and company development (Kim-Soon et al., 2017; Fraser et al., 2015).

2.2 Principal-agent theory and company performance

Agency theory is one of the most commonly analysed theories in entrepreneurship, which can be traced back to Smith's (1776) findings of dangerous differences between owners and managers. Agency theory covers a wide range of topics, from markets and companies to different research fields – for example, organisational behaviour (Effelsberg et al., 2014), knowledge hiding (Khoreva & Wechtler, 2020) and family business (Kowala & Šebestova, 2021) – where organisational governance has historically focused mainly on the perspective of principals and agents with the persuasion of the goal of maximising owner wealth, i.e. principal-agent research (Caldwell et al., 2006). Agency theory teaches us that whenever the principal (i.e. company owner in the case of the paper) engages with another agent (i.e. manager in the case of the paper) to whom some decision-making is granted, a potential agency problem could exist, shown as agency costs that can shape company performance (Ahmed et al., 2023), as one of the parties can have a different approach to solve a particular problem (Jensen & Meckling, 1976). The expected outcome of this behaviour should lead to outcomes specified by principals; however, self-interest behaviour could lie at the core of the agency problem. The problems arising from principal-agent cooperation cause divergence in the area of risk-sharing and create possibilities for information asymmetries, which in turn reduces the principal's ability to monitor and control agent behaviour, leading to situations where it is inherently difficult to create and sustain an ideal contract between the principal (i.e. owner) and the agent (i.e. manager) (Bendickson et al., 2016). Considering HGCs, this could lead to differences in the company's performance and growth possibilities between owner-managers and managers HGCs. It is shown that when agents have equity (or (co)ownership) in the company, they are more likely to embrace and fulfil the actions desired by principals and behave in principal interests (Eisenhardt, 1989), leading to higher HGC performance, compared to a situation where perceived inequity exists, as their, agents are more likely to engage in self-interested behaviour and may not loyally serve their principals (Wagner, 2019). There is no surprise that the correct incentives for managers can significantly enhance a company's performance (Wijeweera et al., 2022), as company performance is positively related to the percentage of equity held by managers and to the percentage of their compensation that is equity-based (Bouras & Gallali, 2017; Haubrich, 1994).

2.3 Hypotheses development

Previous studies have shown that company performance can be positively related to the percentage of equity managers (agents) held. In our paper, we want to examine if managers who are also (co)owners (owner-managers) can contribute to HGC's financial performance through selected growth determinants better than managers who are not (co)owners of HGCs (managers). Even though there are some concerns regarding moderating effects analysis in past theories, as moderator relationships regularly confront challenges, moderated regression analysis still represents the most popular procedure in the context (Helm & Mark, 2012).

2.3.1 Risk-taking, financial performance and ownership

Risk-taking as a dimension of entrepreneurial orientation is defined by Rauch et al. (2009: 763) as "making bold moves, diving into the unknown, when acquiring (borrowing) large amounts of financial assets and providing significant amounts of resources for the realisation of undertakings in uncertain environments". Within entrepreneurial orientation, risk-taking is implemented at the level of the

company or the decisions taken by the company (i.e. upper management) for various uncertain undertakings (Schillo, 2011). Risk-taking is one of the critical determinants of successful entrepreneurs and companies (Putninš & Sauka, 2020) as risk-prone companies combine the search for opportunities with taking risks by creating strategic conditions for their exploitation, leading to higher success either in terms of financial performance or company growth (Frešer, 2022). Risk-taking can thus positively enhance future company goal-setting and financial performance expectations (Mahto & Khanin, 2020). However, companies must be careful that risk-taking is driven by the right strategic management decisions and careful consideration of cost–benefit balance (Kreiser et al., 2013), as otherwise, risk-taking can have unwanted results.

There could also be different risk-taking propensity levels between owner-managers and managers. Some arguments suggest that as managerial ownership increases, the level of risk-taking decreases (Chen et al., 2014), supporting the risk aversion hypothesis, where in the presence of owner/manager agency problems, managers could be more risk averse in some cases. In usual circumstances, managers will not maximise shareholder wealth. Thus, their compensation must be designed so that when managers increase the company's value (take risks), they also increase their expected utility – i.e. their own goals (Smith & Stulz, 1985). These differences could create an uneven impact on financial performance. On the other hand, Brockhaus (1980) found no differences regarding risk-taking propensities when comparing managers who quit their managerial jobs and became owners and regular managers.

H1a: Risk-taking positively and statistically significantly affects the financial performance of owner-manager and manager HGCs.

H1b: There is a moderated effect of (co)ownership on the relationship between risk-taking and HGC's financial performance.

2.3.2 Innovativeness and Proactiveness, financial performance and ownership

Innovativeness as a determinant of entrepreneurial orientation can be most commonly defined as a benchmark of novelty (McGrath et al., 1996), which can cause radical changes, altering the status quo on the market, or change companies' levels of proactiveness, risk-taking propensity and competitiveness. As such, innovativeness is often seen as one of the critical determinants of a company's entrepreneurial behaviour and performance (Hurtado-Palomino et al., 2024; Suifan, 2021). The sample of large companies (Scherer, 1965) found that innovativeness can positively impact achieved sales and, thus, the company's profitability. Some other authors (e.g. Ng et al., 2020; Shashi et al. 2019) also reported positive relations between innovation and a company's financial performance in their studies, while others found a negative direct impact of innovation on financial performance (e.g. Gök & Peker, 2017). Different levels of innovativeness propensity between owner-managers and managers could exist. As shown by Aghion et al. (2013), ownership is associated with more innovation, which aligns with the "lazy" manager hypothesis. Innovation can require many efforts, and "lazy" managers might not exert enough of it (ibid.: 227). Innovation is also extremely risky, as large projects require extensive resources. On the other hand, the effects of innovativeness are uncertain and can most likely be seen more in the long term (Ghanbarpour & Gustafsson, 2022). This could lead more risk-averse managers to be intimidated by innovation (Kuczmarski, 1996) and unwilling to admit to large innovative projects. Conversely, this could represent the opportunity and challenge that will motivate them. Differences in levels of innovativeness between owner-manager and manager could lead to different impacts on a company's financial performance. The same can also be said for proactiveness, which refers to the company's view of the future, in which the company wants to proactively search for business opportunities that will enable the benefits of making the first move and changing the competitive environment (Hughes & Morgan, 2007). Proactiveness can thus be often analysed as interconnected with innovativeness (Covin & Wales, 2012).

H2a: Innovativeness and proactiveness positively and statistically significantly affect the financial performance of owner-manager and manager HGCs.

H2b: There is a moderated effect of (co)ownership on the relationship between innovativeness and proactiveness and HGC's financial performance.

2.3.3 Organisational networking capability, financial performance and ownership

Social capital is essential for entrepreneurship research as a driving force to perceive and exploit business opportunities (Shane, 2003). Nahapiet & Ghoshal (1998) define social capital as a construct of three dimensions – structural, cognitive and rational. Organisational networking capability is defined by Mu & Di Benedetto (2012: 5) as the capability of the company/organisation to exploit its existing network connections (weak and strong) and explore new network connections in order to achieve a (re)configuration of resources and competitive strategic advantages, lies in the core of structural social capital. Organisational networking capability has a decisive impact on the company's performance (Sasmito et al., 2023; Kurniawan et al., 2021). There is no doubt that this determinant is positively linked with better financial performance (Wang et al., 2021). Theoretically, this could be explained by the fact that social capital and networking capability have often

been shown as factors influencing financial resource availability (Lukkarinen et al., 2016), as they can also build trust which can reduce the cost of financing (Meng & Yin, 2019). Previous literature research regarding social capital differences among owner-managers and managers is not standard. In one of the rare studies, Mosleh Shirazi et al. (2013) found out that managers who are not owners are weaker in social capital than owner-managers. This could lead to different effects of organisational network capability on financial performance.

H3a: Organizational networking capability positively and statistically significantly affects the financial performance of owner-manager and manager HGCs.

H3b: There is a moderated effect of (co)ownership on the relationship between organisational networking capability and HGCs' financial performance.

2.3.4 External financial resources diversity, financial performance and ownership

The importance of financial resources as one of the essential resources for the exploitation of opportunities has already been stressed by past theories (Shane, 2003), as insufficient and inadequate financial resources will lead to all sorts of problems related to companies' development, growth and existence. In line with resource-based theory, adequate financial resources will create competitive advantages and the long-term preservation of companies (Eisenhardt & Martin, 2000) and will shape their business strategies (Belenzon et al., 2020). The importance of financial resources is even more highlighted with HGCs. HGC will require extensive financial resources to manage opportunities that will enable growth. In that aspect, Brüderl & Preisendörfer (2000) found that the amount of financial capital invested will significantly impact the likelihood of the company achieving high growth. This will lead HGC to implement different financing strategies as a non-growth company. The critical feature concerns external financial resources (Frešer, 2022), as HGCs are in some cases not able to cover all of their financial requirements using only their sources of financing – retained profits (Vanacker & Manigart, 2010); instead, HGCs are more likely to use a cocktail of financial resources from various providers (Brown & Lee, 2014). There is no doubt that sufficient financial resources can positively contribute to financial performance as an essential link between access to external financial resources and financial performance was shown in past (Memon et al., 2020). Diversity and accessibility of financial resources can also more efficiently distribute risks, leading to better performance. There could also be different levels of propensity between owner-managers and managers to use different external financial resources. Thus, owners could be more prone to finance through their sources (retained profits) and with negligible debt levels to control the company (Hamilton & Fox, 1998). On the other hand, it was found that managers' ownership status has a statistically significant and positive association with their level of preference towards different sources of financing (Zabri et al., 2015). The possible existence of differences between owner-manager and manager could lead to different impacts on financial performance between the two groups.

H4a: External financial resources diversity positively and statistically significantly affects the financial performance of owner-manager and manager HGCs.

H4b: There is a moderated effect of (co)ownership on the relationship between external financial resources diversity and HGCs' financial performance.

3 Methodology and data

3.1 Sample and data collection

The research model is based on the population of companies that were recorded as HGCs (and thus fulfilling multiple criteria on which HGCs are determined) at least once between 2011 and 2016, based on the methodology of the Agency of the Republic of Slovenia for Public Court Records and Related Services (SI: AJPES; Slovenia). Based on this population, 8,194 HGCs were identified. Data was collected in May and June 2022 using the online survey, where 4,049 HGC e-mail addresses were publicly available. The final sample size was n = 119 HGCs after considering all assumptions: (i) the questionnaire was completed by competent individuals, i.e., individuals with experience at the top management level of HGCs (one of the questions in the questionnaire was the position of respondent in the

Table 1: Sample distribution - external financial resources diversity (FRD)

Number of different external financial resources used by HGCs	0	1	2	3	4	5	6	7	Together
fk	5	19	23	30	30	8	4	0	119
fk %	4.2	16.0	19.3	25.2	25.2	6.7	3.4	0	100 %

Source: Own

company, based on which we were able to filter and select just the respondents with top management experiences). We assume that these individuals are responsible individuals in HGCs (managers), as they have the most knowledge about what is happening in the HGCs where they are employed, and (ii) we asked respondents to answer the questions from the perspective of the whole company as one organisation (in the questionnaire preface).

The characteristics of the sample show that out of 119 respondents, 75 (63 %) were male, while 44 (37 %) were female. Ninety-two respondents were also (co)owners of HGC, i.e. owner-managers (representing 77.3 %), while 27 (22.7 %) respondents were managers in HGCs and had no ownership claims. As shown in Table 1, 5 HGCs (4.2 %) included in the survey did not use any external financial resource, while 12 HGCs (10.1 %) did use five or more analysed external financial resources in their operations. On average, HGCs included in the survey used 2.8 different external financial resources out of the seven analysed: (i.) suppliers and other business partners, (ii.) business angels, (iii.) venture capital investors, (iv.) banks, (v.) national programmes and subsidies, (vi.) European Union funds and (vii.) non-formal sources of financing (financial resources from friends and family).

3.2 Measurement scales

The measurement instrument for the survey was designed on existing and validated measurement scales. The basis for measuring entrepreneurial orientation is Hughes and Morgan's scale (2007), which is also recommended by Covin & Wales (2012) as one of the better scales. Organisational networking capability was developed by Mu & Di Benedetto (2012). The measurement of HGC's financial performance was developed based on recommendations in the literature (e.g. Chen et al., 2005). The survey also analyses seven external financial resources based on experiences most common in the Republic of Slovenia. A complete list of measurement items is provided in Appendix A.

Based on measurement scales, exploratory factor analysis (EFA) was conducted (m = number of items included in factor, α = Cronbach's alpha, KMO – Kaiser-Meyer-Oklin Measure of Sampling Adequacy, BT – Bartlett's Test of Sphericity-Chi Square).

1. Entrepreneurial orientation was defined with two factors in line with previous literature (e.g. Hughes & Morgan, 2007). First factor is EO_1 (risk-taking), m = 3, α = 0.707. The second factor is EO_2 (innovativeness and proactiveness), m = 9, α = 0.905. EFA for EO shows that KMO is 0,876 and BT (Chi-Square = 750.744; p = 0.000), total variance explained = 60.44 %.

2. Organisational networking capability was defined as one factor. NC_1 (organisational networking capability), m = 9 (two items were excluded to match the corresponding EFA criteria), α = 0.945, KMO = 0.888, BT (Chi-Square = 1,005.605; p = 0.000), total variance explained = 70.02 %.

3. Financial performance was defined as one factor. FP_1 (financial performance), m = 5, α = 0.951, KMO = 0.820, Bartlett's test (BT) (Chi-Square = 699.029; p = 0.000), total variance explained = 83.92 %.

3.3 Data analysis

The empirical analysis was performed using regression analysis based on EFA results. Analysis was performed using IBM SPSS Statistics 27 software. EFA was designed with key recommendations in past literature: KMO > 0.5; BT significant with Chi-square statistically significant; communalities > 0.4 total variance explained > 60 %; factor loading > 0.50 for samples with a size larger than n = 100 (Yong & Pearce, 2013: 88; Costello & Osborne, 2005). A comparison of two regression models based on ownership of HGC (group one – respondents are also (co) owners, and group two – respondents are not (co)owner of HGC) was made according to guidelines from UCLA (2021) for the analysis of moderated effects of (co)ownership on selected determinants.

4 Results

The results of the regression analysis are presented. Regression analysis was performed in two steps. The first regression analysis was prepared separately for HGCs where respondents were owner-managers (model 1) and the second for HGCs where respondents were managers (model 2). The next step was to check if statistically significant differences between model 1 and model 2 exist (model 3). The results presented below show some important findings.

4.1 Regression models based on (co) ownership

Using a split file, two regression models were created. For both correlation coefficient (R), the adjusted coefficient of determination (adj. R Sq.) and standard error of the estimate (std. err.) were checked.

1. Model 1: R = 0.662; adj. R Sq = 0.413; std. Err. = 0.798. The overall regression was statistically significant, F(4, 87) = 17.003; p = 0.000. R of 0.662 indicates that there is a moderate correlation (Schober, 2018) between independent (EO_1, EO_2, NC_1, financial resources diversity) and dependent variable (FP_1). Adj. R Sq indicates that independent variables explain 41.3 % of the variation in the FP_1.

2. Model 2: R = 0.678; adj. R Sq = 0.362; std. Err. = 0.678. The overall regression was statistically significant,

F(4, 22) = 4.678; p = 0.007. R of 0.678 indicates the existence of a moderate correlation. Adj. R Sq indicates that independent variables explain 36.2 % of the variation in the FP_1.

In both regression models' null hypotheses, H0: R2 = 0 is rejected at a statistically significant level p < 0.05.

Results of statistically significant independent variables from model 1 and model 2 are presented in Table 2. Both models show that EO_1 has a statistically significant and positive impact on FP_1. In model 1, where respondents are also (co)owners, one additional statistically significant impact is recorded, i.e. between NC_1 → FP_1 (β = 0.317, p = 0.002), while in model 2, the impact between two variables is not statistically significant (β = -0.193, p = 0.290).

Table 2: Regression models based on (co)ownership

		β	Std. error	t stat	P-value	VIF statistics**
Model 1	Constant	0.251	0.185	1.355	0.179	
	EO_1	0.418	0.096	4.341	0.000	1.407
	EO_2	-0.004	0.094	-0.038	0.970	1.075
	NC_1	0.318	0.097	3.277	0.002	1.432
	FRD*	-0.093	0.060	-1.552	0.124	1.021
Model 2	Constant	0.409	0.385	1.061	0.300	
	EO_1	0.632	0.159	3.984	0.001	1.099
	EO_2	0.163	0.155	1.053	0.304	2.097
	NC_1	-0.193	0.178	-1.084	0.290	1.441
	FRD*	-0.123	0.113	-1.090	0.288	1.535

Dependent variable: FP_1
Note: * FRD – financial resources diversity (see Table 1), **VIF statistic > 5 would indicate a high existence of multicollinearity (Shrestha, 2020: 40)
Source: Own

Table 3: Comparison of regression coefficients

		β	Std. error	t stat	P-value
Model 3	Constant	0.273	0.166	1.649	0.102
	EO_1	0.632	0.181	3.500	0.001
	EO_2	0.133	0.152	0.877	0.382
	NC_1	-0.183	0.200	-0.914	0.363
	FRD	-0.086	0.064	-1.339	0.183
	EO_1*OWN	-0.215	0.203	-1.058	0.292
	EO_2*OWN	-0.136	0.176	-0.772	0.442
	NC_1*OWN	0.500	0.221	2.265	0.025
	FRD_OWN	-0.014	0.052	-0.265	0.791

Dependent variable: FP_1
Source: Own

4.2 Comparison of regression coefficients between model 1 and 2

A comparison of regression coefficients was done based on UCLA (2021) guidelines. First, a dummy variable was created called OWN (value one was set to respondents who are also (co)owners, and value zero was set to respondents who are not (co)owners of HGC). Second, variables representing the product between the independent variable and variable OWN were created: EO_1*OWN, EO_2*OWN, NC_1*OWN, and FRD*OWN. A new regression model with starting and newly calculated variables was formed to analyse moderated effects (model 3: R = 0.666; adj. R Sq = 0.403; std. err. = 0.772. The overall regression was statistically significant, $F(8, 110) = 10.972$; $p = 0.000$). The results of the regression coefficient comparison are shown in Table 3.

With model 3, the null hypothesis H0: $\beta1 = \beta2$ for each original independent variable was tested, where $\beta1$ is the regression coefficient for respondents who are also (co) owners of HGC (model 1) and $\beta2$ is the regression coefficient for respondents who are not (co)owners of HGC (model 2). As the results show, the regression coefficient for variable NC_1*OWN is statistically significant ($p = 0.025$), meaning that NC_1 will have statistically significant different impacts on FP_1 in relation to (co)ownership. The result implies that when managers are also (co) owners of HGC, NC_1 will have a statistically significantly more pronounced impact on FP_1 and that, thus, a moderated effect of (co)ownership on the relationship between risk-taking and HGC financial performance exists.

5 Discussion and conclusion

5.1 Key findings and theoretical implications

The paper analyses the relationship between selected growth determinants highlighted in previous literature as one of the most critical determinants enabling HGC growth and development, with a meaningful connection to financial performance and HGC ownership. Our paper is based on findings from previous literature (e.g. Bouras & Gallali, 2017) that show that company performance is positively related to the percentage of equity held by managers and the percentage of their equity-based compensation. We want to contribute to these findings by determining for which growth determinants, equity-related manager compensation, can positively influence HGC's financial performance.

Not surprisingly, results showed that risk-taking (EO_1) has a statistically significant and positive impact on the financial performance of both owner-manager and manager HGCs, supporting findings from previous literature (Mahto & Khanin, 2020). As suggested in previous literature and in line with agent-principal theory, there could be different risk-taking propensity levels between owner-managers and managers, as when managerial ownership increases, the level of risk-taking could decrease (Chen et al., 2014), leading to different impacts of risk-taking on financial performance for owner-manager and manager HGC. Even though it can be seen from Table 2 that there are some differences between owner-managers and managers' HGC regression coefficients analysing influence of risk-taking on financial performance, the results, in this case, show that (co)ownership does not have an essential impact on forming the influence of risk-taking on HGC's financial performance, suggesting that regarding risk-taking as a growth determinant additional equity compensation or ownership, will not have a significant impact on HGC's financial performance.

Results show that for both cases – owner-manager and manager HGC – innovativeness and proactiveness (EO_2) do not significantly impact HGC's financial performance, supporting previous findings that innovativeness studies are vastly diverse, with different impacts recorded. Some authors (e.g. Ng et al., 2020; Shashi et al. 2019) reported positive relations between innovation and a company's financial performance, while others found a negative direct impact of innovation on financial performance (e.g. Gök & Peker, 2017). Past literature also suggests that different levels of innovativeness and proactiveness between owners and managers may exist (Aghion et al., 2013; Kuczmarski, 1996), which could lead to different impacts of innovativeness and proactiveness on the financial performance of owner-manager and manager HGCs. It's also critical to emphasise that innovativeness was analysed in our paper as one construct. On the other hand, innovativeness can be divided into many conceptual approaches covering technology-, behaviour-, and product-related innovativeness (Salavou, 2004). Owners and managers could have different desires for innovativeness (Aghion et al., 2013) and thus also have a different propensity to technology, behaviour or product-related changes. Thus, analysing and measuring innovativeness as separate factors could also be beneficial. In addition, our results show that (co)ownership does not have an essential impact on forming the influence of innovativeness and proactiveness on HGC's financial performance, suggesting that regarding this growth determinant, additional equity compensation or ownership in HGC will not significantly impact financial performance.

Regarding organisational network capability (NC_1) for owner-manager HGCs, results support the previous findings that this growth determinant can positively affect financial performance (Wang et al., 2021; Kurniawan et al., 2021). Organisational networking capability as the capability of the company/organisation to exploit its existing network connections to achieve a (re)configuration

of resources and competitive strategic advantages (Mu & Di Benedetto, 2012) is, in that way, directly connected to RBT, as it can provide the company with the set of heterogeneous, valuable, rare and immobile production resources that the competition cannot completely emulate (Barney, 1991), thus forming a competitive advantage leading to economic value creation and leading to higher financial performance. Results also show that organisational networking capability has statistically significant different impacts on financial performance when analysing groups of owner-manager and manager HGCs, suggesting that in owner-manager HGCs, organisational networking capability will have a more pronounced impact on company financial performance. As it was already pointed out by Mosleh Shirazi et al. (2013), managers who are not owners are weaker in social capital. This finding is not only validated in our study, but it is also extended to the company's financial performance. The results show that (co)ownership has an essential impact on forming the influence of organisational networking capability on HGC's financial performance, suggesting that regarding this growth determinant, additional equity compensation or ownership in HGC will significantly impact the company's financial performance. This is an essential theoretical contribution to the research field. Regarding organizational networking capability, our paper builds upon previous literature and RBT, supporting previous findings regarding the significant importance of networking capability to enable companies' resources that will enable competitive advantage and, thus, better performance. In addition, our paper builds on Mosleh Shirazi's (2013) findings, suggesting that different levels of network capacity exist between managers and owner-managers. The difference was shown in our paper as having a decisive role in shaping the financial performance of HGCs. The difference between managers and owners-managers regarding network capability and its relationship to financial performance can also be viewed by the principal-agent theory perspective, where when agents (managers) have equity (or (co)ownership) in the company, they are more likely to embrace and fulfil the actions desired by principals and behave in principal interests (Eisenhardt, 1989), meaning they would be more willing to use their network capability and social capital knowledge and skills to gain profit for the company.

External financial resources diversity (FRD) was found not to have a statistically significant effect on HGCs' financial performance in both groups – i.e. owner-manager and manager HGCs, and there is no relation of (co)ownership on forming the influence of external financial resources diversity on HGC's financial performance. Even though there are findings that sufficient external financial resources can positively contribute to financial performance (Memon et al., 2020), their diversity in our study was shown as a statistically uninfluential factor.

As is shown with principal-agent theory, differences between principals (owners) and agents (managers) can lead to different goals, as in usual circumstances, managers will not maximise shareholder wealth (Smith & Stulz, 1985). Here, ownership or equity-based compensation can have an important role. When agents have equity (or (co)ownership) in the company, they are more likely to embrace and fulfil the actions desired by principals and behave in principal interests (Bendickson et al., 2016; Eisenhardt, 1989), leading to higher HGC financial performance. Our study made a significant contribution, showing that (co)ownership and, with this equity-based compensation, can significantly contribute to better HGC financial performance through organisational networking capability.

5.2 Practical implications

Our study has practical implications for HGCs and policymakers seeking higher financial performance and development. Penrose (1959) pointed out that financial performance is crucial and can be compromised with extensive growth. The first contribution of our paper is thus to figure out which growth determinants positively influence HGC's financial performance. Concerning this, decision-makers can focus more on the growth determinants highlighted to shape financial performance positively. In the case of our paper, this are risk-taking and organisational network capability. Managers and owner-managers can thus build on their network capability and other determinants of entrepreneurial orientation by participating in different supporting programs prepared by and driven by government policies. Examples of successful programmes that promote the motivation to achieve more remarkable growth through a supportive environment come from Ireland (the Going for Growth in Ireland programme) and Sweden (Mentor Eget Företag) (OECD/European Union, 2015: 14). These programmes encourage and support entrepreneurs in their entrepreneurial pursuits, through appropriate mentoring and education, supporting the development of entrepreneurial orientation (including innovativeness) and networking capability.

The second contribution, in line with the paper's aim, can be derived from findings that show that growth determinants, such as equity-related manager compensation, positively influence HGC's financial performance. The results confirm previous literature suggesting that correct incentives for managers can significantly enhance a company's performance (Bouras & Gallali, 2017). Decision-makers can thus strive to enhance equity-based compensations, as it was shown that (co)ownership has a crucial positive influence on shaping HGCs' financial performance through organisational networking capability. It is also vital that (co)ownership and equity-based compensation will not statistically significantly worsen the HGC financial performance through other growth determinants.

Table 4: Overview of Hypotheses Acceptance

H1a	H1b	H2a	H2b	H3a	H3b	H4a	H4b
Accepted	Rejected	Rejected	Rejected	Accepted	Accepted	Rejected	Rejected

Source: Own

This is essential for policymakers aiming to create a business environment enabling growth, development and financial prosperity. Policymakers can support equity-based compensations through different tax systems, enabling tax benefits for equity-based compensations, as past theory suggests tax rules can significantly affect equity-based compensation behaviour (Widdicks & Zhao, 2014). Additional equity-based compensations could also support the innovative tendencies of companies, as they will successfully build company financial performance through different determinants – meaning there will be more money available in the future to cover extensive needs to finance large innovative projects.

Thus, policymakers could encourage policies promoting equity ownership among high-growth companies' managers and employees (HGCs). This can be in the form of stock options, equity-based compensation, or other ownership structures. Such policies can align the interests of managers and employees with those of the company, potentially leading to better financial performance. To support organisational networking capability, policymakers can support initiatives that enhance the organisational networking capability of HGCs. This can include providing resources for training, fostering business networks, and facilitating partnerships to help HGCs build robust and effective social capital. This is especially relevant for owner-manager HGCs, where networking capability can significantly impact financial performance.

Additionally, implications that may be important for HGCs may include the following viewpoints. HGCs should consider implementing equity-based compensation for managers and employees. This can serve as a tool to align incentives, motivate, and engage key personnel in the success and growth of the company. HGCs, especially owner-manager HGCs, should invest in building and leveraging their networking and social capital (for example, actively participating in industry events, forming strategic alliances, and fostering relationships with key stakeholders).

HGCs should also focus on risk-taking by carefully balancing their risk-taking strategies, especially in owner-manager HGCs, where the relationship between managerial ownership and risk-taking may be more complex. While the study found that external financial resource diversity did not significantly impact HGCs' financial performance, policymakers can still encourage HGCs to diversify their funding sources. This can help HGCs better navigate financial challenges and access various types of financial support. A diverse funding base can provide financial stability and reduce dependence on a single source. Considering the implications of management structure and (co)ownership on financial performance, HGCs should evaluate whether a combination of equity-based compensation, (co)ownership and organisational networking capability can contribute to improved financial outcomes.

5.3 Limitations and directions for future research

The research paper examines the specific context of HGCs to contribute to previous theories suggesting that company performance can be positively related to the percentage of equity managers hold and fill the research gap by including growth determinants. We do this with the empirical model combining selected growth determinants with financial performance and including the moderated effect of (co)ownership. This research paper is subjected to a few limitations. The first limitation concerns the analysis of moderated effects, which are the most popular procedure in the context but are often subjected to some concerns and challenges (Helm & Mark, 2012). The second limitation is related to the research model, where only selected growth determinants were analysed. Another limitation arises from the sample – even though the study is based on a representative sample, there are some limitations regarding online surveys, i.e., email address availability. It is also important to note that measurement scales, even though they are recognised in past literature to measure analysed determinants, represent subjective measures. More objective measures could be implemented in the future, to measure analysed determinants better – e.g. innovativeness could be additionally measured with objective measures like patent counts, R&D investments, etc., adding validity and reliability to research findings. Several future research directions are also possible. As HGC research is a diverse and heterogeneous research field, an open issue for further research is analysing research models across other datasets. As the generally accepted definition of HGCs does not exist (Moreno & Casillas, 2007), the research findings are limited to the specific selected context of Slovenia, and comparison with findings of international or other specific country contexts can be limited. As growth is a very heterogeneous phenomenon, criteria defining HGCs differs

between countries and could also be subjected to cultural, institutional or other economic factors. This leads to differences in samples and hardens the direct comparison of the research findings. Thus, the suggested research model could also be used on other samples of HGCs from different countries and contexts to confirm the model's validity. Next, another possibility lies in including and analysing growth determinants not primarily included in the model. Our research only covers a few of the most important ones in relation to article context. Selected growth determinants could be analysed more in-depth, adding additional context. The determinants of entrepreneurial orientation could be additionally divided. For example, innovativeness as one of the critical determinants of a company's performance could be analysed more in-depth by examining the importance of different innovation types. Adding additional growth determinants and other in-theory emphasised factors or analysing existing determinants in more depth would result in a more sophisticated research model that could contribute to theory and practice even more. Additionally, to the quantitative approach presented in the paper, qualitative research methods could also be used. With qualitative methods like case study analysis or in-depth interviews, better insight into the analysed topic could be obtained, providing a better understanding of any additional challenges, limitations or best practices that could be used to develop theoretical and practical implications.

Literature

Aghion, P., Van Reenen, J., & Zingales, L. (2013). Innovation and Industrial Ownership. *American Economic Review*, 103 (1), 277-304. DOI: 10.1257/aer.103.1.277

Ahmed, A. M., Nugraha, D. P., & Hagen, I. (2023). The Relationship between Capital Structure and Firm Performance: The Moderating Role of Agency Costs. *Risks*, 11 (6), 1-17. DOI: https://doi.org/10.3390/risks11060102.

Alvarez-Torres, J. F., Lopez-Torres, C. G., & Schiuma, G. (2019). Linking entrepreneurial orientation to SMEs' performance: Implications for entrepreneurship universities. Management Decision, 57 (12), 3364-3386. DOI: DOI 10.1108/MD-11-2018-1234

Barney, B. J., Ketchen Jr., J. D. & Wright, M. (2021). Resource-Based Theory and the Value Creation Framework. *Journal of Management*, 47 (7), 1936-1955. DOI: https://doi.org/10.1177/01492063211021655

Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17 (1), 99-120. DOI: https://doi.org/10.1177/014920639101700108

Belenzon, S., Chatteriji, A. K., & Daley, B. (2020). Choosing between growth and glory. *Management Science*, 66 (5), 2050-2074. DOI: https://doi.org/10.1287/mnsc.2019.3296

Bendickson, J., Muldoon, J., Liguori, W. E. &Davis, E. P. (2016). Agency theory: background and epistemology. *Journal of Management History*, 22 (4), 437–449. DOI: https://doi.org/10.1108/JMH-06-2016-0028

Bisztray, M., de Nicola, F., & Muraközy, B. (2023). High-growth firms' contribution to aggregate productivity growth. *Small Business Economics*, 60 (2), 771-811. DOI: https://doi.org/10.1007/s11187-022-00614-9

Bouras, M., & Gallali, I. M. (2017). Managerial Ownership, Board of Directors, Equity-based Compensation and Firm Performance: A Comparative Study between France and the United States. *Mediterranean Journal of Social Sciences*, 8 (1), 78-95. DOI: 10.5901/mjss.2017.v8n1p78

Brockhaus, R H. jr. (1980). Risk Taking Propensity of Entrepreneurs. *Academy of Management Journal*, 23, 509–520. DOI: https://doi.org/10.2307/255515

Brown, R., & Lee, N. (2014). *Funding issues confronting high growth SMEs in the UK*. Edinburgh, UK: ICAS. ISBN 9781909883055

Brüderl, J., & Preisendörfer, P. (2000). Fast-growing businesses: Empirical evidence from a German study. *International Journal of Sociology*, 30 (3), 45-70. DOI: https://doi.org/10.1080/15579336.2000.11770218

Caldwell, C., Karri, R., & Vollmar, P. (2006). Principal Theory and Principle Theory: Ethical Governance from the Follower's perspective. *Journal of Business Ethics*, 66 (2/3), 207-223. DOI: https://www.jstor.org/stable/25123826

Chaston, I., & Sadler-Smith, E. (2012). Entrepreneurial Cogniton, Entrepreneurial Orientation and Firm Capability in the Creative Industries. *British Journal of Management*, 23 (3), 415-432. DOI: https://doi.org/10.1111/j.1467-8551.2011.00752.x

Chen, M.-C., Cheng, S.-J., & Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *Journal of Intellectual Capital*, 6 (2), 159-176. DOI: https://doi.org/10.1108/14691930510592771

Chen, R. C., Steiner, L. T., & Whyte, M. A. (2014). Risk-taking behavior and management ownership in depository institutions. *Journal of Financial Research*, 21 (1), 1–16. DOI: https://doi.org/10.1111/j.1475-6803.1998.tb00266.x

Chen, W-H., Kang, M-P., & Butler, B. (2019). How does top management team composition matter for continual growth? Reinvestigating Penrose's growth theory through the lens of upper echelons theory. *Management Decision*, 57 (1), 41-70. DOI: https://doi.org/10.1108/MD-02-2017-0147

Coad, A., Dominick, C., Flachnecker, F., Harasztosi, P., Janiri, L. M., Pal. R., & Teruel, M. (2022). Capacity constraints as a trigger for high growth. *Small Business Economics*, 59, 893-923. DOI: https://doi.org/10.1007/s11187-021-00558-6

Correa, S. V., Queiroz, M. M., Cruz, A. M., & Shigaki, B. H. (2022). Entrepreneurial orientation far beyond opportunity: the influence of the necessity for innova-

tiveness, proactiveness and risk-taking. *International Journal of Entrepreneurial Behavior & Research,* 28 (4), 1355-2554. DOI: https://doi.org/10.1108/IJEBR-06-2021-0518

Costello, A. B., & Osborne, W. J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10 (7), 1–9. DOI: https://doi.org/10.7275/jyj1-4868

Covin, G.J., & Wales, J.W. (2012). The Measurement of Entrepreneurial Orientation. *Entrepreneurship Theory and Practice*, 36, 677–702. DOI: https://doi.org/10.1111/j.1540-6520.2010.00432.x

Effelsberg, D., Solga, M., & Gurt, J. (2014). Getting Followers to Transcend Their Self-Interest for the Benefit of Their Company: Testing a Core Assumption of Transformational Leadership Theory. *Journal of Business and Psychology*, 29 (1), 131-143. DOI: https://doi.org/10.1007/s10869-013-9305-x

Eisenhardt, K.M. (1989). Agency theory: an assessment and review. *Academy of Management Review*, 14, 57-74. DOI: https://www.jstor.org/stable/258191

Eisenhardt, M. K., & Martin, A. J. (2000). Dynamic capabilities: What are they?. *Strategic Management Journal*, 21 (1), 1105–1121. DOI: https://www.jstor.org/stable/3094429

Fraser, S., Bhaumik, K. S., & Wright, M. (2015). What do we know about entrepreneurial finance and its relationship with growth?. *International Small Business Journal: Researching Entrepreneurship,* 33 (1), 70-88. DOI: https://doi.org/10.1177/0266242614547827

Frešer, B (2022). Multidimensional Model of High-Growth Companies: Do COVID-19 and the Ukraine-Russia Crisis Lead to Differences?. *Sustainability*, 14 (22), 1-25. DOI: https://doi.org/10.3390/su142215278

Ghanbarpour, T., & Gustafsson, A. (2022). How do corporate social responsibility (CSR) and innovativeness increase financial gains? A customer perspective analysis. *Journal of Business Research,* 140, 471-481. DOI: https://doi.org/10.1016/j.jbusres.2021.11.016

Gök, O., & Peker, S. (2017). Understanding the links among innovation performance, market performance and financial performance. *Review of Managerial Science*, 11, 605-631. DOI: https://doi.org/10.1007/s11846-016-0198-8

Hamilton, T. R., & Fox, A. M. (1998). The financing preferences of small firm owners. *International Journal of Entrepreneurial Behavior & Research*, 4 (3), 239–248. DOI: https://doi.org/10.1108/13552559810235529

Haubrich, J. G. (1994). Risk Aversion, Performance Pay, and the Principal-Agent Problem. *Journal of Political Economy,* 102 (2), 258-276. DOI: 10.1086/261931

Helm, R., & Mark, A. (2012). Analysis and evaluation of moderator effects in regression models: state of art, alternatives and empirical example. *Review of Managerial Science*, 6, 307–332. DOI: https://doi.org/10.1007/s11846-010-0057-y

Hughes, M., & Morgan, E. R. (2007). Deconstructing the relationship between entrepreneurial orientation and business performance at the embryonic stage of firm growth. *Industrial Marketing Management*, 36 (5), 651–661. DOI: https://doi.org/10.1016/j.indmarman.2006.04.003

Hurtado-Palomino, A., De La Gala-Valasquez, B., & Merma-Valverde, W. F. (2024). The Synergistic Efforts of Innovativeness, Risk-taking and Proactiveness on Performance of Tourism Firms. *Tourism Planning and Development,* 21 (2), 178-199. DOI: https://doi.org/10.1080/21568316.2021.2001036

Jensen, M.C., & Meckling, W.H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal Financial Economics*, 3, 305-360. DOI: https://doi.org/10.1016/0304-405X(76)90026-X

Khoreva, V., & Wechtler, H. (2020). Exploring the consequences of knowledge hiding: an agency theory perspective. *Journal of Managerial Psychology*, 35 (2), 71-84. DOI: https://doi.org/10.1108/JMP-11-2018-0514

Kim-Soon, N., Ahmad, R.A., & Poh, C.Y. (2017). Improving small and medium enterprises financing for more robust financial and non-financial performance. *Advanced Science Letters,* 23, 3025–3028. DOI: https://doi.org/10.1166/asl.2017.7641

Kowala, R., & Šebestova, J. D. (2021). Using stewardship and agency theory to explore key performance indicators of family businesses. *Forum Scientiae Oeconomia*, 9 (4), 9-30. DOI: https://doi.org/10.23762/FSO_VOL9_NO4_1

Kreiser, M. P., Marino, D. L., Kuratko, F. D., & Weaver, K. M. (2013). Disaggregating entrepreneurial orientation: The non-linear impact of innovativeness, proactiveness and risk-taking on SME performance. *Small Business Economics*, 40 (2), 273-291. DOI: https://doi.org/10.1007/s11187-012-9460-x

Kuczmarski, D. T. (1996). What is innovation? The art of welcoming risk. *Journal of Consumer Marketing,* 13 (5), 7-11. DOI: https://doi.org/10.1108/07363769610130846

Kurniawan, R., Budiastuti, D., Hamsal, M., & Kosasih, W. (2021). Networking capability and firm performance: the mediating role of market orientation and business process agility. *Journal of Business and Industrial Marketing*, 36 (9), 1646-1664. DOI: https://doi.org/10.1108/JBIM-01-2020-0023

Landström, H. (2010). *David Birch*, in: Landström, H. (ed.). Pioneers in entrepreneurship and small business research, USA, Springer, 159-172.

Lau, C. H., & Michie, J. (2024). Penrose's theory of the firm in an era of globalisation. *International Review of Applied Economics*, 38 (1-2), 155-174. DOI: https://doi.org/10.1080/02692171.2022.2117284

Laur, I., & Mignon, I. (2021). Match or mismatch between gazelle companies' challenges and the support provided by intermediary actors-an empirical example of the

construction industry. *European Planning Studies*, 29 (10), 1845-1869. DOI: https://doi.org/10.1080/09654313.2021.1889477

Lukkarinen, A., Teich, E. J., Wallenius, H., & Wallenius, J. (2016). Success drivers of online equity crowdfunding campaigns. *Decision Support Systems*, 87, 26-38. DOI: https://doi.org/10.1016/j.dss.2016.04.006

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, 21, 135–172. DOI: https://doi.org/10.2307/258632

Mahto, V. R., & Khanin, D. (2020). Satisfaction with Past Financial Performance, Risk Taking, and Future Performance Expectations in the Family Business. *Journal of Small Business Management*, 53 (3), 801-818. DOI: https://doi.org/10.1111/jsbm.12088

McGrath, G. R., Tsai, H.-M., Venkataraman, S., & MacMillan, C. I. (1996). Innovation, competitive advantage and rent: A model and test. *Management Science*, 42 (3), 389–403. DOI: https://doi.org/10.1287/mnsc.42.3.389

Memon, A., Yong An, Z., & Memon, Q. M. (2020). Does financial availability sustain financial, innovative, and environmental performance? Relation via opportunity recognition. *Corporate Social Responsibility and Environmental Management,* 27 (2), 562-575. DOI: https://doi.org/10.1002/csr.1820

Meng, Y., & Yin, C. (2019). Trust and the cost of debt financing. *Journal of International Financial Markets, Institutions and Money,* 59, 58-73. DOI: https://doi.org/10.1016/j.intfin.2018.11.009

Miller, D. (1983). The correlates of entrepreneurship in three types of firms. *Management Science*, 29 (7), 770–791. DOI: https://doi.org/10.1287/mnsc.29.7.770

Moreno, M. A., & Casillas, C. J. (2007). High-growth SMEs versus non-high-growth SMEs: A discriminant analysis. *Entrepreneurship & Regional Development*, 19, 69-88. DOI: https://doi.org/10.1080/08985620601002162

Mosleh Shirazi, N. A., Mohamadi, A., Jahangiri, J., & Zahed, K. R. (2013). A Comparison of Social Capital between Owner-Managers and Professional Managers. *Global Journal of Science, Engineering and Technology*, 8, 48-57.

Mu, J., & Di Benedetto, A. (2012). Networking capability and new product development. *IEEE Transactions on Engineering Management*, 59 (1), 4-19. DOI: 10.1109/TEM.2011.2146256

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *The Academy of Management Review*, 23 (2), 242–266. DOI: 10.2307/259373

NG, H. S., Kee, D. M. H., & Ramayah, T. (2020). Examining the mediating role of innovativeness in the link between core competencies and SME performance. *Journal of Small Business and Enterprise Development,* 27 (1), 103-129. DOI: https://doi.org/10.1108/JSBED-12-2018-0379

OECD/European Union (2015). *The Missing Entrepreneurs 2015: Policies for Self-employment and Entrepreneurship*, OECD Publishing, Paris. DOI: https://doi.org/10.1787/9789264226418-en.

Penrose, E. (1959). *The Theory of the Growth of the Firm*. Oxford, UK: Oxford University Press.

Putninš, T. J., & Sauka, A. (2020). Why does entrepreneurial orientation affect company performance. *Strategic Entrepreneurship Journal*, 14 (4), 711-735. DOI: https://doi.org/10.1002/sej.1325

Rauch, A., Wikludn, J., Lumpkin, G .T., & Frese, M. (2009). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. *Entrepreneurship Theory and Practice*, 33 (3), 761–787. DOI: https://doi.org/10.1111/j.1540-6520.2009.00308.x

Rocha, G. R., & Ferreira, J. J. (2022). Gazelles (High-growth) Companies: a Bibliometric Science Map of the Field. *Journal of the Knowledge Economy,* 13, 2911-2934. DOI: https://doi.org/10.1007/s13132-021-00828-4

Salavou, H. (2004). The concept of innovativeness: should we need to focus?. *European Journal of Innovation Management,* 7 (1), 33-44. DOI: https://doi.org/10.1108/14601060410515628

Santoleri, P. (2021). Innovation and job creation in (high-growth) new firms. *Industrial and Corporate Change*, 29 (3), 731-756. DOI: https://doi.org/10.1093/icc/dtz059

Sasmito, T., Nugroho, M., & Shihab Ridwan, M. (2023). The impact of organizational capability, external networking, entrepreneurism, competitive advantage, and social responsibility (CSR) on performance. *Uncertain Supply Chain Management*, 11 (2), 833-842. DOI: 10.5267/j.uscm.2022.12.007

Scherer, F. M. (1965). Corporate inventive outputs, profits, and growth. *Journal of Political Economy*, 73 (3), 290-297. DOI: https://doi.org/10.1086/259017

Schillo, S. (2011). Entrepreneurial orientation and company performance: Can the academic literature guide managers?. *Technology Innovation Management Review*, 1 (2), 20-25. DOI: http://doi.org/10.22215/timreview/497

Schober, P. (2018). Correlation Coefficients: Appropriate Use and Interpretation. *Anesthesia & Analgesia*, 126 (5), 1763-1768. DOI: 10.1213/ANE.0000000000002864

Shane, S. (2003). *A general theory of entrepreneurship. The individual-opportunity nexus*. Chaltenham, UK: Edward Elgar.

Shashi, Centobelli, P., Cerchione, R., & Singh, R. (2019). The impact of leanness and innovativeness on environmental and financial performance: Insights from Indian SMEs. International Journal of Production Economics, 212, 111-124. DOI: https://doi.org/10.1016/j.ijpe.2019.02.011

Sheppard, M. (2023). The behavioural gap between entrepreneurial SME's and high growth: evidence from

Canada. *International Entrepreneurship and Management Journal*, 19 (1), 427-449. DOI: https://doi.org/10.1007/s11365-023-00832-x

Shrestha, N. (2020). Detecting Multicollinearity in Regression Analysis. *American Journal of Applied Mathematics and Statistics,* 8 (2), 39–42. DOI: 10.12691/ajams-8-2-1

Smith, A. (1776). *An Inquiry into the Wealth Of Nations*. London: Strahan and Cadell.

Smith, W. C., & Stulz, M. R. (1985). The Determinants of Firms' Headging Policies. *The Journal of Financial and Quantitative Analysis*, 20 (4), 391–405. DOI: https://doi.org/10.2307/2330757

Sorama, K., & Joensuu-Salo, S. (2023). Entrepreneurial Orientation, Firm Growth and Performance in SMEs: Testing the Scale of EO in SME Context. *Entrepreneurship Research Journal*, 13 (3), 601-629. DOI: https://doi.org/10.1515/erj-2021-0175

Suifan, T. (2021). How innovativeness mediates the effects of organizational culture and leadership on performance. *International Journal of Innovation Management*, 25 (2), 2150016. DOI: https://doi.org/10.1142/S136391962150016X

UCLA. (2021). *How can I compare regression coefficients between two groups? SPSS FAQ*. UCLA, Statistical Methods and Data Analytics.

Vanacker, R. T., & Manigart, S. (2010). Pecking order and debt capacity considerations for high-growth companies seeking financing. *Small Business Economics*, 35, 53-69. DOI: https://doi.org/10.1007/s11187-008-9150-x

Wach, K., Maciejewski, M., & Glodowska, A. (2023). Inside entrepreneurial orientation: Do risk-taking and innovativeness influence proactiveness? *Economics and Sociology*, 16 (1), 159-175. DOI: https://doi.org/10.14254/2071789X.2023/16-1/11

Wagner, D. N. (2019). The Opportunistic Principal. *Kyklos,* 72 (4), 637-657. DOI: https://doi.org/10.1111/kykl.12213

Wang, L., Yan, J., Chen, X., & Xu Q. (2021). Do network capabilities improve corporate financial performance? Evidence from financial supply chains. *International Journal of Operations & Production Management*, 41 (4), 336-358. DOI: https://doi.org/10.1108/IJOPM-07-2020-0484

Widdicks, M., & Zhao, J. (2014). A Model of Equity Based Compensation with Tax. *Journal of Business Finance & Accounting*, 41 (7-8), 1002-1041. DOI: https://doi.org/10.1111/jbfa.12085

Wijeweera, A., Rampling P., & Eddie, I. (2022). Executive remuneration and firm financial performance: Lessons from listed companies in Australia and implications for their APEC counterparts. *Asia Pacific Business Review*, 28 (2), 260-272. DOI: https://doi.org/10.1080/13602381.2022.2013614

Yong, G. A., & Pearce, S. (2013). A Beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, 9 (2), 79–94. DOI: https://doi.org/10.20982/tqmp.09.2.p079

Zabri, M. S., Ahmad, K., & Lean, J. (2015). Understanding Owner-Managers' Preferences Towards Different Sources of Financing: The Case of Successful SMEs in Malaysia. *Advanced Science Letters*, 21 (5), 1435-1438. DOI: https://doi.org/10.1166/asl.2015.6060

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Ali je lastništvo pomembno: Povezava med podjetniško naravnanostjo, sposobnostjo za mreženje, raznolikostjo finančnih virov in finančno uspešnostjo hitro rastočih podjetij

Ozadje/namen: Namen tega članka je analizirati povezavo med izbranimi dejavniki rasti in finančno uspešnostjo hitro rastočih podjetij (HRP) glede na njihovo lastništvo. V skladu s agencijsko teorijo (odnos principal-agent) poskušamo ugotoviti, ali obstajajo razlike med menedžerji, ki so tudi (so)lastniki, in menedžerji, ki niso (so)lastniki HRP. Prav tako smo analizirali, ali lahko dodatno nadomestilo za menedžerje v obliki lastniškega kapitala, preko različnih dejavnikov rasti, poveča finančno uspešnost HRP.
Metode: Raziskava je bila izvedena v letu 2022 na vzorcu 119 HRP iz Republike Slovenije. Empirična analiza je bila izvedena z regresijsko analizo na podlagi eksplorativne faktorske analize. Analiza je bila izvedena s programsko opremo IBM SPSS Statistics 27.
Rezultati: Rezultati so pokazali, da obstajajo statistično značilne razlike med menedžerji, ki so lastniki in menedžerji, ki to niso, kadar se obravnava pomen organizacijske sposobnosti za mreženje v povezavi s finančno uspešnostjo HRP. To nakazuje, da bi lahko lastništvo (in tako nadomestila za menedžerje na podlagi lastniškega kapitala) pozitivno vplivalo na finančno uspešnost HRP. Poleg tega rezultati kažejo, da pri analizi skupine menedžerjev, ki so tudi lastniki, prevzemanje tveganja in organizacijska sposobnost za mreženje pozitivno in statistično značilno vplivata na finančno uspešnost HRP.
Zaključek: Naš prispevek poudarja pomen organizacijske sposobnosti za mreženje kot dejavnika rasti, preko katerega lahko dodatna nadomestila menedžerjev na podlagi lastniškega kapitala, pozitivno vplivajo na finančno uspešnost HRP. Članek prispeva k raznoliki literaturi v povezavi s HRP in je pomemben za oblikovalce politik, katerih cilj je omogočiti boljšo finančno uspešnost HRP.

Ključne besede: *Hitro rastoče podjetje, Podjetniška naravnanost, Sposobnost za mreženje, Finančna uspešnost, Agencijska teorija, Nadomestilo v obliki lastniškega kapitala*

Appendix – measurement items

Entrepreneurial orientation was measured on a 7-point Likert scale (1 -I disagree entirely, 7 – I agree completely). The questionnaire consisted of the following statements (EO_q1–12): Q1: The term "risk taker" is considered a positive attribute for people in our business; Q2: People in our business are encouraged to take calculated risks with new ideas; Q3: our business emphasises both exploration and experimentation for opportunities; Q4: we actively introduce improvements and innovations in our business; Q5: our business is creative in its methods of operation; Q6: our business seeks out new ways to do things; Q7: we always try to take the initiative in every situation (e.g., against competitors, in projects when working with others); Q8: we excel at identifying opportunities; Q9: we initiate actions to which other organisations respond; Q10: our business is intensely competitive; Q11: in general, our business takes a bold or aggressive approach when competing; Q12: we try to undo and outmanoeuvre the competition as best as we can.

Organisational networking capability was measured on a 7-point Likert scale (1 -I disagree entirely, 7 – I agree completely). The questionnaire consisted of the following statements (NC_q1–11): Q1: we search locally to find proper network partners; Q2: we search globally to identify appropriate network partners; Q3: we search widely to look for the right partners; Q4: if something seems to be going wrong in relationships with partners, we try hard to figure out why; Q5: if the relationship with a partner is successful, we try to understand what makes it work well; Q6: we constantly assess and analyze our relationships with partners so that we know what adjustments to make; Q7: dynamically integrating networking activities into the business operational process is part of our firm's strategy; Q8: we can find partners to count on in time when the need arises; Q9: we can be pretty accessible to our partners in a timely fashion; Q10: we can get the needed assistance from our partners in an accurate and timely manner; Q11: our partners can refer us to a third party who could help if the partners cannot provide direct help.

Financial performance was measured on a 7-point Likert scale (1 -I disagree entirely, 7 – I agree completely), where the respondents would express their agreement with the statement, "Compared to directly competing companies, we believe that our company shows better". The questionnaire consisted of the following statements (FP_q1–5): FP_1: net profit; FP_2: ROE—return on equity (income before taxation/average value of capital); FP_3: ROA—return on assets (income before taxation/average assets); FP_4: revenue growth percentage (revenue of the current year/revenue of the previous year); FP_5: value added per employee.

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Employer Branding as a Catalyst for Workforce Diversity and Excellence: An In-Depth Study from Costa Rica

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Background/Purpose: This study explores key factors Costa Rican workers consider when applying to or staying with a company, aiming to inform effective employer branding strategies.
Method: Surveying 385 mid/senior-level professionals, the research focuses on five dimensions: interest value, social value, economic value, development value, and application value.
Result: Findings reveal that Costa Rican professionals prioritize Interest Value, Application Value, and Development Value, emphasizing growth opportunities, engaging roles, and alignment with company values. Competitive compensation is also crucial.
Conclusion: The study suggests that employer branding strategies should highlight development opportunities, meaningful work, and value alignment to attract and retain diverse talent. Limitations include the survey's design, which may restrict response depth, and its exclusive focus on Costa Rica, potentially limiting generalizability. The results offer valuable insights for organizations in Costa Rica to enhance recruitment and retention by aligning with job seeker preferences.

Keywords: *Employer branding, Employer attractiveness, Diversity, Equity & inclusion, Talent attraction, Costa Rica*

1 Introduction

Numerous factors determine a company's competitiveness. However, one crucial aspect that stands out, particularly in today's global economy, is the presence of world-class human resources. Outstanding performance enables a business to excel and create a competitive advantage in the market. The competence of human resources significantly impacts performance, underscoring the need for a specific process: an employer branding strategy (Kriswanto et al., 2023). Employer branding aims to support Human Resources departments in attracting and retaining potential talent by leveraging marketing and brand communication techniques. This approach enhances the organization's reputation as an employer of choice in the competitive labor market (Saini et al., 2022).

A brand is often conceived unconsciously. In his first axiom of communication, psychologist Watzlawick (1967) asserts that "one cannot communicate"; it is practically inevitable to evoke a reaction from observers. Remaining silent, failing to create a strategy, or avoiding social outlets does not prevent external audiences from forming opinions about a company's image. The absence of an action plan conveys to potential candidates how much a business values the construction of a diverse and capable workforce

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(Noutel et al., 2021).

Marketing a job can be compared to selling a product. The planning behind it heavily depends on the product's "attractiveness". Similarly, the attractiveness of advertised open positions is crucial. Berthon (2005) defines employer attractiveness as the benefits a prospective candidate expects from a specific employer. His study devised a five-factor Employer's Attractiveness (EmpAt) model to identify the key aspects that measure and determine an organization's level of attractiveness. These factors provide a structured approach to evaluate how appealing an employer is to potential talent:

- Interest value, which refers to the promise of an exciting work environment and innovative work practices.
- Social value, which focuses on the relevance of team morale and work atmosphere.
- Economic value, which translates to an offering of a comprehensive compensation package.
- Development value, which assesses a candidate's attraction to an employee's recognition program and career-enhancing opportunities.
- Application value, which measures attraction to employers offering opportunities to apply learned skills and teach others.

Companies can gauge their performance through employer brand equity (EBE). Just as consumers hold specific perceptions about a brand, organizations are subject to the assessments and preferences of potential candidates. EBE reflects the distinct impact of a company's employer branding on the decision-making processes of both prospective and current employees. It evaluates the extent to which these decisions are influenced by the organization's employer brand, including job application, offer acceptance, and retention. EBE encompasses dimensions such as awareness or familiarity with the employer's activities, and the nuanced association's job seekers form to envision their experience working for the organization (Collins & Kanar, 2013).

Understanding the elements that influence decision-making when applying for a role is fundamental for developing effective strategies. Saini et al. (2014) identify several key factors that prospective candidates consider important: monetary compensation, career growth opportunities, environmental policies, termination policies, company services or products, location, and reputation. The decision-making process can vary significantly depending on factors such as job type, demographic characteristics, and cultural particularities, with certain aspects carrying more weight than others.

Efforts towards talent attraction might differ from talent retention, yet both are critical components of employer branding. While attracting the right candidates and building "talent pools," internal branding is equally crucial. Replacing employees can be costly and inefficient; all stages of this process—recruiting, screening, interviewing, hiring, training, and maintaining business operations—consume significant time and resources. Therefore, retaining existing talent is often more cost-effective and beneficial (Ahmed et al., 2022).

Recently, local authorities and non-profit organizations have been actively promoting Diversity, Equity, and Inclusion (DE&I) in Human Resources Management (HRM) to raise awareness among employers about labor regulations compliance. Kupczyk et al. (2016) explain that organizations are experiencing a significant surge in workforce diversity due to various factors, including globalization, internationalization, demographic shifts, and migration driven by unemployment. This trend is further bolstered by legislation facilitating employment in foreign countries, fluctuations in labor costs, and the mobility of young talent. Consequently, organizations face a pressing need to adopt diversity management strategies to navigate this evolving landscape effectively (Yadav & Lenka, 2020).

Each region follows a distinct set of considerations that employers must take into account when implementing strategies and attracting talent. DE&I is multi-dimensional and can be defined differently by various authors according to specific cultures, countries, or companies. Plummer (2003) identified the "Big 8" dimensions of diversity: age, ethnicity/nationality, gender, psychophysical capacity, organizational role/function, race, religion, and sexual orientation, all of which remain relevant even 20 years after their examination. Dauth et al. (2023) confirm that companies with DE&I initiatives and policies positively impact employers' attractiveness.

A globalized plan must be deconstructed to address the needs and cultural differences among both current and potential employees. While some countries may be more advanced in DE&I politics, this research aims to explore the intricate relationship between employer branding and job seekers' decisions within the context of Costa Rica. Canossa (2020) found that out of 381 companies in Costa Rica, 92% had never hired a person with a disability. Additionally, many organizations are unaware of the incentives provided by Costa Rican public entities for implementing inclusion policies.

This leads to the main research question: How does employer branding impact job seekers' decisions in Costa Rica, and what are the implications for an organization's Diversity, Equity, and Inclusion (DE&I) goals?

In today's competitive job market, where attracting and retaining top talent is crucial for organizational success, understanding the dynamics of employer branding has become paramount. Costa Rica's growing economy and burgeoning job market present a unique setting to examine how employer branding influences the choices of job seekers. By delving into this phenomenon, this study seeks to uncover the factors that shape perceptions of organizations as desirable places to work and how these percep-

tions impact job seekers' decisions regarding employment opportunities. Furthermore, this study will investigate the implications of employer branding on an organization's Diversity, Equity, and Inclusion (DE&I) goals, contributing to a more comprehensive understanding of talent acquisition and retention strategies in the modern workforce landscape through the following research objectives:

Objective 1: Reviewing existing literature on employer branding and its role in diversifying and sustaining workforce excellence.

Objective 2: Exploring how employer branding influences job seekers' decisions.

Objective 3: Identifying factors influencing the impact of employer branding on job seekers' decisions in Costa Rica and their implications for organizational DE&I goals.

This study employs a descriptive research approach to examine the role of employer branding in fostering diversity and sustaining workforce excellence, focusing on Costa Rica. This study aims to identify how employer branding strategies contribute to an employer's attractiveness to the Costa Rican workforce and, therefore, help companies attract and retain diverse talent.

2 Literature review

2.1 Employer Branding (EB)

The concept of employer branding was introduced almost twenty years ago by Ambler & Barrow (1996). They described the importance of integrating two disciplines for a greater purpose: human resources and brand marketing. This conceptual framework articulated how awareness of a company's brand could influence employees' positive associations with their jobs and foster loyalty. Their study delineated the benefits perceived by job seekers within the same three categories as retail products: functional, economic, and psychological. Each aspect is acquired through a mutual exchange between the individual and the organization.

Sullivan (2004) further elucidated on this definition by emphasizing that the strategy should be long-term to manage awareness and perceptions, not only of potential and current employees but also of relevant stakeholders. A strategic employment brand management effort attracts suitable applicants, retains top performers within the company, and enhances employee productivity. His article proposes that the blueprint of each strategy should encompass the following eight elements:

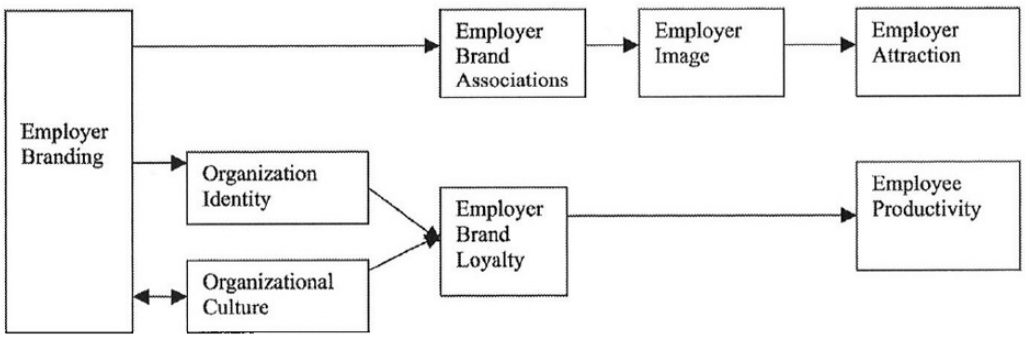
- A culture of sharing and continuous improvement, fostering collaboration and encouraging employees to regularly contribute ideas and feedback.
- A balance between good management and high productivity, necessitating effective leadership that supports employee well-being while driving efficient performance.
- Obtaining public recognition, such as being listed on great-place-to-work lists, validating the company's efforts in creating a positive work environment and attracting top talent.
- Employees "proactively" telling stories, fostering strong engagement and enhancing the company's reputation and brand image.
- Garnering attention, signalling the company's efforts in making an impact and generating interest within its industry and beyond.
- Becoming a benchmark firm, serving as a reference point for others to emulate.
- Increasing candidate awareness of best practices, attracting top talent aligned with the company's values and goals, contributing to long-term success.
- Utilizing branding assessment metrics, providing valuable insights into how the company is perceived by stakeholders and guiding strategic decisions to enhance brand reputation and identity.

Backhaus & Tikoo (2004) introduced a framework that facilitated additional studies on employer branding. This framework comprises a process and elements influencing a company's image and potential attraction through branding strategies. Brand associations are significant as they define people's perceptions of a brand, regardless of its offerings. While some brand associations may result from employer branding strategies, it is essential to recognize that many are influenced by factors not directly controlled by the employer, including people's interpretations of the company's actions, behaviors, and reputation.

Strategic efforts can aid messaging and positioning. However, the authenticity of the company's values is a decisive factor in employees' opinions. Consequently, many companies are actively engaged in employer branding initiatives to gain a competitive edge in the battle for talent (Pertiwi & Azmy, 2023) using specific tools depending on the target group, e.g. following Janssen & Rudeloff (2024) regarding the role and impact of corporate and external influencers in employer branding for Generation Z. According to Gurgu & Kuleto (2023), employee engagement and satisfaction pivot the organization's employer branding, influenced by leadership, job design, recognition, work environment, and growth opportunities (Figure 1).

2.2 Employer Value Proposition (EVP)

Edwards (2010) remarks that employer branding strategies identify a company's unique employment experience by considering both tangible and intangible variables. This argument leads to the development of the Employer Value Proposition (EVP) concept. The essence of any strategy revolves around the employer value proposition, which is influenced by the organization's values, culture, initiatives,



Adapted from (Backhaus & Tikoo, 2004)

Figure 1: Comparison of regression coefficients

environment, and talent and reward programs. Employer branding entails promoting a compelling image of what makes a company attractive as an employer, both internally and externally (Lievens, 2007).

Other authors suggest that EVP refers to the balance of rewards and benefits employees receive in exchange for their performance in the workplace. Organizations formulate an employer value proposition to establish a consistent platform for communicating their employer branding and managing the employee's experience. Companies employ a strategic approach to articulate why the organization is distinctive, appealing, and an excellent workplace for current and potential employees. EVPs are conveyed through organizational actions and policies, eliciting emotional and rational benefits for current and prospective employees. Companies may choose to be as explicit as possible about their offerings, while others might prefer to communicate their benefits through aspirational branding and relatable content. Merely offering a competitive salary package is insufficient to ensure talent retention within an organization. Establishing a lasting emotional connection between the organization and its employees is possible through the employee value proposition in employer branding initiatives (Pawar, 2016).

Eroglu (2019) suggests that the employee value proposition (EVP) serves as the core of employer branding, offering both emotional and functional benefits the organization commits to its employees alongside their expected roles. Diverging from the company's principles and values or presenting unattainable promises in the EVP can result in unfavorable consequences for the post-employment experience of the employees.

2.3 Employer Attractiveness (EA)

Employer attractiveness is vital for attracting and retaining talent, maintaining a competitive edge, enhancing employee engagement, managing reputation, and ultimately achieving organizational success. Berthon (2005) delves into the concept of Employer Attractiveness, defining it as the perceived benefits that prospective candidates associate with a particular employer, extending to advertised job positions. The study introduces the "EmpAt" model, comprising five critical factors for assessing and determining an organization's level of attractiveness. These factors include:

- Interest value, promising an engaging work environment and innovative practices.
- Social value, focusing on team morale and the overall work atmosphere.
- Economic value, encompassing a competitive compensation package.
- Development value, assessing opportunities for career advancement and recognition programs.
- Application value, reflecting the appeal of opportunities for individuals to apply their skills and contribute to the learning of others.

These categories represent a nuanced and expanded iteration of the three dimensions (functional, psychological, and economic) initially introduced by Ambler & Barrow (1996).

A recent study by Puri (2018) further expands upon the dimensions proposed by Ambler and Barrow (1996), enhancing the understanding of what makes an employer attractive. The study introduces eleven factors contributing to employer attractiveness, including:

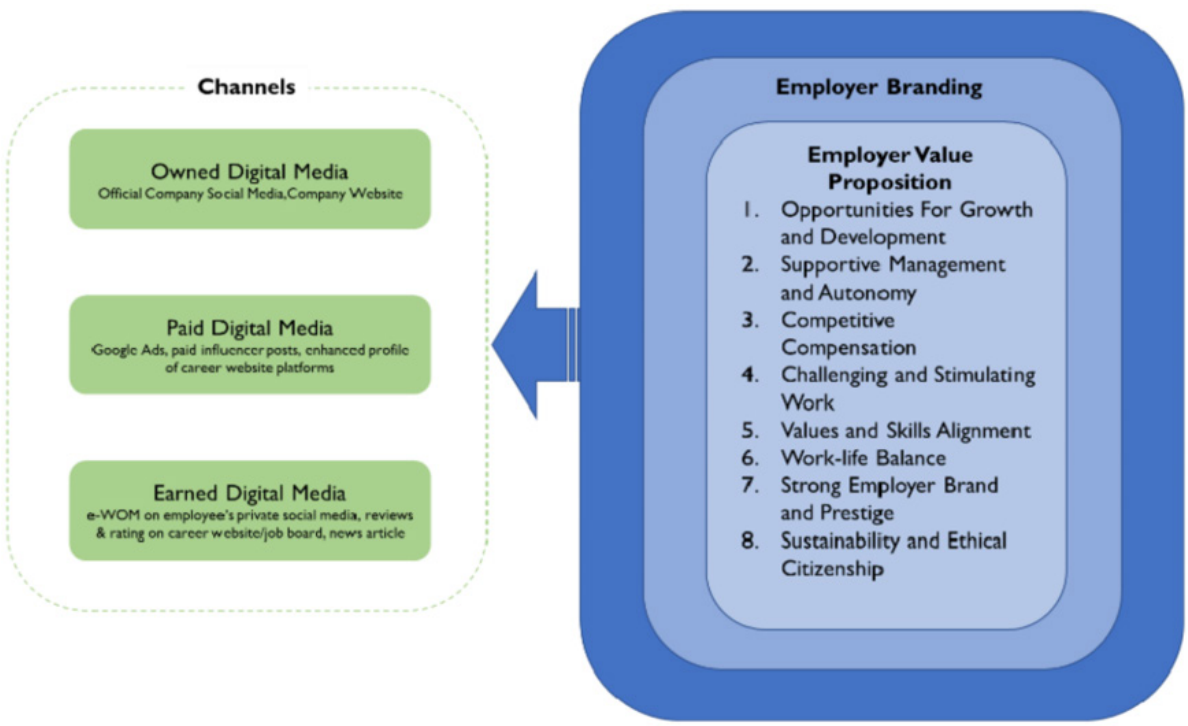
- Role Value, measuring if the organization offers challenging roles, involvement, value, empowerment, clear career paths, and trust in the workplace.
- Ethical & Cultural Value, considering positive relationships with superiors and colleagues, supportive teamwork, and recognition of merit.
- Employer Brand Value, reflecting the employer's high ranking in brand surveys, awards received,

and word-of-mouth reputation.

- Familiarity Value, influenced by factors such as online presence, personal contact, and participation in events.
- Developmental Value, focusing on development opportunities through learning programs and projects.
- Innovative Value, suggesting consistent innovation in producing high-quality products and services.
- Career Growth Value, encompassing recognition from management and opportunities for future employment.
- Social Value, related to company size and international presence.
- Ease Value, referring to flexible working hours and work-from-home options.
- Economic Value, including attractive compensation and benefits packages.
- Locational Value, considering the convenience of the location to candidates.

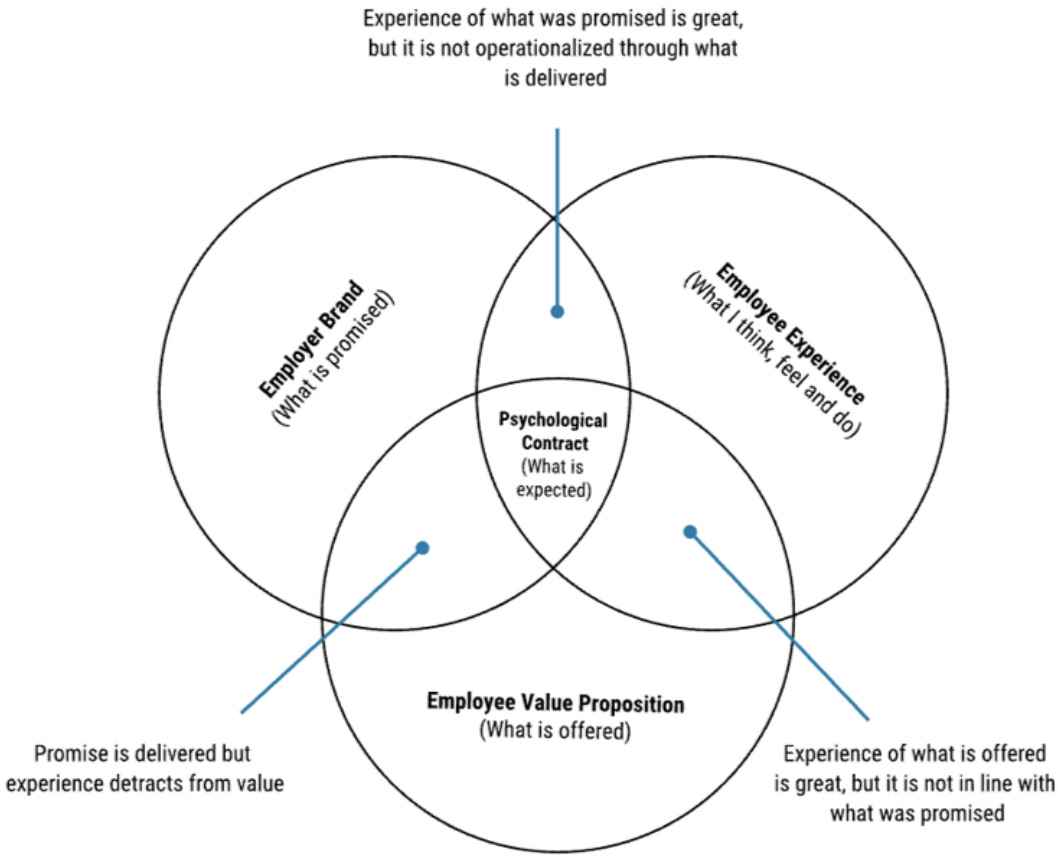
Each aspect provides insights into different facets of an organization's appeal to potential employees, ranging from the ethical environment to the compensation package and career advancement opportunities. According to Ariyanto & Kustini (2021), the Employer Value Proposition positively affects Employer Brand Attractiveness and can increase the interest of prospective employees.

Further studies, such as that conducted by Ružić & Benazić (2023), emphasize the importance of developing a clear and compelling Employee Value Proposition (EVP) for attracting top talent and fostering engagement among existing staff. Identifying factors relevant to specific demographics, such as Gen-Z, is crucial for effective recruitment and retention strategies. Employers must adeptly convey their brand and principles to desired audiences, particularly Millennials (Gen-Y) and Zoomers (Gen-Z), who rely heavily on digital platforms for accessing job information and perks (Reinikainen et al., 2020).



Adapted from (Kristia, 2023)

Figure 2: Key Employer Value Propositions and Digital Media Channels



Adapted from (Veldsman & Van der Merwe, 2022)

Figure 3: The E-cubed model

Positive employer branding is enhanced when companies receive favorable reviews and comments from current and former employees, which, in turn, attracts more interest from potential candidates. Figure 2 illustrates how companies can utilize three types of digital media channels to bolster their employer brand: owned digital media, earned digital media, and paid digital media (Kristia, 2023).

Veldsman & Van der Merwe (2022) propose an integrated model that emphasizes the importance of maintaining a balance between employer branding (promises made), the employee value proposition (offerings provided), the employee experience (thoughts, feelings, and actions), and the psychological contract (expectations), all through a human-centered approach. Achieving equilibrium among these interconnected yet distinct concepts (Figure 3) is pivotal for fostering genuine employee experiences. A consistent and coherent narrative connecting these elements is essential to ensure an authentic and optimal employee journey.

2.4 Employer Brand Equity (EBE)

Employer brand equity (EBE) measures the unique influence of a company's employer brand on the decision-making of potential and current employees, encompassing aspects like job application, offer acceptance, and retention. It evaluates the impact of the employer's brand awareness, surface and complex associations, and perceptions on job seekers envisioning their work experience within the organization (Collins & Kanar, 2013).

According to Theurer et al. (2016), most literature attributes employer branding definitions to the concept of brand equity and its categories proposed by Aaker (1991): brand loyalty, name awareness, perceived quality, brand associations, and other proprietary assets. Together, these contribute to measuring how easily a brand comes to mind, the types of associations formed, and the levels of attraction. Ščiukauskė (2021) adds to these definitions by stating that Employer Brand Equity (EBE) resembles traditional

brand equity but is specifically tailored for potential and current employees. It encompasses all knowledge and perceptions regarding the employer, which can be evaluated through various factors such as employer brand awareness, image, reputation, associations, loyalty, trust, and overall experience with the employer.

2.5 The connection between Employer Branding and Advancing Diversity, Equity, and Inclusion (DE&I) in Costa Rica

The intersection of employer branding and the advancement of Diversity, Equity, and Inclusion (DE&I) initiatives has emerged as a critical area of inquiry within contemporary organizational research. A robust employer brand that underscores DE&I values and practices holds significant implications for talent acquisition, retention, and organizational performance. By strategically integrating DE&I principles into their branding strategies, organizations can effectively signal their commitment to promoting an inclusive work environment that embraces diversity in all its forms.

The International Labour Organization (2021) stated that the principle of DE&I is not a "one-size-fits-all solution." This proactive approach attracts a diverse talent pool and cultivates a culture of inclusivity. However, despite growing pressure from employees, investors, and local laws and policies, the pace of change within enterprises across various regions, sectors, and sizes remains uneven and notably sluggish. Research indicates that most enterprise Diversity, Equity, and Inclusion (DE&I) efforts primarily focus on gender equality, followed by ethnicity/race and sexual orientation. However, attention toward inclusion for people with disabilities is lacking, with minimal consideration for factors such as religion and age, particularly concerning older workers and individuals living with HIV/AIDS. Unemployment rates among people with disabilities are alarmingly high, reaching up to 80% in certain countries. Despite concentrated efforts on gender equality, progress has been gradual. Although the proportion of women in managerial roles globally has steadily increased since 2002, women still occupy fewer than 30% of entry-level management positions. In 60% of companies, less than 30% of senior managers and top executives are women.

Furthermore, women are more likely to be employed in low-skilled occupations, face inferior working conditions, and are disproportionately exposed to informal employment. Globally, the gender wage gap persists at nearly 20% (ILO, 2021). Costa Rica's workforce data from 2023 revealed that women hold less than 45% of managerial roles.

In Costa Rica's most recent National Survey on Disability, it was determined that less than 40% of individuals with disabilities were employed (Garcia Mora et al, 2021). Unemployed individuals provided reasons for not applying for a job, and diversity factors directly impacted half of those listed:

- I have already found a job.
- Waiting for the restart of operations, reopening of business, or response from previous efforts.
- No money to look for work or tired of looking for work.
- Not given a job because of age, sex, ethnicity, gender identity, sexual orientation, or other reasons.
- Lack of job opportunities in the area or only occasional work when requested.
- Illness or health conditions affecting job availability.
- I attend school.

Consequently, such alignment between employer branding and DE&I initiatives promotes social responsibility and ethical leadership and enhances organizational reputation, employee engagement, and overall performance outcomes.

3 Research Methodology

The study employs a descriptive research approach to examine the role of employer branding in fostering diversity and sustaining workforce excellence. This approach provides detailed information about a population or phenomenon, using versatile methods like surveys. It helps identify trends, patterns, and relationships, serving as a foundation for further research. This approach is useful for comparisons, has real-world applications, and is often non-intrusive and easy to conduct. Its broad scope makes it suitable for this research topic (Broek, 2015). An anonymous survey was conducted using snowball sampling, collecting data from mid/senior-level professionals. The survey covers demographic data, employer attractiveness metrics, and workplace awareness of Diversity, employer branding, Equity, and Inclusion (DE&I). Kupczyk et al. (2016) employed a descriptive research analysis using Spearman's rank correlation coefficient. This method allowed the study to find a significant correlation between diversity management within an organization and the perception of the company's image. Kummrow (2023) implemented the same approach using surveys to conclude that diverse measures are associated with employer branding to enhance loyalty. Applying this research approach, this study aims to capture not only the perceptions of the general public but also those of managers involved in shaping employer branding strategies.

3.1 Primary Data

To acquire primary data for this research, an anonymous survey was distributed using the snowball sampling technique. The survey consisted of 15 questions divided into three sections: demographic data, employer attractiveness metrics, and awareness of DE&I in the workplace. The questionnaire was created using Google Forms, a specialized online platform designed for survey creation. Participants were asked to indicate their level of agreement or disagreement with the provided statements using a 5-point Likert response scale, ranging from "strongly disagree" to "disagree," "neither disagree nor agree," "agree," and "strongly agree" (Hodge & Gillespie, 2007).

3.2 Study Population

The study population comprised 500,526 mid/senior-level representative professionals from Costa Rica, sourced from the INEC data of September-November 2023. A sample of 385 professionals was selected with a 95% confidence level to ensure its representativeness to the population while minimizing sampling error.

$$n = \frac{z^2(\mathrm{pq})}{e^2\,2 + \frac{z^2(pq)}{N}} \quad (1)$$

3.3 Evaluation and Justification

The choice of this research approach allows for a comprehensive understanding of the research objectives by triangulating different data sources. Utilizing a statistically significant sample size and a high confidence level ensures the reliability and generalizability of the findings. The data analysis was performed using Python and Excel. Additionally, integrating insights from current related literature about the topic adds depth and credibility to data interpretation of the study. Overall, this methodological approach provides a robust framework for achieving the research objectives and mitigates potential risks associated with data collection and analysis.

The objective of this study was to determine how employer branding strategies promote diverse, equitable, and inclusive workplaces. By examining the interplay between employer branding and DE&I goals, this research offers valuable insights for organizations seeking to attract diverse talent pools and cultivate inclusive work environments.

Ultimately, the findings of this study will not only enhance scholarly understanding of employer branding dynamics in Costa Rica but also offer practical implications for organizations striving to optimize their recruitment strategies and advance their DE&I agendas.

4 Results

In this section, the study delves into the impact of employer branding on job seekers' decisions in Costa Rica and its implications for organizational Diversity, Equity, and Inclusion (DE&I) goals. The survey questions were designed to align with the five values that measure an employer's attractiveness (EmpAt) as proposed by Berthon (2005):

- Interest Value:

I expect the company's mission to resonate with my values, making it compelling to me.

I value working in an environment that fosters innovative work practice and presents me with constant, exciting challenges.

- Social Value:

A company's commitment to Corporate Social Responsibility (CSR) is essential to me when considering applying for a job.

I seek to work in an environment that values and promotes Diversity, Equity, and Inclusion through policies and initiatives.

- Economic Value:

A competitive compensation package, including salary, benefits, office space, work-from-home options, and other perks, is a must-have for me.

The size of a company influences my level of interest when applying for a job position.

- Development Value:

I am drawn to companies that offer recognition programs and opportunities to advance my career.

I am inclined to stay with a company when I see opportunities for career growth, such as promotion from employee to manager.

- Application Value:

The opportunity to apply my acquired knowledge and mentor others in a company is important to me.

I seek learning opportunities sponsored by my company.

Out of the total participants who completed the survey, (3.8%) were excluded for not meeting the study criteria. These individuals indicated "retired" as their job status, indicating that they are not actively or passively seeking new opportunities and are thus not considered part of the active Costa Rican workforce targeted in this study.

Employer Attractiveness Dimensions (Values)

Interest Value

Q1. I want the company's mission to resonate with my values, making it compelling for me.

More than half of the participants expressed a strong desire to work for a company they can relate to, as shown

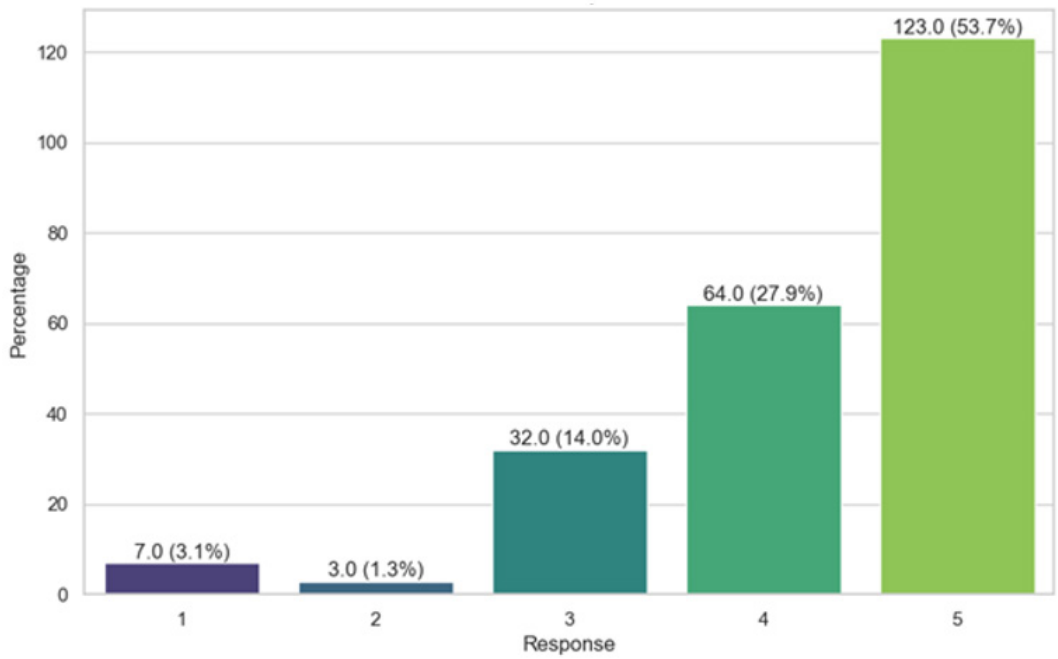


Figure 4: Distribution of Responses for Q1: "I want the company's mission to resonate with my values, making it compelling to me."

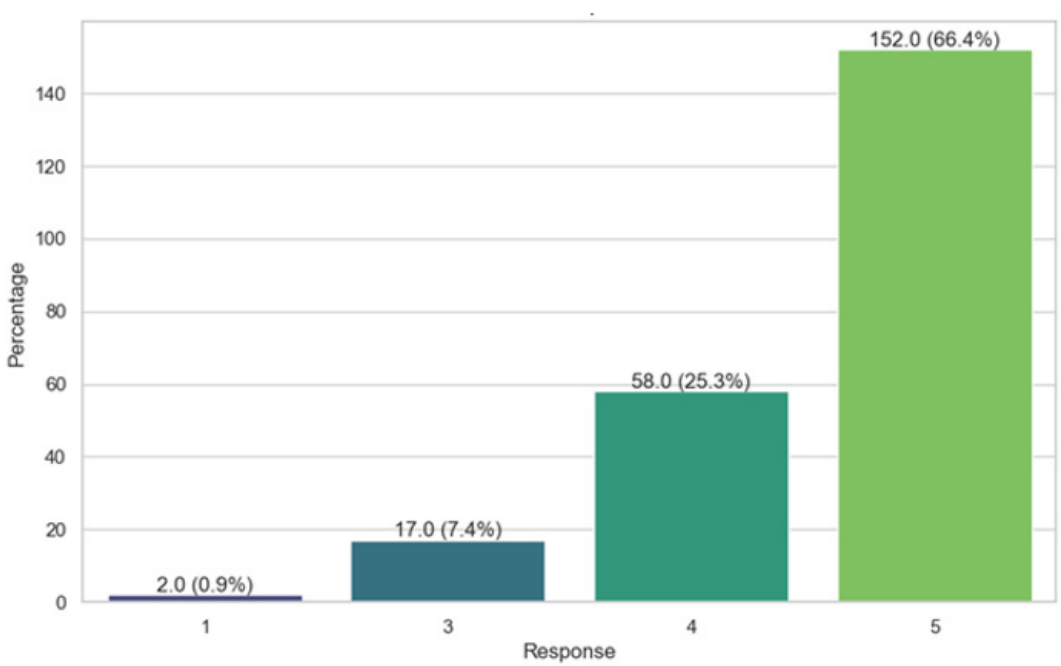


Figure 5: Distribution of Responses for Q2: "I appreciate working in an environment that fosters innovative work practices and provides me with constant, exciting challenges."

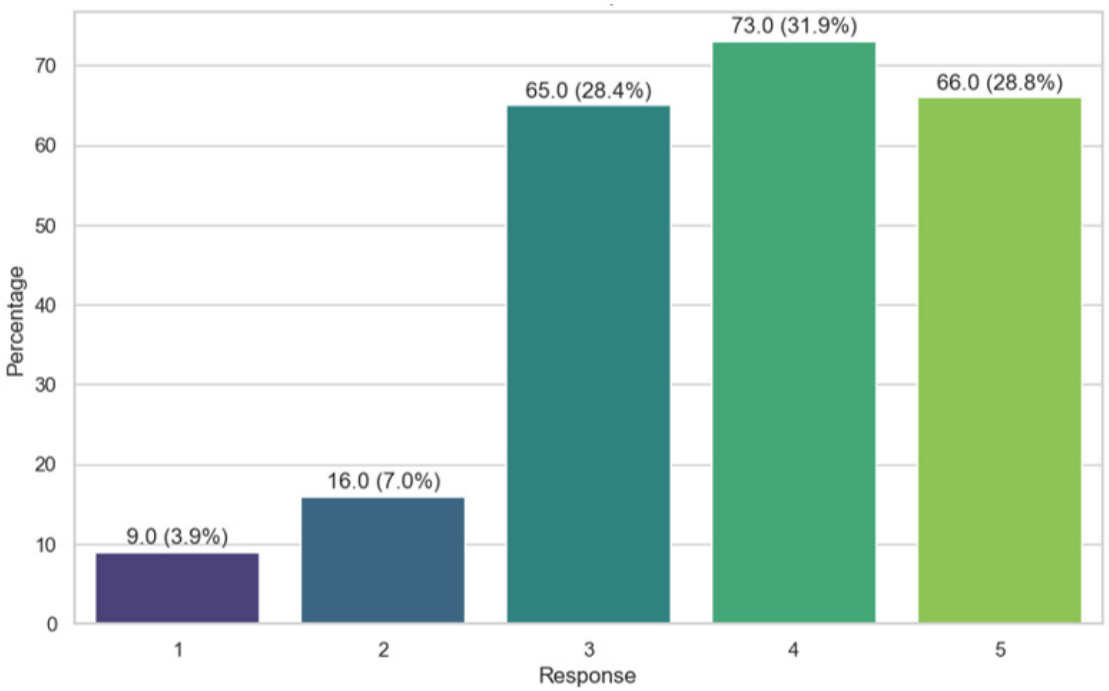


Figure 6: Distribution of Responses for Q3: "A company's commitment to Corporate Social Responsibility (CSR) is essential for me when considering applying for a job."

in Figure 4.

Q2. I appreciate working in an environment that fosters innovative work practices and provides me with constant, exciting challenges.

Figure 5 illustrates that to remain fulfilled in their jobs, 91.7% of participants require constant challenges and creative ways of working.

Social Value

Q3. A company's commitment to Corporate Social Responsibility (CSR) is essential for me when considering applying for a job.

Figure 6 indicates that over 60% of respondents are more likely to apply to companies with active Corporate Social Responsibility programs.

Q4. I need to work in an environment that values and promotes Diversity, Equity, and Inclusion through policies and initiatives.

More than 75% of respondents agreed that it is crucial to work for an organization that supports and implements DE&I initiatives (Figure 7). Less than 10% were indifferent, saying they would still apply to a company if possible.

Economic Value

Q5. It is essential for me to have a competitive compensation package that includes salary, benefits, office space, work-from-home options, and other perks.

As depicted in Figure 8, more than 95% of participants believe that feeling satisfied with the compensation package offered by their employer is crucial.

Q6. The size of a company affects my level of interest when applying for a job position.

According to Figure 9, more than 50% of participants are likely to apply to a company based on its size or perceived global presence.

Development Value

Q7. I am attracted to companies that offer recognition programs and opportunities to enhance my career.

Based on Figure 10, more than 90% of respondents believe that recognizing employees' performance and offering growth opportunities based on merit makes a company more appealing.

Q8. I decide to remain with a company when I see opportunities for career advancement, such as promotion from employee to manager.

85% of participants seek career advancement programs that include job level and title change (Figure 11).

Application Value

Q9. The opportunity to apply my acquired knowledge and teach others in a company is important to me.

A significant majority of survey respondents (over 85%) express a strong desire to utilize their skills and have the chance to mentor others (Figure 12).

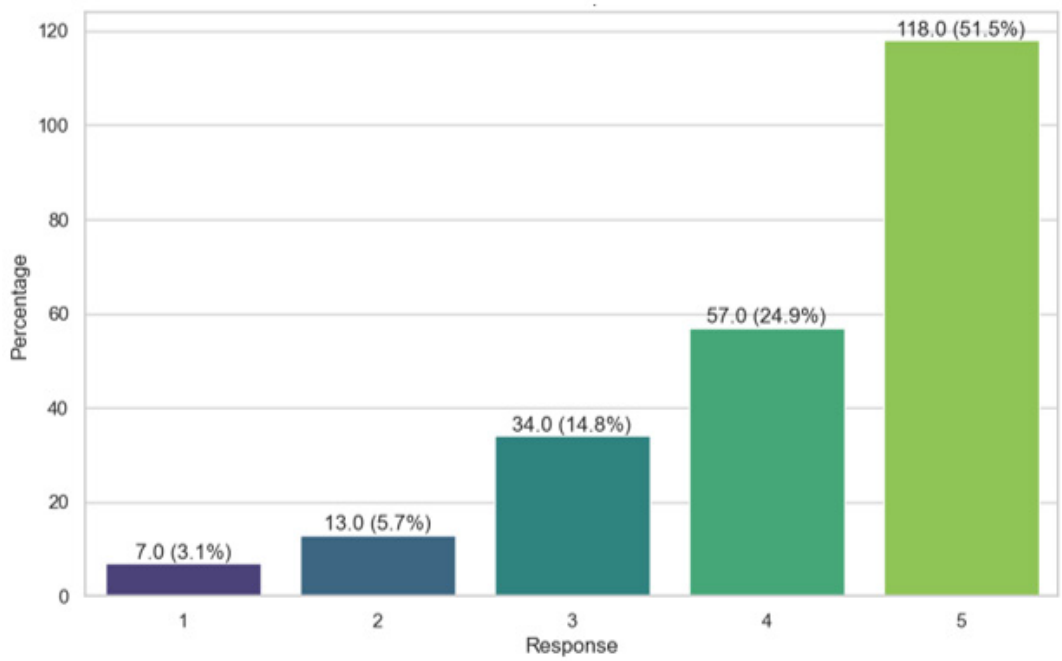


Figure 7: Distribution of Responses for Q4: "I need to work in an environment that values and promotes Diversity, Equity, and Inclusion through policies and initiatives."

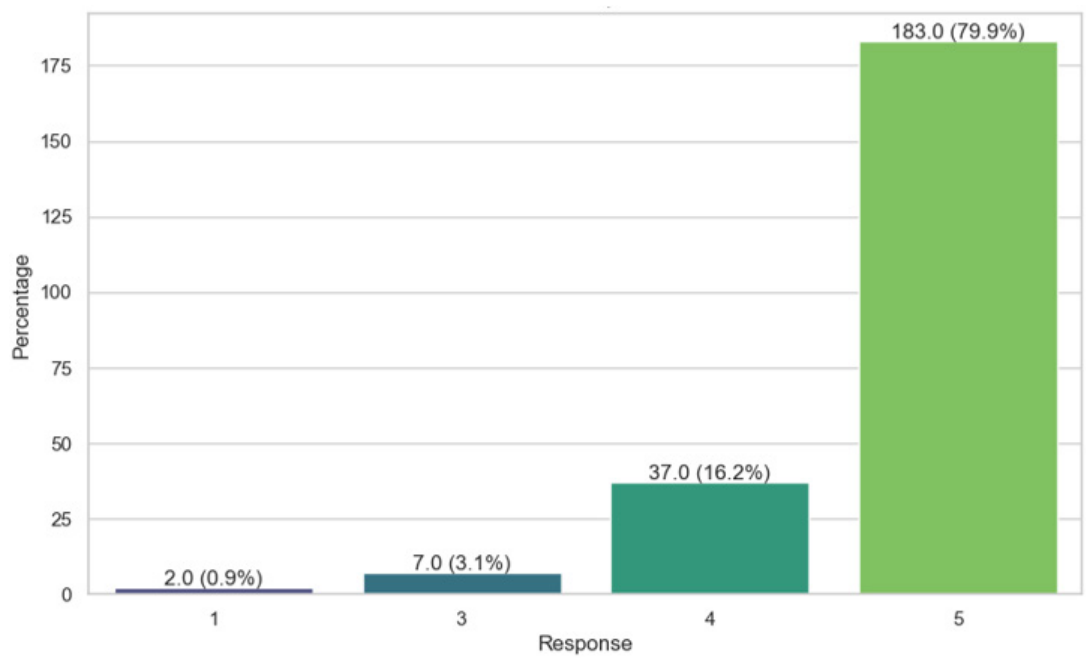


Figure 8: Distribution of Responses for Q5: "It is essential for me to have a competitive compensation package that includes salary, benefits, office space, work-from-home options, and other perks."

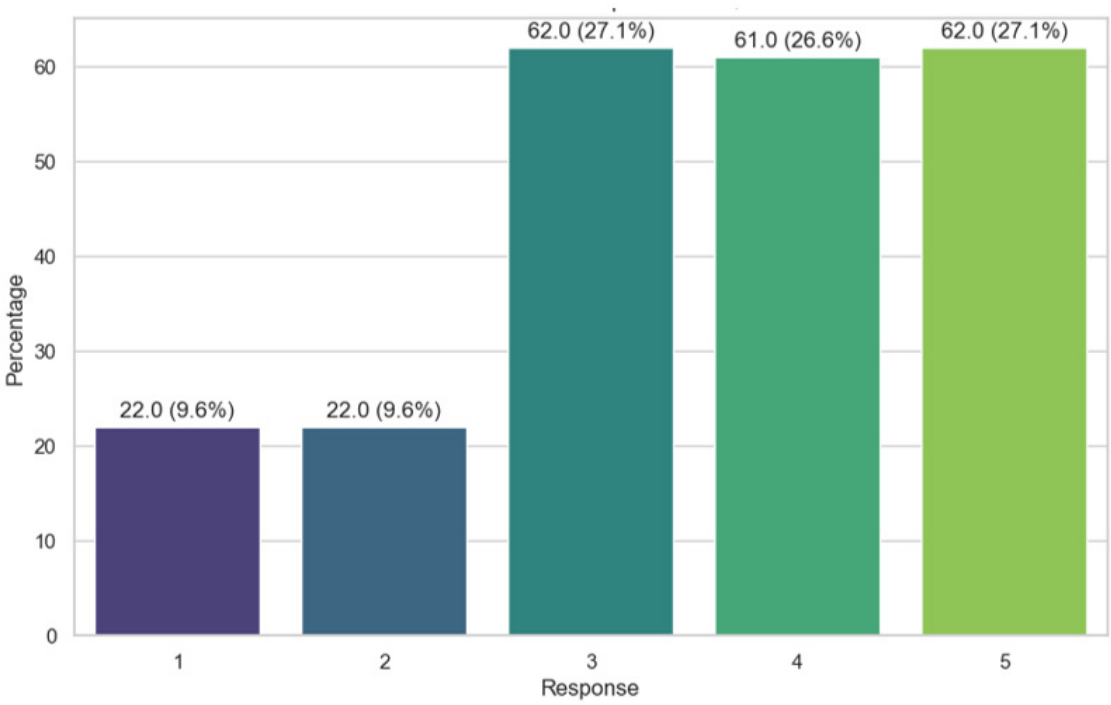


Figure 9: Distribution of Responses for Q6: "The size of a company affects my level of interest when applying for a job position."

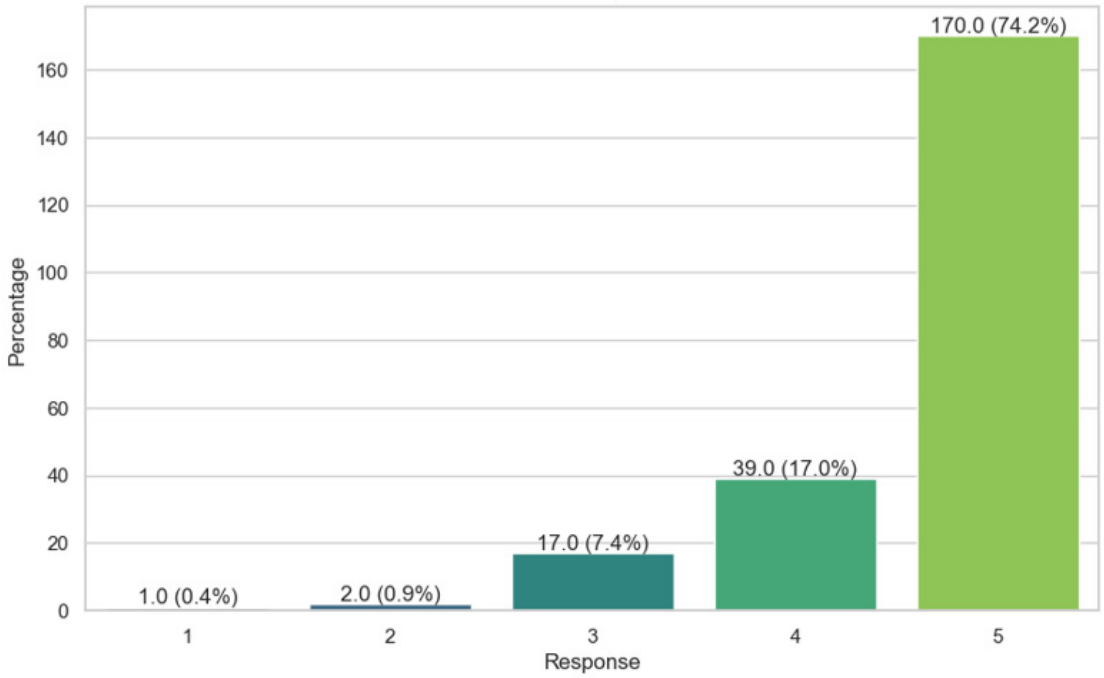


Figure 10: Distribution of Responses for Q7: "I am attracted to companies that offer recognition programs and opportunities to enhance my career."

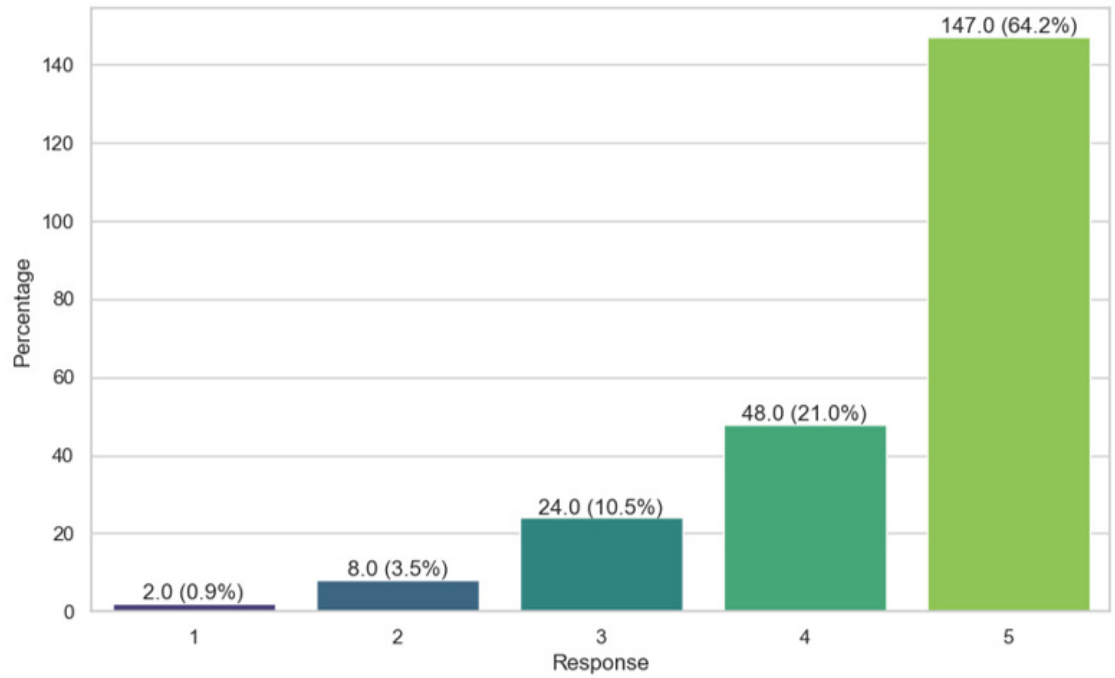


Figure 11: Distribution of Responses for Q8: "I decide to remain with a company when I see opportunities for career advancement, such as promotion from employee to manager."

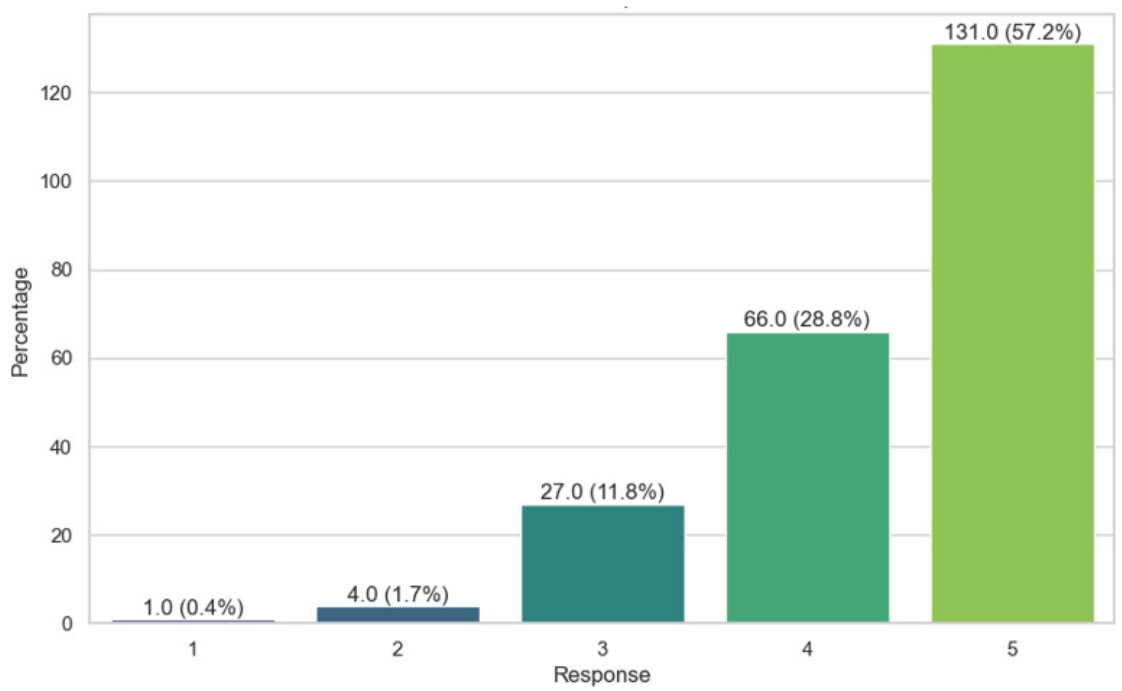


Figure 12: Distribution of Responses for Q9: "The opportunity to apply my acquired knowledge and teach others in a company is important to me."

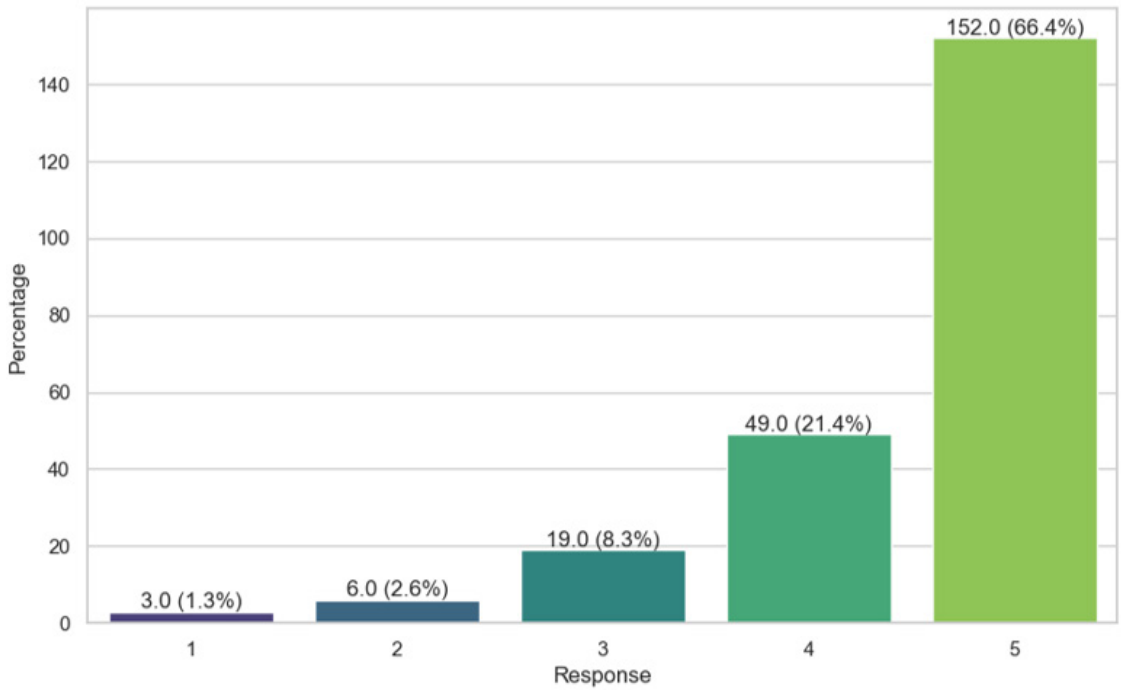


Figure 13: Distribution of Responses for Q10: "I am looking for learning opportunities that are sponsored by my company."

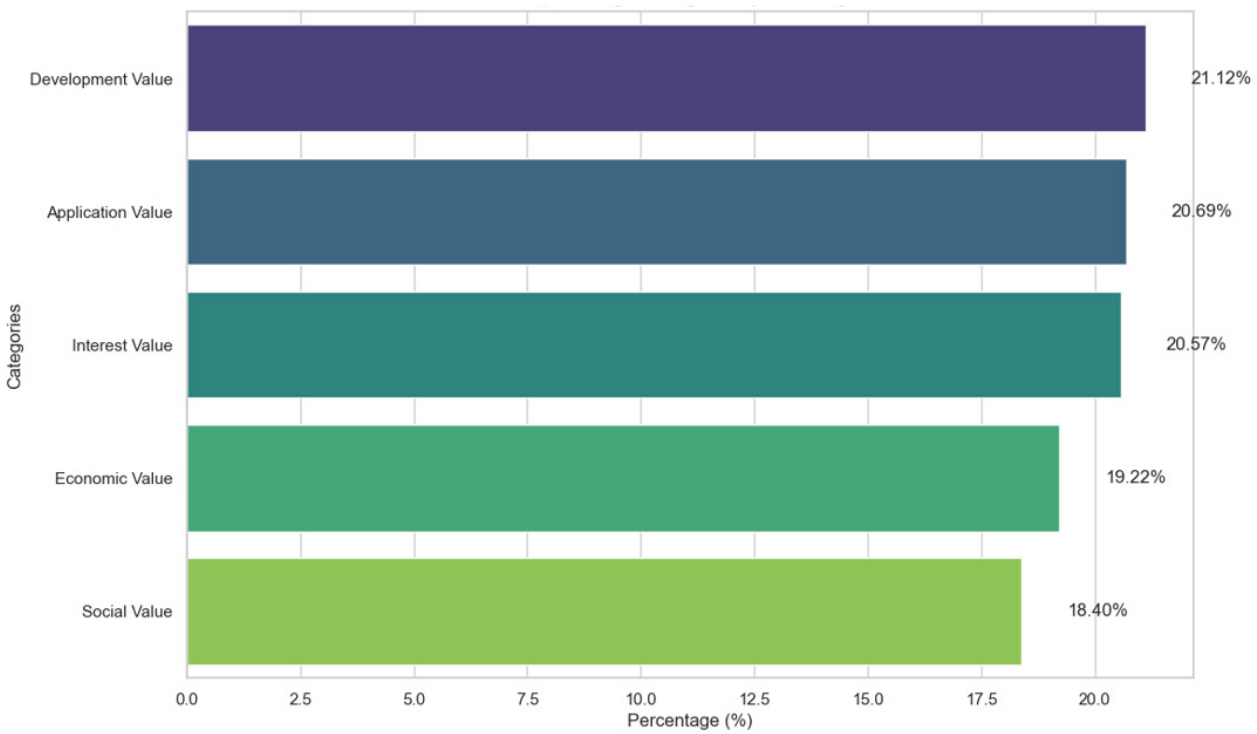


Figure 14: Top Ranking of Categories by Percentage

Table 1: Regression coefficients and statistical significance of each predictor

Predictors	Coefficient	Standard Error	t-Statistic	p-value	95% Confidence Interval
Intercept	6.78	0.40	16.90	<0.001	[5.99, 7.57]
Development Value	-0.052	0.0092	-5.62	<0.001	[-0.070, -0.034]
Application Value	0.668	0.0263	25.45	<0.001	[0.616, 0.720]
Interest Value	2.226	0.1387	16.05	<0.001	[1.953, 2.499]

Q10. I am looking for learning opportunities that are sponsored by my company. These could include paid graduate programs, language courses, online courses, job shadowing, and other similar opportunities.

A vast majority, above 85% of respondents, actively seek learning opportunities sponsored or supported by the companies they work for. This underscores a strong desire among employees to enhance their skills and knowledge within a supportive organizational framework (Figure 13).

Final Ranking

The analysis of responses from participants revealed the most important dimensions of employer branding attractiveness for the Costa Rican workforce. The top three categories, as indicated by the participants, are (1) Development Value, (2) Application Value, and (3) Interest Value (Figure 14).

A multiple linear regression analysis was conducted to evaluate the effect of three prioritized critical factors (Development Value, Application Value, and Interest Value) on Employer Attractiveness. The analysis explained 97.78% of the variance in Employer Attractiveness, R^2 = 0.9778, adjusted R^2 = 0.9777, indicating a strong fit of the model to the data. The ANOVA results showed that the model was statistically significant, F (3,380) = 5589.17, p<0.001, suggesting that the predictors contribute significantly to the variance in employer attractiveness.

From table 1, it can be observed that Application Value (β = 0.668, p<0.001) and Interest Value (β = 2.226, p<0.001) are significant positive predictors of employer attractiveness. Development Value (β = −0.052, p<0.001) had a small, negative but statistically significant effect.

5 Discussion

The study surveyed 385 mid/senior-level professionals in Costa Rica, with a majority (63.7%) falling into the late Gen-Z (25-27 years) and Millennial (28-44 years) age groups. The top seven areas of work represented were Administration (15.7%), Marketing (11.4%), Customer Service (8.7%), Finance (8.3%), IT (8.3%), Engineering (7.4%), and Healthcare (7%). Regarding employment status, 75.1% described themselves as "salaried employees." In terms of job level, 62.4% reported being in mid-level positions or aspiring to attain one, while only 5.7% had reached executive-level roles.

Moreover, 62.3% of the participants reported that they have never experienced discrimination while applying for a job or during the recruitment process. However, some participants did report experiencing discrimination, with the most common reasons given being age (19.3%), gender expression (6.1%), and religion (3.3%).

The overall results indicate the following per value:

Interest Value:

- 52.1% strongly agreed that a company's mission alignment with their values was crucial.
- 91.7% expressed a strong desire for an environment fostering innovative work practices and providing constant, exciting challenges.

Social Value:

- Over 60% were more likely to apply to companies with active Corporate Social Responsibility (CSR) programs.
- More than 75% agreed that working for an organization that supports and implements DE&I initiatives was essential.

Economic Value:

- 95.3% believed that being content with the compensation package offered by their employer was crucial.
- More than 50% indicated that the size of a company affected their level of interest when applying for a job position.

Development Value:

- Over 90% expressed attraction to companies offering recognition programs and career enhancement opportunities.
- 85% sought career advancement programs that included job level and title change.
- Application Value:
- Over 85% expressed a strong desire to utilize their skills and have the chance to mentor others.

A significant majority, exceeding 85%, actively sought learning opportunities sponsored or supported by their

companies. These findings underscore the significance of these dimensions in employer branding strategies in Costa Rica. However, the top three dimensions of employer attractiveness identified were Development Value, Application Value, and Interest Value.

The dimensions of employer attractiveness proposed by Berthon (2005) are interconnected, implying that while they influence each other, they should be analyzed independently. This approach helps to identify the key factors that talent marketing and human resources professionals should emphasize in their application and retention strategies.

The regression analysis reveals several key insights into key factors that influence employer attractiveness among mid and senior-level professionals in Costa Rica. Interest Value emerged as the strongest variable, with a positive coefficient ($\beta = 2.226$), suggesting that individuals place a high importance on personal alignment with the company's values, mission, and innovative work environment. This finding is consistent with prior studies, which emphasize the growing importance of value congruence between employers and employees, particularly among younger generations (Rank & Palframan, 2021).

Application Value also contributed significantly to employer attractiveness ($\beta = 0.668$), indicating that the ability to apply one's skills, autonomy in work, and opportunities for mentoring are critical factors. This reinforces the idea that professionals seek environments where they can contribute meaningfully and grow through challenging assignments.

Interestingly, Development Value was negatively associated with employer attractiveness ($\beta = -0.052$). Although significant, this small negative coefficient may suggest that, for mid and senior-level professionals, continuous development opportunities might not hold as much weight as initially assumed. This could be because these individuals already have established careers and prioritize other aspects, such as job security or alignment with personal values, over development programs typically aimed at younger or entry-level employees.

For employers in Costa Rica, these findings highlight the importance of emphasizing value alignment and providing environments where employees can apply their skills meaningfully. Particularly in the context of mid/senior-level professionals, focusing on CSR initiatives, creating innovative workspaces, and offering meaningful work opportunities may enhance employer attractiveness. While development programs remain important, their role may be secondary to more immediate work-related values.

The Top Three Dimensions: What Do Costa Ricans Value the Most?

The responses from the survey offer valuable insights into the aspects of employer branding attractiveness that matter the most to the Costa Rican workforce. Three categories emerged as particularly influential.

Firstly, the Interest Value category was identified as crucial, emphasizing the alignment of personal values with the company's mission and industry contribution. This dimension reflects participants' inclination towards organizations whose products or services resonate with their own interests. Additionally, Interest Value encompasses the desire to work in an environment that fosters innovative work practices and provides constant, exciting challenges. This aspect indicates that professionals in Costa Rica seek dynamic and stimulating work environments that allow them to contribute meaningfully and grow professionally.

Secondly, the Application Value category was revealed as a critical factor, emphasizing the significance of being able to apply acquired skills and knowledge in a meaningful way within the organization. This dimension suggests that Costa Rican professionals value challenging and engaging roles that offer opportunities to apply their skills and knowledge to real-world problems. Participants want to feel that their work is making a meaningful impact and contributing to the organization's success. This highlights the importance of job roles that provide autonomy, creativity, and innovation opportunities, including mentoring other peers.

Thirdly, the Development Value category was identified the third most relevant dimension, indicating the importance of providing opportunities for professional growth, recognition programs, and career advancement. It highlights the participants' preference for employers who invest in their employees' development and offer clear pathways for career progression. This suggests that the opportunity for personal and professional development is a key factor in attracting and retaining talent in Costa Rica.

Kummrow (2023) indicated that loyalty transcends mere identification with the company's work. There is a significant positive relationship between feeling loyal to one's employer and having a clear career path within the company, echoing Kummrow's findings. This correlation aligns with expert opinions, emphasizing career development as pivotal for fostering loyalty. Additionally, the study found a positive association between loyalty and the workplace feeling like a family, mirroring expert beliefs that team events and social interactions are crucial for cultivating loyalty. These findings underscore the multifaceted nature of employee loyalty, extending beyond mere job satisfaction.

Overall, these findings suggest that employer branding strategies in Costa Rica should focus on promoting development opportunities, providing challenging and meaningful work, and aligning with the values and interests of the workforce. The results of this study can be compared to Broek's findings (2015), which highlight how work environment, work-life balance, leadership style, task variety, and decision-making autonomy significantly impact an employer's attractiveness, as perceived by both European

students and employees.

Economic Value: More Than Just a Salary

Current employees now have heightened expectations, with a fundamental characteristic of a reputable employer being the facilitation of development. This shift can be attributed to the swiftly evolving knowledge and innovation-driven economy, which mandates continuous employee growth. Contemporary expectations of a reputable employer encompass work-life balance, flexible employment arrangements, innovation, diversity management, and environmental and societal concerns (Kupczyk et al., 2016).

Economic Value, though ranked fourth, emerges as a crucial dimension in the employer branding landscape for the Costa Rican workforce, as evidenced by the overwhelming response of 95.3% of participants emphasizing the significance of being content with the compensation package offered by their employer. However, participants' perceptions of compensation extended beyond monetary aspects, highlighting non-monetary benefits.

Moreover, more than half of the participants indicated that the size of a company influenced their interest in applying for a job. This suggests that while the size of a company may play a role in their decision-making process, the allure of a competitive compensation package outweighs the impact of a company's presence or size. This underscores the importance of offering attractive benefits and perks to attract and retain talent in Costa Rica's competitive job market.

Social Value and its Relevance for Younger Generations

Sullivan (2004) underscores the escalating significance of candidates' awareness regarding a company's best practices, implying that this area warrants pivotal attention for organizations, particularly concerning CSR and Diversity, Equity, and Inclusion (DE&I) initiatives. The findings of this study align with Sullivan's perspective, indicating a strong preference among Costa Rican professionals for companies with which they can strongly identify. This identification extends to the company's values, mission, and the industry it contributes to. Ružić & Benazić (2023) conducted a review of Berthon's dimensions using a Gen-Z target audience in Croatia; the findings allowed them to create a new structure divided into six dimensions: Organization's market orientation, Acceptance and good relationships with colleagues, Informal characteristics of the workplace, Potential of the workplace for gaining experience and career advancement, Salary and other material benefits, and Sense of belonging to the organization. While they all relate to the original five, the sense of belonging could be categorized similarly to "Social Value."

This dimension received the fewest votes. However, the percentage difference between each value is less than 4%, underscoring the relevance of this pillar to a company's employer brand strategy. Since more than 60% of respondents belong to Generation Y or Z, it can be inferred that this value has become a pertinent consideration for younger generations when applying for jobs or deciding to stay at a company, almost matching the percentage of the "Economic Value," which is commonly perceived as the most sought-after dimension by job seekers.

6 Conclusions

This study sheds light on the dimensions of employer attractiveness that hold the most significance for the Costa Rican workforce. The findings reveal a nuanced understanding of what professionals in Costa Rica value in their employers, highlighting key areas that organizations should focus on in their employer branding strategies.

The top three dimensions of employer attractiveness identified in this study - Development Value, Application Value, and Interest Value - underscore the importance of personal and professional growth, challenging and engaging work, and alignment with organizational values. These dimensions provide a framework for organizations to effectively tailor their employer branding efforts to attract and retain talent.

Furthermore, the study highlights the interconnectedness of these dimensions, suggesting that while they influence each other, they should be addressed independently to comprehensively cover all job seekers' needs. By understanding and addressing these dimensions, organizations can enhance their employer branding efforts and create a more attractive workplace for professionals in Costa Rica.

The findings also emphasize the importance of economic value, indicating that while a competitive compensation package is crucial, non-monetary benefits such as work-life balance and flexible employment arrangements play a significant role in attracting and retaining talent. Additionally, the study underscores the relevance of social value, particularly among younger generations, highlighting the importance of CSR and DE&I initiatives in employer branding strategies.

Employer branding significantly influences job seekers' decisions in Costa Rica by shaping their perception of an organization as an attractive employer. Factors such as reputation, values, culture, and growth opportunities are crucial in attracting top talent. Moreover, a strong employer brand emphasizing Diversity, Equity, and Inclusion (DE&I) can attract a more diverse pool of candidates, signaling the organization's commitment to creating an inclusive workplace.

For organizations, investing in a DE&I-focused employer brand can yield several benefits. It can help attract and retain diverse talent, enhance the organization's reputation as an inclusive employer, and improve employee engagement and retention. By aligning their employer branding efforts with DE&I goals, organizations can create a more diverse and inclusive workplace, improving busi-

ness performance and market competitiveness.

Overall, employer branding is a powerful tool that organizations in Costa Rica can leverage to attract top talent and advance their Diversity, Equity, and Inclusion (DE&I) initiatives. By strategically aligning their branding efforts with the values and interests of the local workforce, companies can create a compelling narrative that resonates with job seekers. This not only helps in attracting diverse talent but also plays a crucial role in retaining employees by fostering a sense of belonging and purpose. Moreover, a strong employer brand can positively impact an organization's reputation, both internally and externally, enhancing its ability to compete for talent in the market. Therefore, investing in employer branding not only serves as a competitive advantage but also contributes to the overall success and sustainability of the organization.

A critical gap in current literature lies in understanding the comprehensive needs and preferences of job seekers in Costa Rica, encompassing not only Diversity, Equity, and Inclusion (DE&I) factors but also broader aspects relevant to their employment decisions. Existing research predominantly focuses on organizational practices and DE&I initiatives on a global scale. By exploring job seekers' priorities, expectations, and challenges in the Costa Rican labor market, this research can provide valuable insights to organizations seeking to enhance their recruitment strategies and employer branding efforts. Moreover, integrating job seekers' perspectives into recruitment practices can help firms understand the impact of their preferences on organizational Diversity, Equity, and Inclusion (DE&I) goals and ultimately contribute to creating more inclusive and diverse workplace environments in Costa Rica. Therefore, bridging this gap in the literature by examining the holistic needs of prospective candidates in Costa Rica can inform organizational decision-making processes and facilitate the creation of more tailored and appealing employment opportunities in the country.

Recommendations for Further Research

Expanding on the recommendations to enhance the understanding of how employer branding impacts job seekers' decisions in Costa Rica and its implications for organizations' Diversity, Equity, and Inclusion (DE&I) goals, several avenues of exploration and analysis can be pursued (Davies & Vieker, 2023),

Firstly, the unique cultural and economic context of Costa Rica should be thoroughly examined. This includes delving into how local culture, labor market conditions, and sociocultural expectations shape job seekers' perceptions of employer branding. For example, Costa Rica's strong emphasis on education and sustainability could influence job seekers' preferences for employers committed to environmental stewardship and employee development (Okot & Castro, 2023), whereby in the model underlying the survey the importance of CSR is attributed with one of the lowest levels regarding the importance for applying for a job. To this end, comparative studies of different nations could provide further insights.

Additionally, the impact of globalization and digitalization on the Costa Rican workforce should be considered. These factors may influence job seekers' expectations regarding job flexibility, remote work options, developing skills for using artificial intelligence and access to global opportunities, affecting their perception of employer branding.

Another area of focus for future research could be to examine how employer branding varies across different job areas and industries in Costa Rica. The study's findings highlight the top dimensions of employer attractiveness across various sectors, such as Administration, Marketing, Customer Service, Finance, IT, Engineering, and Healthcare. However, it is essential to recognize that preferences for employer branding elements may vary significantly between these sectors. For example, professionals in the healthcare industry might prioritize employer branding aspects related to work-life balance, job security, and opportunities for professional development, while those in the IT sector might value innovation, flexibility, and competitive compensation packages. Conducting sector-specific studies could provide deeper insights into the unique needs and preferences of professionals in different job areas, enabling organizations to tailor their employer branding strategies more effectively to attract and retain talent in specific industries.

A deeper exploration of the role of communication and transparency in employer branding is also essential, particularly concerning DE&I practices. Organizations that effectively communicate their commitment to DE&I and demonstrate transparency in their practices are more likely to attract and retain diverse talent. Research could focus on identifying best practices for communicating DE&I initiatives, such as using inclusive language in job postings, showcasing diverse employee stories on company websites, and training employees and hiring managers on unconscious bias.

Furthermore, applying additional theoretical frameworks to analyze the study's results could provide further insights. For example, using other tools developed after Berthon's (2005) framework could help better understand how professional development opportunities and compensation practices affect job seekers' decisions. These approaches could enrich the understanding of job seekers' motivations and preferences regarding employer branding and DE&I practices on a larger scale by further dissecting the dimensions, as demonstrated by Puri (2018) and Kummrow (2023). Understanding how job seekers identify with an organization's values and culture can help tailor employer branding strategies to better resonate with their target audience.

Literature

Aaker, D.A. (1991). *Managing Brand Equity*. New York, NY: Free Press

Ahmed, R., Azam, M., Qureshi, J., Hashem A., Parmar, V. & Salleh, N. (2022). The Relationship Between Internal Employer Branding and Talent Retention: A Theoretical Investigation for the Development of a Conceptual Framework. *Frontiers in psychology,* 13, 859614. https://doi.org/10.3389/fpsyg.2022.859614

Ambler, T., & Barrow, S. (1996). The employer brand. *Journal of brand management*, 4, 185-206.

Ariyanto, R., & Kustini, K. (2021). Employer branding and employee value proposition: The key success of startup companies in attracting potential employee candidates. *Annals of Human Resource Management Research*, 1(2), 113-125.

Backhaus, K., & Tikoo, S. (2004). Conceptualizing and researching employer branding. *Career development international*, 9(5), 501-517.

Ružić, E., & Benazić, D. (2023). Dimensions of attractiveness in employer branding and the value proposition framework for young employees. *Ekonomski vjesnik/ Econviews-Review of Contemporary Business, Entrepreneurship and Economic Issues*, 36(1), 89-100. https://doi.org/10.51680/ev.36.1.7

Berthon, P., Ewing, M., & Hah, L. L. (2005). Captivating company: dimensions of attractiveness in employer branding. *International journal of advertising*, 24(2), 151-172.

Broek, M. N. (2015). From employer attractiveness to employer branding: Results of a mixed methods research (Master's thesis, University of Twente).

Canossa, H. (2020). Retos para la inclusión laboral de personas con discapacidad en Costa Rica. *Economía y Sociedad,* 25(58), 50-68. https://dx.doi.org/10.15359/eys.25/58.4

Collins, C., & Kanar, A. (2013). Employer brand equity and recruitment research. *The Oxford Handbook of Recruitment*, 284-297.

Dauth, T., Schmid, S., Baldermann, S., & Orban, F. (2023). Attracting talent through diversity at the top: The impact of TMT diversity and firms' efforts to promote diversity on employer attractiveness. *European Management Journal*, 41(1), 9-20. https://doi.org/10.1016/j.emj.2021.10.007

Davies, J., & Vieker, K. (2023). Building diverse and inclusive doctoral ecosystems. *Global Focus*, 17(2), 35-40.

Edwards, M. (2010). An integrative review of employer branding and OB theory. *Personnel Review*. 39. 5-23. http://dx.doi.org/10.1108/00483481011012809

Garcia Mora, M. E., Schwartz Orellana, S., & Freire, G. (2021). *Disability inclusion in Latin America and the Caribbean: A path to sustainable development*. World Bank. https://documents1.worldbank.org/curated/en/099015112012126833/pdf/P17538305622600c00bf3f09659df1f2f79.pdf

Gurgu, E., & Kuleto, V. (2023). The impact of employer branding on organizational performance: a comprehensive analysis. *Annals of Spiru Haret University. Economic Series*, 23(2).

Hodge, D. R., & Gillespie, D. F. (2007). Phrase completion scales: a better measurement approach than Likert scales? *Journal of Social Service Research*, 33(4), 1-12. https://doi.org/10.1300/J079v33n04_01

International Labour Organization. (2021). *Diversity and inclusion in the workplace.* Retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---act_emp/documents/publication/wcms_808983.pdf

Janssen, H., Rudeloff, C. (2024) Exploring the Role of Influencers in Shaping Employer Brands: A Comparative Study of Corporate and Third-Party Influencers. *Corp Reputation Rev*. https://doi.org/10.1057/s41299-023-00177-9

Kristia. (2023). Connecting with Future Talent: A Review of Employer Value Propositions and Digital Media Channels for Sustainable Companies Targeting Generations Y and Z . *Journal of Theoretical and Applied Management (Jurnal Manajemen Teori Dan Terapan),* 16(2), 293–308. https://doi.org/10.20473/jmtt.v16i2.45126

Kriswanto, D., & Rofiq, A. (2023). The Effect of Market Orientation, HR Competence, Knowledge Management on Competitive Advantage, Mediated by Company Performance. *Revista De Gestão Social E Ambiental,* 17(8), e03677-e03677. https://doi.org/10.24857/rgsa.v17n8-021

Kummrow, R. (2023). *Employer Branding as a Tool to Facilitate Employee Retention*, *Modul University Vienna*. Retrieved from https://www.modul.ac.at/uploads/files/Theses/Bachelor/Undergrad_2023/BBA_2023/61904204_KUMMROW_Richard_Bachelor_Thesis.pdf

Kupczyk, T., Szymańska, A., Kubicka, J., & Oleszkiewicz, A. (2016). The relationships between diversity management and employer branding. *Journal of US-China Public Administration*, 13(2), 82-90.

Lievens, F. (2007). Employer branding in the Belgian Army: The importance of instrumental and symbolic beliefs for potential applicants, actual applicants, and military employees. *Human resource management,* 46(1), 51-69. https://doi.org/10.1002/hrm.20145

Noutel, R., Araujo, P., Fernandes, R., & Arriscado, P. (2021). An employer branding strategy: developing a talent atraction model through action research. *South Florida Journal of Development*, 2(1), 417–431. https://doi.org/10.46932/sfjdv2n1-031

Okot, T., & Castro, M. Z. (2023). Desigualdad Digital en el Sistema de Educación Pública: Estudio de Caso Fuera del Área Metropolitana de Costa Rica. *Revista de Educación y Derecho*, (28). https://doi.org/10.1344/REYD2023.28.41707

Pawar, A. V. I. N. A. S. H. (2016). Leveraging the Employer Brand Strategy with Employee Value Proposition. *Journal of Contemporary Issues in Business Research*, 5(2), 35-44.

Pertiwi, L., & Azmy, A. (2023). The Implementation of Employer Branding in Hospitality Industry: A Literature Review. *International Journal of Multicultural and Multireligious Understanding,* 10(12), 305-314. http://dx.doi.org/10.18415/ijmmu.v10i12.5315

Plummer, D. L. (2003). Handbook of diversity management: Beyond awareness to competency based learning. University Press of America.

Puri, D. (2018). Developing the Scale to Measure Employer Attractiveness. *Annals of the University Dunarea de Jos of Galati: Fascicle: I, Economics & Applied Informatics*, 24(3). https://doi.org/10.26397/eai1584040923

Rank, S., & Palframan, J. (2021). Internal Corporate Social Responsibility Preferences of Young Job Seekers with Regard to Sustainable HRM: Are These CSR Preferences Related to Their Personal Value Orientations?. *Journal of Intercultural Management*, *13*(4), 34-62. https://doi.org/10.2478/joim-2021-0071

Reinikainen, H., Kari, J. T., & Luoma-Aho, V. (2020). Generation z and organizational listening on social media. *Media and Communication*, 8(2), 185–196. https://doi.org/10.17645/mac.v8i2.2772

Saini, G. K., Rai, P., & Chaudhary, M. K. (2014). What do best employer surveys reveal about employer branding and intention to apply?. *Journal of Brand Management*, 21(2), 95-111. https://doi.org/10.1057/bm.2013.10

Saini, G. K., Lievens, F., & Srivastava, M. (2022). Employer and internal branding research: a bibliometric analysis of 25 years. *Journal of Product & Brand Management*, 31(8), 1196-1221.

Eroglu, U. (2019, December). Identifying the Dimensions of Employer Brand within the Framework of Employee Value Proposition9. *In Congress Proceedings Series* (p. 139).

Ščiukauskė, I. (2021). The Impact of Employer Brand Equity Elements on Consumer Attitude to Service Brand. *Vilnius University Open Series*. 99-106. https://doi.org/10.15388/VGISC.2021.13

Sullivan, J. (2004). Eight elements of a successful employment brand. *ER Daily*, 23(2), 501-517.

Theurer, C. P., Tumasjan, A., Welpe, I. M., & Lievens, F. (2018). Employer branding: a brand equity-based literature review and research agenda. *International Journal of Management Reviews*, 20(1), 155-179. http://doi.org/10.1111/ijmr.12121

Veldsman, D., & van der Merwe, M. (2022). Promises in action: The role of employer brand, employee value proposition and employee experience in delivering on psychological contract expectations. *EWOP in Practice*, 16(1). https://doi.org/10.21825/ewopinpractice.87160

Watzlawick, P., Beavin, J. & Jackson, D.D. (1967), Pragmatics of Human Communication, W.W. Norton & Company, *New York*

Yadav, S., & Lenka, U. (2020). Diversity management: a systematic review. Equality, Diversity and Inclusion: *An International Journal*, 39(8), 901-929. https://doi.org/10.1108/EDI-07-2019-0197

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Blagovna znamka delodajalca kot katalizator za raznolikost in odličnost delovne sile: poglobljena študija iz Kostarike

Ozadje/namen: Študija raziskuje ključne dejavnike, ki jih kostariški delavci upoštevajo, ko se prijavljajo v podjetje ali ostajajo v njem, z namenom informiranja o učinkovitih strategijah blagovne znamke delodajalca.
Metoda: Anketiranje 385 strokovnjakov srednjega/višjega nivoja. Raziskava se osredotoča na pet razsežnosti: interesna vrednost, družbena vrednost, ekonomska vrednost, razvojna vrednost in vrednost uporabe.
Rezultat: Ugotovitve razkrivajo, da kostariški strokovnjaki dajejo prednost interesni vrednosti, aplikacijski vrednosti in razvojni vrednosti, pri čemer poudarjajo priložnosti za rast, privlačne vloge in usklajenost z vrednotami podjetja. Ključno je tudi konkurenčno nadomestilo.
Zaključek: Študija kaže, da bi morale strategije blagovne znamke delodajalca poudarjati razvojne priložnosti, smiselno delo in usklajevanje vrednot, da bi pritegnili in obdržali različne talente. Omejitve vključujejo zasnovo ankete, ki lahko omeji globino odgovora, in njeno izključno osredotočenost na Kostariko, kar lahko omejuje posplošljivost. Rezultati ponujajo dragocene vpoglede za organizacije v Kostariki za izboljšanje zaposlovanja in zadrževanja zaposlenih.

Ključne besede: *Blagovna znamka delodajalca, Privlačnost delodajalca, Raznolikost, Pravičnost in vključenost, Privlačnost talentov, Kostarika*

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The Impact of Students' Cybersecurity Vulnerability Behavior on E-Learning Obstacles

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Background/purpose: This study examines the relationship between students' cybersecurity vulnerability behavior and e-learning obstacles. With the rapid growth of online education, ensuring the security and privacy of digital platforms has become crucial. In this background, the current study is a first-of-its-kind attempt to understand the relationship between these two variables in the background of higher educational institutions in Iraq.
Methods: For this study, the researchers collected data during 2023 from students aged between 19 and 25 enrolled in the University of Karbala, Iraq, using a semi-structured research questionnaire, who were selected through a random sampling method. The questionnaire comprised questions pertaining to the dimensions of both the dependent and the independent variable. A total of 350 valid responses were considered for the analysis in which PLS-SEM was conducted.
Results: The outcomes revealed that the professional and human obstacles have a high association with cybersecurity vulnerability behavior. The study also found that the overall obstacles have a significant effect on the cybersecurity vulnerability behavior. All hypotheses were verified and the outcomes confirm that there is an effective relationship between cybersecurity vulnerability behavior and e-learning obstacles
Conclusion: Based on the study outcomes, the authors proposed a few recommendations for all the stakeholders of the e-learning process, such as educational institutions, governments, faculty members, students, and their parents. Though the current study has been confined to a single university in Iraq, future researchers can focus on expanding the study to other higher educational institutions so that a nationwide policy-level initiative can be brought based on the research evidence.

Keywords: *Cybersecurity Vulnerability Behavior, E-Learning Obstacles, Higher education, PLS-SEM, Student motivation, Learning behaviour*

1 Introduction

E-learning or online learning has become a popular learning method, especially in the aftermath of COVID-19 pandemic (Fauzi, 2022). E-learning brings positive impact on the success of the students in terms of their academics. However, various challenges are associated with e-learning from the perspective of universities/educational institutions (lack of financial and physical resources, lack of technical infrastructure, trained professionals, resistance

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from faculty to adopt to novel training methods and so on), students/learners (unable to access internet, lack of necessary equipment/technical infrastructure, high chances of distraction, loss of humanly approach, disconnection with peers and instructors) and the faculty/teacher (access to internet/technical infrastructure, unable to understand the learners' outcomes, clarify their queries etc.,(Mojarad et al., 2023) (Alhamdawee, 2023) mentioned that Iraq opted for e-learning only in the recent years, due to two-decade long political instability, internet unavailability, outdated technical infrastructure, etc., However, Iraqi institutions understood COVID-19 as an opportunity in disguise to upgrade their technical infrastructure and e-learning option by leveraging the open-source and paid platforms like doodle, Google classroom and free conference call etc., In literature, the authors mentioned a variety of challenges in Iraq for e-learning adoption, one of which remains the cybersecurity issue.

Cybersecurity Vulnerability Behavior (CVB) refers to actions or behaviors that increase the chances of experiencing cyber-attack or data breach. In this behavior, the victims tend to lose their confidential data due to their weak passwords or clicking the suspicious links or attachments, failing to update software, or sharing sensitive information (N. F. Khan et al., 2022). When students engage in e-learning platforms, they exhibit cybersecurity vulnerability behavior and expose themselves to cybersecurity risks, including malware, ransomware, or phishing attacks (Wijayanto & Prabowo, 2020).

The impact of students' behavior exposed to cybersecurity on e-learning obstacles can be significant, for instance inability to access the e-learning platforms (Morrow, 2024). In addition to this, a compromised device of the student may be used by the attacker to gain access to the rest of the students and even the platform also. Thus, the cyberattacker may disrupt the module altogether and the institutional infrastructure as well. So, it becomes important to understand the behaviour of the students with regards to cybersecurity risks. Research has shown that a lack of awareness, training, or motivation can contribute to students' cyberattack vulnerability (Vishal Verma & Janardan Pawar, 2024). In the case study published earlier (Al Shabibi & Al-Suqri, 2023), 83% students were found to have been exposed to cybersecurity threats, when they were enrolled in online learning programs during the COVID-19 pandemic. Further, 77% of the target population i.e., post-basic education students from Muscat, lacked awareness about the cybersecurity issues. Therefore, it is important for the educators and administrators to provide the students with appropriate cybersecurity education, training, and resources to reduce the cybersecurity vulnerability behavior and ensure the security and continuity of e-learning activities (Abbas, 2020; Kumar et al., 2022).

E-learning obstacles are of different types such as lecturer-related (desire for change, understanding and knowledge about the technology, sufficient training, technical support etc.,), student-related, curriculum-related and so on (Abeer, 2022). In this background, it is important to understand the relationship between cybersecurity vulnerability behaviour of the students and the e-learning obstacles, since the researchers have mentioned it as a complex phenomenon that requires in-depth understanding (A. H. Ibrahim et al., 2019). Various studies have been conducted earlier focusing cybersecurity awareness among the students and faculty members in Iraq (Abdulla et al., 2023; Al-Janabi & Al-Shourbaji, 2016; Ameen et al., 2017; Nagham Oudeh Alhamdawee, 2023; Tarrad et al., 2022; Zahid et al., 2023), Iraqi private banks (Faez Hasan & Al-Ramadan, 2021), Iraqi national security (Al-Tae et al., 2022), Iraqi organizations (Khadija Hassan & Mustafa Jawad, 2022) and so on. However, there is a lack of studies pertaining to cybersecurity vulnerability behavior and the presence of e-learning obstacles, conducted among students in University of Karbala, Iraq. Thus, the current study is a first-of-its-kind attempt in this domain within the study environment as no other study has been conducted so far, to the best of the authors' knowledge. The current study outcomes will help the decision makers at the institutional level, governments and the cybersecurity organizations that fight the cyberattackers on the daily basis. By understanding the relationship between these two constructs and using a multi-faceted approach, it is important to identify the most vulnerable areas so as to create awareness among students on appropriate cybersecurity practices and provide them with the tools and resources to protect their devices and data.

Based on the study findings, the institutional committees can set up training programs for the students, faculty and other non-teaching staff on how to combat phishing attacks, using safe and complex passwords and making sure the technical infastructure is up-to-date. By promoting good cyber security practices, it is possible for all the stakeholders involved in the e-learning process to reduce the cyberattack vulnerabilities and minimize the impact of their behavior on increasing obstacles to e-learning (Alkaaf, 2023; Arul & Punidha, 2022).

2 Literature review

The current section details about the studies conducted in cybersecurity vulnerability behaviour and the obstacles faced in e-learning system in terms of electronic and physical obstacles, financial and organizational obstacles followed by professional and human obstacles. Cybersecurity vulnerable behavior refers to actions or behaviors that can make an individual, organization, or a system highly vulnerable to cyberattacks or data breaches. Cybersecurity vulnerabilities are weaknesses or gaps in the security measures exploired by the cybercriminals to gain

unauthorized access, steal sensitive data, install malware, or disrupt operations (Ewoh & Vartiainen, 2024).

Poor cybersecurity vulnerability behavior can include a wide range of actions, such as failing to update software and systems, using weak or easy-to-guess passwords, clicking on suspicious links or attachments, sharing sensitive information over unsecured networks or platforms, and neglecting to implement the basic security practices such as two-factor authentication and data backups (Gourisetti et al., 2020). So, it is essential to understand and address the cybersecurity vulnerability behavior to mitigate cybersecurity risks in an effective manner. By identifying and providing a remedy for the vulnerability behavior, both individuals as well as the organizations can reduce the likelihood of successful cyberattacks and protect themselves from potential threats. Some of the studies conducted earlier pertaining to awareness levels among students about cybersecurity have been discussed herewith.

Al-Sherideh (Al-Sherideh et al., 2023) analyzed the satisfaction level of the students enrolled in e-learning platform named Moodle e-learning system, in terms of data security and privacy and their opinions on the overall standard of education. The study outcomes revealed that the presence of security and cybersecurity measures positively influence the increased usage of e-learning modules while the study recommended to get regular feedback and have a constant communication with the students about their experience with the e-learning portals. Thus, it is possible to mitigate the security risks and also have increased engagement. (Bottyan, 2023) assessed the awareness levels among Dunaújváros university students in Hungary, pertaining to cybersecurity using a Personal Cyber Security Provision Scale questionnaire. The questionnaire involved questions regarding protection of privacy, payment information, avoiding the untrusted links, precaution and no trace of transaction history. The study found that password management and performing sensitive transactions on public computers are some of the issues that need to be taken care, since the students are highly exposed to cyberattacks.

Abeer (Abeer, 2022) made an attempt to identify the most important obstacle faced by the lecturers in handling e-learning modules for the purpose of higher education. In this study, the 95 lecturers working in the Palestine Technical University Kadoorie were chosen through convenient sampling method and the outcomes revealed the following challenges in the order of high to low; technological infrastructure > university-oriented > student-related > curriculum-related and finally lecturer-related. The study also established a moderate positive correlation among lecturer, student and the curriculum-bound challenges.

In literature (Abdulla et al., 2023), the authors analyzed the risks involved in data attacks, focusing the University of Sulaimani, Iraq and how far the students and faculty members are aware of social engineering attacks and cyber-security threats. The institution was chosen since the university's internet users invited security risks, confidentiality issues and so on. Using a self-report questionnaire, the data was collected and the outcomes revealed that spear phishing is mostly used by the attackers followed by phishing, baiting, pretexting, quid pro quo and piggybacking, while the victims have significant knowledge about piggybacking. Some of the reasons cited by the participants on not being aware include lack of experience, human error, lack of appropriate training, using same or shared passwords by multiple persons in the same department, not being aware of the social engineering-based attacks, poor knowledge and so on. Cybersecurity vulnerability behaviour includes the following concepts in a broader perspective such as human factors (lack of awareness, training, etc.,), risk management (detection and mitigation of risks followed by risk management practices), threat landscape (constant evolution of threats and the increasing security vulnerabilities), compliance (lack of Standard Operating Procedures and non-adherence to security measures, cybersecurity audits etc) and technology (using outdated software or hardware, absence of technological infrastructure) (Geogiana Buja et al., 2021; Syed, 2020; Yusif & Hafeez-Baig, 2023).

In literature (Tarrad et al., 2022), the authors considered five independent variables such as information security, cybereducation, cyber-training, internet applications and creative behavior with a dependent variable named digital awareness to understand the relationship among these variables and its impact on each other. For this study, 140 school academicians from Eastern Iraq were randomly selected and the data was collected. From the study findings, digital awareness was found to have a positive effect on the rest of the variables. The results emphasized the importance of digital awareness while it urged the government to introduce novel cybersecurity and information security programs within the curriculum itself. In a study conducted among graduate and undergraduate students in Iraq (Zahid et al., 2023), the authors analyzed the impact of demographic features of the individuals upon their awareness levels with regards to cybersecurity. For this study, the authors developed a questionnaire and collected 613 responses. Based on the data analysis outcomes, gender has a significant difference while educational level and age had no significant difference on the cybersecurity awareness. Alzubaidi (Alzubaidi, 2021) measured the awareness level about cybersecurity among 1,230 Saudi Arabian nationals aged above 18 participants, in which the authors assessed the level of awareness and the number of incidents, educational background, critical thinking and the absence of e-government portals for dealing cybercrime-related issues. The study found that half of the participants used personal information to create their passwords while 32.5% had no idea about phishing attacks while 21.7% were already victims of cybercrimes.

3 E-learning obstacles

E-learning has gained wide popularity in recent years, especially after the outbreak of the COVID-19 pandemic. Due to the outbreak, many educational institutions were forced to switch to online learning mode so as to ensure safe distance and avoid public gatherings. E-learning platforms are a flexible, cost-effective, and scalable way to deliver education. However, e-learning model has its own challenges for all the stakeholders involved in the institution such as the decision makers in the institution, technical staff, faculty members, students and their parents (Aborujilah et al., 2022). . The current section details about the studies conducted earlier that defined the issues faced by learners towards e-learning and the ways to address it. In literature (Almaiah et al., 2020), the authors analyzed the critical challenges faced by 30 students, 25 faculty members and 4 e-learning experts at six universities, located in Jordan and Saudi Arabia about the primary factors that support and hinder the adoption of e-learning system. The authors identified the factors that influence the adoption of e-learning and segregated them under various aspects such as trust, system quality, cultural aspects, self-efficacy and interest issues. On the other hand, the challenges found were financial issues, change management conflicts and the lack of technical infrastructure.

Various authors (Barakat et al., 2022; Muhammad, 2022; Pandian, 2023) have summarized the obstacles found in e-learning such as technical issues (low processing capability, faulty or absence of power, hardware and bug issues, compatability etc.,), educational issues (different pedagogical approach, resistance to change from conventional classroom teaching, lack of engagement between the learner and the teacher etc.,), social issues (absence of interaction, less or no motivation, insufficient social skills etc.,), motivational issues and time-management issues. In the systematic review conducted earlier (Mohamed & Kim, 2023), the authors found technology barriers, engagement issues, learning interest among the learners and anxiety to perform are the challenges faced by learners in e-learning programs, enrolled in the educational institutions in Middle east. In the qualitative study conducted among 10 female undergraduate students enrolled in Saudi Public universities (Abed et al., 2022), the authors analyzed how far the learners are motivated and have belief towards online education and the barriers faced by them in terms of societal and religious bases. As per the study findings, the sudden change that occurred during COVID-19 had a heavy impact upon their learning. On the other hand, personal challenges too reduced the student's willingness towards online education.

In a study conducted at Salahaddin University, Iraq, the authors (Ameen et al., 2017) determined the challenges encountered in e-learning and their perceptions about the impact caused by e-learning system in Iraqi higher education. For this study, 300 responses were collected from the students studying in the university through convenience sampling. The findings confirm the following challenges in Iraqi higher educational institutions regarding online learning; inability to get certified, lack of electricity, bad internet connection, absence of a supportive culture and absence of knowledge about the system. Based on the review of literature, it can be understood that there is a lack of studies pertaining to cybersecurity vulnerability behaviour and e-learning obstacles while no study has been conducted at the University of Karbala in this background. In order to fulfil this research gap, the current study aims at understanding the relationship between students' cybersecurity vulnerability behavior and e-learning obstacles.

4 Development of the hypotheses

The current section deals with the development of the hypotheses. Cybersecurity vulnerability behavior refers to actions or inactions that increase an individual's risk of experiencing a cyberattack while such actions include using weak passwords or failing to update software. Learners who use e-learning platforms for engaging in digital learning programs are highly prone to experience cyberattacks. These issues, in turn, can hinder their successful e-learning experience. Additionally, the learners who possess cybersecurity vulnerability behavior are less likely to trust e-learning platforms or feel confident about themselves on using such digital platforms in a safe and effective manner. This lack of confidence and trust can result in motivational issues and hinder their ability to engage with the platform. On this basis, the first main hypothesis has been developed for the study (Abumandour, 2022; Maatuk et al., 2022).

First Hypotheses (H1): *There is a significant relationship between cybersecurity vulnerability behavior and the obstacles to e-learning.*

Based on this main hypothesis, seven sub hypotheses have been framed as briefed herewith. Access to data and information is essential for effective learning in e-learning environments. In the absence of adequate access to data and information, the learning experience becomes incomplete while it also hinders the students from achieving their educational goals. For example, it was found that students perceived access to online resources positively affected their motivation and participation in e-learning (Yeh & Tsai, 2022). Similarly, it was found that insufficient access to data and information was a significant barrier to effective e-learning in healthcare education (Al Shamari, 2022). Moreover, it was found that the lack of access to appropriate resources was one of the major obstacles to the successful adoption of e-learning in the workplace (Abdelfattah et al., 2023). In this background, the first sub-hypothesis has been framed as follows.

The first sub-hypothesis (H1.1): *There is a significant relationship between the Behavior of Data and Informa-*

tion Access and e-learning obstacles.

Access to reliable devices and internet/network connectivity is critical to effective e-learning. Improper device and internet/network use can lead to technical issues, power outages, and limited access to online resources, all of which can affect the student's participation and performance. Therefore, it can be hypothesized that insufficient use of devices and internet/networks may exacerbate these e-learning obstacles, resulting in lower student engagement and performance (M. Khan et al., 2020). It was found that technical issues with hardware and internet/network connectivity were the most significant barriers to effective e-learning during the COVID-19 pandemic (Abeer, 2022). Similarly, it was found that insufficient use of devices and the internet/network were important factors influencing the adoption of e-learning among Jordan and Saudi Arabian university students (Almaiah et al., 2020). Moreover, it found that students with reliable devices and internet/network connections were likelier to engage in e-learning activities. In this background, the second sub-hypothesis has been framed as follows.

The Second sub-hypothesis (H1.2): *There is a significant relationship between the behavior of devices and internet / network usage and e-learning obstacles.*

Using social media can be a distraction for e-learners and can reduce their focus and concentration. Social media addiction can lead to procrastination, poor time management, and lower productivity, affecting student engagement and performance (Vishal Verma & Janardan Pawar, 2024). Therefore, it can be hypothesized that excessive use of social media may exacerbate the obstacles of e-learning, leading to lower student engagement and performance. Several studies have identified the relationship between social media use and e-learning barriers (Abdulhassan Abbas & Hurajah Al Hasnawia, 2020; Sefriani et al., 2023). For example, excessive use of Facebook is associated with lower academic performance among college students (N. T. Khan & Ahmed, 2018).So, was it found that social media addiction was negatively related to academic performance and time management among undergraduate students. Moreover, it was found that the use of social media was a significant predictor of procrastination among college students (Sobaih et al., 2022). In this background, the third hypothesis has been framed as given below.

The third sub-hypothesis (H1.3): *There is a significant relationship between the behavior of social media and e-learning obstacles.*

Password security is an important aspect of eLearning security. Weak or easy-to-guess passwords can result in unauthorized access while the hacked passwords can create a chaos in the e-learning environment, reducing participation (Abeer, 2022; Salman & Shahadab, 2022). Therefore, it can be hypothesized that the behavior of using weak or easy-to-guess passwords may exacerbate e-learning obstacles, leading to lower student engagement and performance Several studies have identified the relationship between password security and e-learning obstacles (Darawsheh et al., 2023; K. Elberkawi et al., 2022; Klaib et al., 2022). For example, a study found that weak passwords were among the most common causes of security breaches in e-learning environments (Khlifi, 2020). Further, it was found that technical issues and accessibility issues were the major obstacles that hinder the adoption of e-learning among adult learners. In this background, the fourth sub-hypothesis has been framed as follows.

The fourth sub-hypothesis (H1.4): *There is a significant relationship between the Behavior of Using Password and e-learning obstacles.*

As mentioned earlier, smartphone addiction can lead to procrastination, poor time management, and lower productivity, affecting student engagement and performance (Peng, 2023; C. Zhang et al., 2022). Several studies have identified the relationship between smartphone use and e-learning obstacles. For example, higher smartphone use levels were associated with lower academic performance among college students. Similarly, it was found that using smartphones for non-academic purposes during class was negatively associated with a student's GPA. Moreover, smartphone addiction was negatively related to academic performance among university students (J. Zhang & Zeng, 2024; Zou et al., 2022). In this background, it can be hypothesized that the excessive use of smartphones may exacerbate these e-learning obstacles, leading to lower student engagement and performance (Sunday et al., 2021). So, the fifth sub-hypothesis has been framed as given below.

The Fifth sub-hypothesis (H1.5): *There is a significant relationship between the behavior of using smartphone devices and e-learning obstacles.*

As mentioned earlier, weak technical infrastructure represented by outdated devices, power outage, lack of access of high-speed internet, networking issues, lack of permanent maintenance, the lack of modern computers, and the lack of original programs remain the most important physical and electronic obstacles towards the widespread adoption of online education. The cybersecurity vulnerability behavior affects this dimension directly based on which the following hypothesis has been developed.

The Six sub-Hypotheses (H1.6): *There is a significant relationship between cybersecurity vulnerability behavior and the electronic and physical obstacles*

In addition to the lack of technical infrastrcutrue, the organizational obstacles such as the lack of financial support, lack of support from the management, lack of equipped and modern scientific laboratories, and the weakness of training programs and so on. These issues tend to have an impact upon the cybersecurity vulnerability behavior based on which the seventh hypothesis has been framed below.

The Seven sub-Hypotheses (H1.7): *There is a significant relationship between cybersecurity vulnerability behavior and financial and organizational obstacles*

The lack of seasoned professionals in the organization, inexperienced faculty members, lack of basic computer education for the students, conventional teaching methods in the field of the internet and computers, the lack of specialized people to maintain devices and update programs, and the absence of clear mechanisms in the employment and application of e-learning heavily affect the Cybersecurity Vulnerability Behavior based on which the eight sub-hypothesis has been framed as given below.

The Seven sub-Hypotheses (H1.8): There is a significant relationship between cybersecurity vulnerability behavior and the professional and human obstacles

5 Methods

In order to achieve the objective, a semi-structured research questionnaire was developed and the number of questions pertaining to each and every dimension of the study are quoted in table 1. Table (1) shows the dimensions of both dependent variable (E-learning obstcles ELO) and the independent variable (Cybersecurity vulnerability behavioru – CVB) used in the current study. The respective number of questions, for the dimensions, used in the questionnaire along with the source articles are shown in the table.

The questionnaire developed was converted into a google form so that the responses can be easily collected and used for analysis. For this study, random sampling method was followed to choose the potential respondents from a pool of students enrolled at the Faculty of Administration and Economics, Department of Accounting, University of Karbala, Iraq. The potential respondents i.e., students were given this questionnaire to respond during the study period 08th May and 19th May 2023. The respondents were given time and informed consent was obtained from the study participants. Out of the total 968 students, 450 students were approached to participate in the study. Based on the responses received and upon validation, 350 valid responses were considered for final analysis. Out of the final responses, 167 (47.71%) were male students and 183 (52.28%) were female students aged between 19 and 25 years. Before completing the design of the study, the researchers conducted interviews among a sample of students in this department, and majority of the respondents reported that they actually encounter numerous obstacles in the field of cybersecurity and also in e-learning, which had an impact on their performance and increased the vulnerability of their accounts to hacking. This study employed the Structural Equation Modeling (SEM) approach with Partial Least Squares as an analytical tool (PLS). PLS studies psychometric traits and provides evidence for the existence or absence of associations (Bagozzi, 1981). SmartPLS 3.2.9 and SPSS 28 were used to analyze the data in this investigation in two phases. The first step measurement model validated the structures' content, convergent, and discriminant validity. In the second step, the structural model and hypotheses were tested. Common Method Bias (CMB) was detected through Harman's single-factor test; the percentage of the factor's explained variance for the common factor (10.8%) was below the threshold of 50%, indicating the absence of this problem (MacKenzie & Podsakoff, 2012).

Table 1: Variable, dimensions and the number of questions pertaining to the dimension in the questionnaire

Variable	Dimensions	number of questions	Type	Source
Cybersecurity Vulnerability Behavior (CVB)	The behavior of Data and Information Access (BDIA)	5	independent	(Wijayanto & Prabowo, 2020)
	The behavior of Device and Internet / Network Usage (BDIU)	4		
	The behavior of social media (BSM)	3		
	The behavior of Using Password (BUP)	5		
	The behavior of Using Smartphone Devices (BUSD)	4		
E-Learning Obstacles (ELO)	Electronic and physical obstacles (EPO)	4	Dependent	(Abeer, 2022; A. F. Ibrahim et al., 2021)
	Financial and organizational obstacles (FOO)	6		
	Professional and human obstacles (PHO)	5		

Table 2: Measurement model assessment

Itmem	BUP	BDIA	BDIU	BSM	BUSD	EPO	PHO	FOO
BUP1	0.401							
BUP2	0.61							
BUP3	0.47							
BUP4	0.467							
BUP5	0.533							
BDIA1		0.57						
BDIA2		0.456						
BDIA3		0.486						
BDIA4		0.663						
BDIA5		0.528						
BDIU1			0.49					
BDIU2			0.716					
BDIU3			0.611					
BDIU4			0.541					
BSM1				0.587				
BSM2				0.585				
BSM3				0.703				
BUSD1					0.533			
BUSD2					0.416			
BUSD3					0.655			
BUSD4					0.595			
EPO1						0.552		
EPO2						0.658		
EPO3						0.595		
EPO4						0.512		
PHO1							0.461	
PHO2							0.652	
PHO3							0.501	
PHO4							0.534	
PHO5							0.66	
PHO6							0.649	
FOO1								0.524
FOO2								0.424
FOO3								0.464
FOO4								0.7
FOO5								0.504
CR	0.622	0.675	0.683	0.659	0.637	0.67	0.751	0.656

6 Results

The current study details about the measurement model for the reflective and latent variables. Further, factor loadings, composite reliability and discriminant validity were also utilized in this study. Further, discriminant validity is assessed through Fornell–Larcker criterion and HTMT ratio. In addition to this, Pearson correlation analysis was conducted after which the structure model was assessed. Finally, the hypothesis testing was conducted and the results are discussed in this section along with discussion.

6.1 Measurement Model

To establish the validity of the model's constructs, the measurement model was evaluated for reflective and latent variables (see Figure 1). Factor loadings, composite reliability (CR), and discriminant validity were used to assess construct validity (Hair et al., 2014). Hair et al. recommended dropping indicators with loading below 0.40 to allow forester composite reliability (CR) (Leguina, 2015) Click or tap here to enter text.. No indicators were dropped from the model, as shown in Table (2) and Figure (1). The values of composite reliability should be greater than 0.6 (Bagozzi, 1981). These indicate that the study satisfied these requirements for convergent validity and internal consistency of the scales.

Further, discriminant validity is assessed through Fornell–Larcker criterion and HTMT ratio. Fornell–Larcker criterion required that each composite AVE square root on the diagonal element be greater than the correlations between the constructs (Leguina, 2015).

The HTMT approach is 'the ratio of the between-trait correlations to the within-traits correlations'. The HTMT values should be lower than 1 (Gaskin et al., 2018). The discriminant validity is established following the previous guides of the Fornell-Larcker criterion and HTMT values in tables 3 and 4.

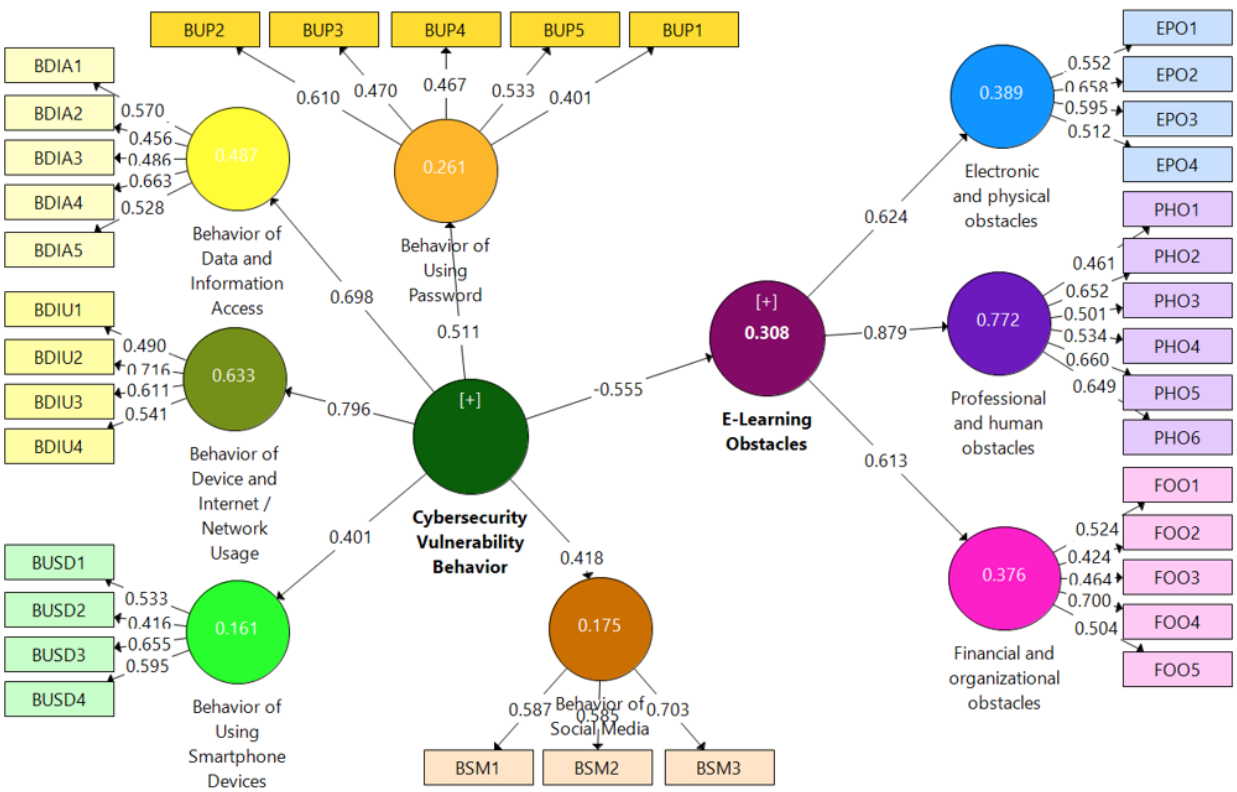

Figure 1: Measurement model assessment

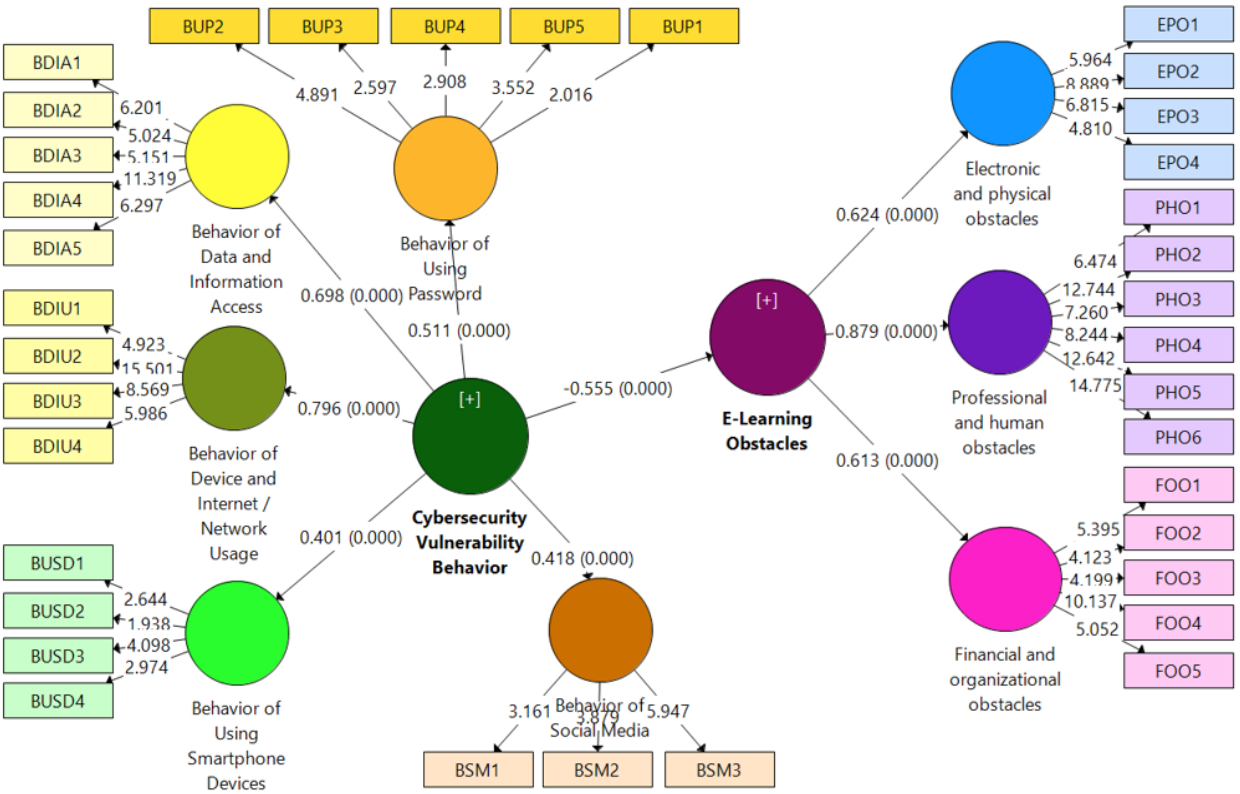

Figure 2: Structural model assessment

Table 3: Discriminant validity (Fornell-Larcker criterion)

	BDIA	BDIU	BSM	BUP	BUSD	EPO	FOO	PHO
BDIA	**0.545**							
BDIU	0.351	**0.596**						
BSM	0.123	0.181	**0.627**					
BUP	0.214	0.213	0.204	**0.501**				
BUSD	0.077	0.28	-0.02	0.069	**0.557**			
EPO	-0.219	-0.352	-0.181	0.069	-0.193	**0.582**		
FOO	-0.117	-0.273	-0.249	0.038	-0.14	0.19	**0.532**	
PHO	-0.388	-0.469	-0.262	-0.123	-0.159	0.328	0.321	**0.582**

Table 4: Discriminant validity (HTMT ratio)

	BDIA	BDIU	BSM	BUP	BUSD	EPO	FOO	PHO
BDIA								
BDIU	0.93							
BSM	0.593	0.713						
BUP	0.733	0.712	0.835					
BUSD	0.618	0.767	0.578	0.631				
EPO	0.685	0.975	0.648	0.643	0.683			
FOO	0.629	0.788	0.98	0.575	0.8	0.656		
PHO	0.72	0.957	0.824	0.494	0.529	0.713	0.673	

Table 5: Descriptive statistics and multiple correlations

		BUP	BDIA	BDIU	BSM	BUSD	EPO	PHO	FOO	CVB	ELO
BUP	**r**	--									
BDIA	**r**	.22***	--								
	P	<.001									
BDIU	**r**	.19***	.32***	--							
	P	<.001	<.001								
BSM	**r**	.20***	.13*	.18***	--						
	P	<.001	0.016	0.001							
BUSD	**r**	0.09	0.06	.26***	-0.03	--					
	P	0.097	0.299	<.001	0.563						
EPO	**r**	0.06	-.20***	-.35***	-.19***	-.17***	--				
	P	0.242	<.001	<.001	<.001	0.001					
PHO	**r**	-.12*	-.34***	-.46***	-.27***	-.16**	.32***	--			
	P	0.030	<.001	<.001	<.001	0.003	<.001				
FOO	**r**	0.02	-0.06	-.23***	-.26***	-0.10	.18***	.31***	--		
	P	0.751	0.252	<.001	<.001	0.057	0.001	<.001			
CVB	**r**	.57***	.58***	.71***	.51***	.49***	-.31***	-.48***	-.23***	--	
	P	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		
ELO	**r**	-0.02	-.29***	-.4***	-.33***	-.20***	.73***	.76***	.66***	-.48***	--
	P	0.759	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
M		**3.97**	**3.82**	**4.01**	**3.66**	**3.23**	**3.87**	**3.97**	**3.96**	**3.74**	**3.93**
SD		**0.43**	**0.42**	**0.51**	**0.46**	**0.47**	**0.52**	**0.49**	**0.44**	**0.26**	**0.35**
Skewness		**-0.16**	**0.33**	**-0.17**	**0.31**	**0.41**	**0.19**	**-0.01**	**-0.08**	**-0.43**	**0.24**
Kurtosis		**-0.65**	**-0.06**	**-0.62**	**-0.35**	**-0.10**	**-0.68**	**-0.97**	**-0.62**	**-0.11**	**-0.69**

r= correlation coefficient; P= P-value; M=mean; SD=standard deviation.

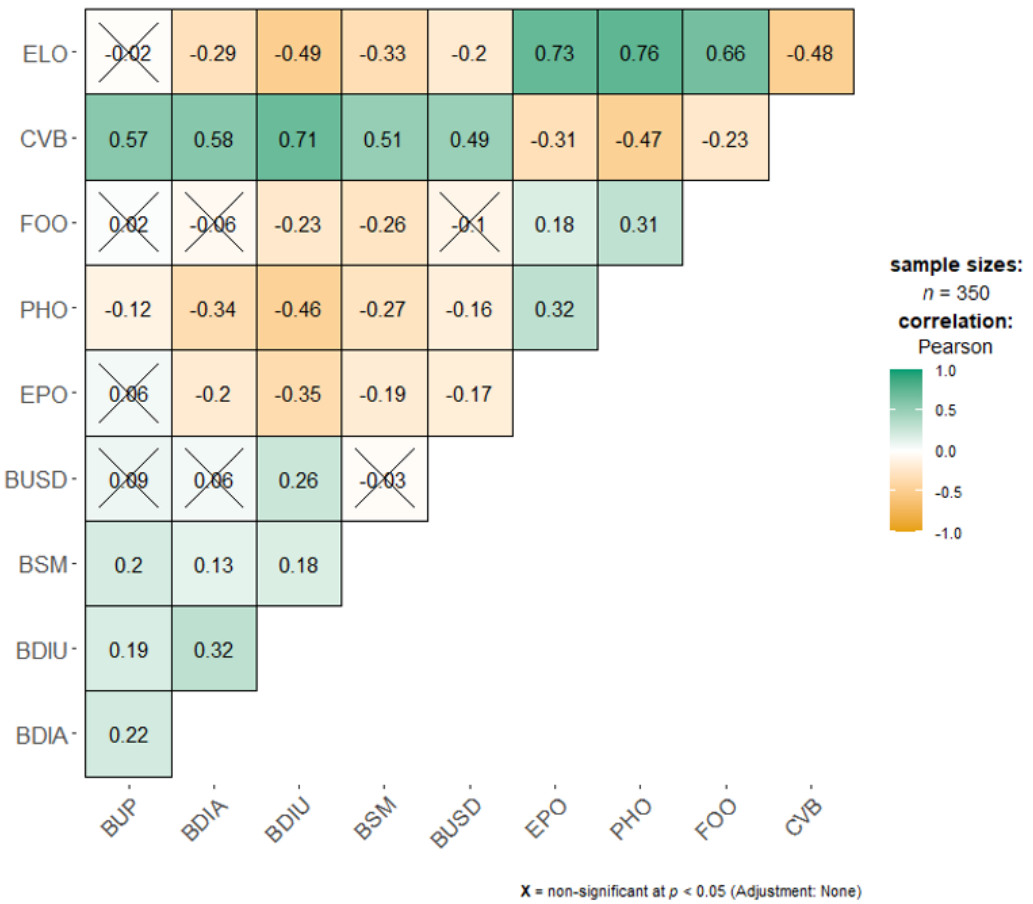

Figure 3: Visualization of the correlation matrix

6.2 Descriptive Statistics and Multiple Correlations

After establishing the reliability and validity of the variables, descriptive statistics and multiple correlations were conducted between the selected constructs including the mean (M) and standard deviation (SD) as shown Table (5). The descriptive statistics for the independent variable "Cybersecurity Vulnerability Behaviour" was (M=3.74,SD=0.26), and for the dependent variable, "E-Learning Obstacles" was (M=3.93,SD=0.35).

Among the dimensions of the independent variable "Cybersecurity Vulnerability Behaviour", it was found that the "BDIU" had the highest mean (M=4.01,SD=0.51) and "BUSD" had the lowest mean (M=3.23,SD=0.47). Among the dimensions of the dependent variable "E-Learning Obstacles", it was found that the "PHO" had the highest mean (M=3.97,SD=0.49) and "EPO" had the lowest mean (M=3.87,SD=0.52). The values for Skewness between -2 to +2 and kurtosis between -7 and +7 are generally considered to be acceptable to prove normal distribution (Byrne, 2016; Hair et al., 2021) Click or tap here to enter text.. The results of the normality test, shown in Table 5, infer that the values of Skewness and kurtosis for the constructs of the model were within the specified range.

Pearson product-moment correlation coefficient is calculated to determine the strength and the direction of the relationship between the selected constructs. Correlation coefficients marked with three stars (***) are significant at 0.001, i.e., 99.9% confidence level; correlation coefficients marked with two stars (**) are significant at 0.01, i.e., 99% confidence level, coefficients marked with one star (*) are significant at 0.05, i.e., 95% confidence level, and finally, coefficients NOT marked are not significant at 0.05, i.e., P-values are greater than 0.05. Table 5 shows the matrix of Pearson correlation coefficients among all the constructs and the dimensions. A negative relationship was found between the independent variable (and its dimensions) and the dependent variable (and its dimensions). However, a significant negative relationship was found between Cy-

bersecurity Vulnerability Behaviour and E-Learning Obstacles since (r(350)=-.48,P<0.001).

6.3 Assessing the Structural Model

Examining the structural model includes path coefficients, collinearity diagnostics, coefficient of determination (R2), effect size (f^2), predictive relevance (Q2), and global goodness of fit criteria. Before analyzing the structural model, the collinearity among the constructs was examined (table 7) using Variance Inflation Factors (VIF), and found that all the values were less than the threshold of 5 (Leguina, 2015).

The results of hypothesis testing in Table 6 and Figure 2 showed that Cybersecurity Vulnerability Behavior yielded a significant negative effect on E-Learning Obstacles since (β=-0.555,t=11.943,P<0.001,95% CI for β=[-0.632,-0.453]), consequently, the first hypothesis is confirmed. Additionally, in Table 5 and Figure 4, the dimensions of Cybersecurity Vulnerability Behavior yielded a significant negative effect on E-Learning Obstacles as follows: Behavior of Data and Information Access (β=-0.214,P<0.001), Behavior of Device and Internet/Network Usage (β=-0.412,P<0.001), Behavior of Social Media (β=-0.258,P<0.001), and Behavior of Using Smartphone Devices (β=-0.147,P=0.001). While Behavior of Using Passwords does not influence E-Learning Obstacles since (β=0.048,P>0.05).

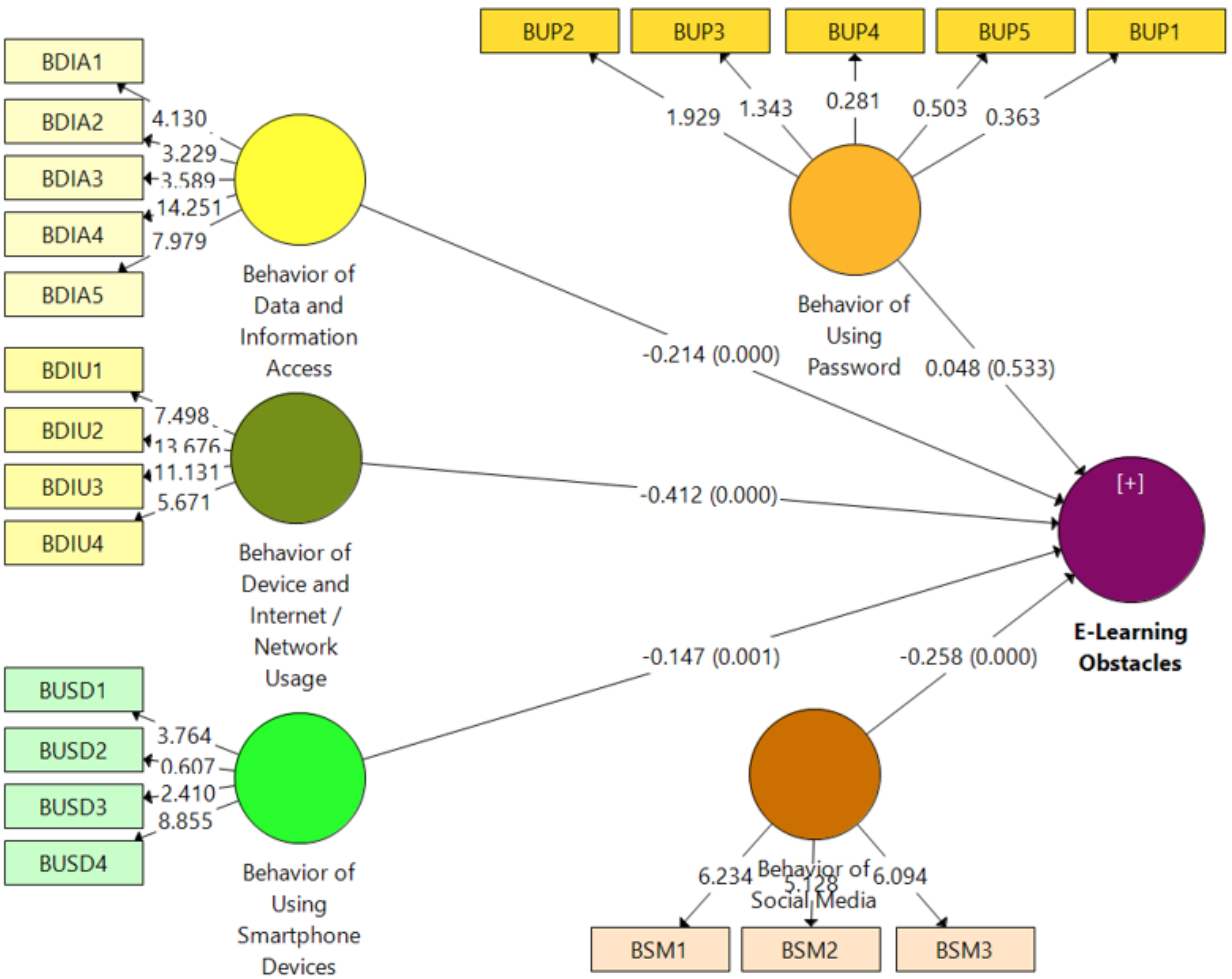

Figure 4: Effect of Cybersecurity Vulnerability Dimensions on E-Learning Obstacles

Table 6: Results of Hypothesis Testing

Path	B	t-value	P-value	95% Bias-Corrected CI		Remark
				LB	UB	
H1: *Cybersecurity Vulnerability Behavior -> E-Learning Obstacles*	-0.555	11.943	<.001	-0.632	-0.453	Supported
H1.1: *Behavior of Data and Information Access -> E-Learning Obstacles*	-0.214	4.506	<.001	-0.294	-0.118	Supported
H1.2: *Behavior of Device and Internet / Network Usage -> E-Learning Obstacles*	-0.412	8.648	<.001	-0.506	-0.32	Supported
H1.3: *Behavior of Social Media -> E-Learning Obstacles*	-0.258	6.396	<.001	-0.337	-0.18	Supported
H1.4: *Behavior of Using Password -> E-Learning Obstacles*	0.048	0.623	0.533	-0.073	0.232	Not Supported
H1.5: *Behavior of Using Smartphone Devices -> E-Learning Obstacles*	-0.147	3.476	0.001	-0.224	-0.058	Supported
H1.6: *Cybersecurity Vulnerability Behavior -> Electronic and physical obstacles*	-0.421	9.128	<.001	-0.492	-0.312	Supported
H1.7: *Cybersecurity Vulnerability Behavior -> Financial and organizational obstacleS*	-0.395	8.658	<.001	-0.461	-0.279	Supported
H1.8: *Cybersecurity Vulnerability Behavior -> Professional and human obstacles*	-0.581	20.03	<.001	-0.622	-0.518	Supported

CI=Confidence Interval; LB=Lower Bound; UB=Upper Bound.

Furthermore, in Table 5 and Figure 5, the Cybersecurity Vulnerability Behavior construct yielded a significant negative effect on E-Learning Obstacles dimensions as follows: Electronic and physical obstacles (β=-0.421,P<0.001), Financial and organizational obstacles (β=-0.395,P<0.001), and Professional and human obstacles (β=-0.581,P<0.001).

The results in Table 7 indicate that about 31% of the variation in E-Learning Obstacles is explained by the variation in Cybersecurity Vulnerability Behavior with a high Cohen's effect size (f2 =0.444). The effect sizes of the other hypotheses were reported and ordered in Figure 6. Then, the predictive relevance was determined by assessing the Stone-Geisser's Q2 Blindfolding, a sample reuse technique that can be used to calculate Q2 values for latent variables. The blindfolding procedure was followed and the Q2 values were calculated for the E-Learning Obstacles (Q2 =0.049). All the values were higher than zero, thus indicating a predictive relevance for endogenous latent variables in the current study' PLS path model (Leguina, 2015; Wetzels et al., 2009). The Goodness of Fit (GoF) was introduced by (Tenenhaus et al., 2005) as a global fit metric (Wetzels et al., 2009).

The GoF criterion for determining if GoF values are too little, too moderate, or too high to be considered a globally adequate PLS model. The GOF value (0.314) was greater than 0.25, indicating moderate fit, so it can be safely concluded that the GoF model is good enough to be considered a sufficiently valid global PLS model. All hypotheses were verified and the outcomes confirm that there is an effective relationship between cybersecurity vulnerability behavior and e-learning obstacles. Also, there are influencing relationships and varying proportions among the dimensions for each of the two variables. Figure (6) explains them in detail that are arranged according to their importance. All hypotheses were fulfilled in varying proportions, even if they were few, except for the sub-hypothesis 1.4, whose percentage was very low and was not supported.

7 Discussion

The current study outcomes confirmed that the professional and human obstacles have a high association with cybersecurity vulnerability behavior. This might be due to the students' poor experience in using modern technologies, and most students have no proficiency in English language and remain unfamiliar with the scientific terminology. Further, the conventional training programs too add fuel to the fire. In most of the cyberattacks, the victims are

either duped by a malicious portrayal or it occurs as a result of lack of cybersecurity knowledge. This finding alarms the educational institutions to develop a sense of belonging and awareness among the students about cybersecurity issues because it not only affects the students' themselves, but also the entire e-learning portal users, technical infrastructure developed by the university/educational institution and so on. With increasing instances of human rights violations on the internet and telecommunication modes, it is important to develop and nurture a healthy ecosystem for the online learning education system, which is possible only through the establishment of a strong, vibrant and secure cyber-communication environment (AbdulAmeer et al., 2022).

The study also found that the overall obstacles have a significant effect on the cybersecurity vulnerability behavior. This finding is in line with the literature pertaining to Iraqi and other MENA countries' educational institutions since in the aftermath of COVID-19, most educational institutions started preferring hybrid mode of education due to health advisories, increasing cost of infrastructure and so on. (Hameed, 2023) listed various obstacles towards the widespread adoption of e-learning in Iraq in terms of educational institutions, student learners, faculty members and so on. According to the authors, students feel isolated and becomes introvert through e-learning mode of education while they lack sufficient socialization skills, lack face-to-face interaction with faculty members and are afraid of facing the real-world scenarios. Cyberattacks pose a significant risk while the students also face difficulties in meeting the technical infrastructure requirements.

The study findings emphasized the importance of using advanced devices, high-speed internet connectivity, access to uninterrupted power and the absence of cyberattacks. Because, these factors tend to affect the mindset of the students. It is important for the student to gain motivation for attention, to gain confidence on the learning outcomes, satisfied over the learning objectives and stay relevant to the job market (Yahiaoui et al., 2022). The current study findings confirm that using smart devices may come as an obstacle towards e-learning while the social media behavior also have an impact on digital learning outcomes. On the contrary, the quantitative study conducted among 185 Iraqi students and lecturers (Al-Malah et al., 2021), the

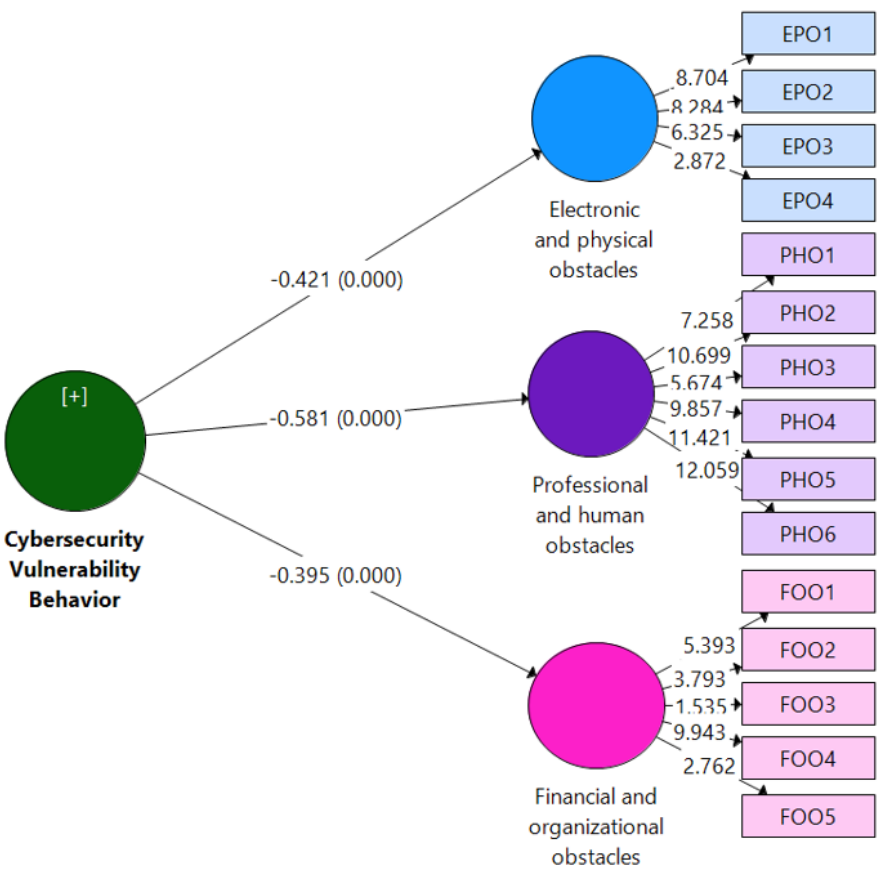

Figure 5: Effect of Cybersecurity Vulnerability Behavior on E-Learning Obstacles Dimensions

Table 7: Structural model assessment

Path	R-Square	R-Square Adjusted	Q Square	F-Square	VIF
Cut-off	***> 0.1***		***> 0***	***> 0.02***	***<5***
Cybersecurity Vulnerability Behavior -> E-Learning Obstacles	0.308	0.306	0.049	0.444	1
Behavior of Data and Information Access -> E-Learning Obstacles	0.445	0.437	0.067	0.072	1.153
Behavior of Device and Internet / Network Usage -> E-Learning Obstacles				0.238	1.286
Behavior of Social Media -> E-Learning Obstacles				0.114	1.051
Behavior of Using Password -> E-Learning Obstacles				0.004	1.046
Behavior of Using Smartphone Devices -> E-Learning Obstacles				0.036	1.089
Cybersecurity Vulnerability Behavior -> Electronic and physical obstacles	0.177	0.175	0.053	0.215	1
Cybersecurity Vulnerability Behavior -> Financial and organizational obstacles	0.156	0.154	0.028	0.185	1
Cybersecurity Vulnerability Behavior -> Professional and human obstacles	0.337	0.335	0.102	0.509	1

Cut-off values reference: (Leguina, 2015; Wetzels et al., 2009)

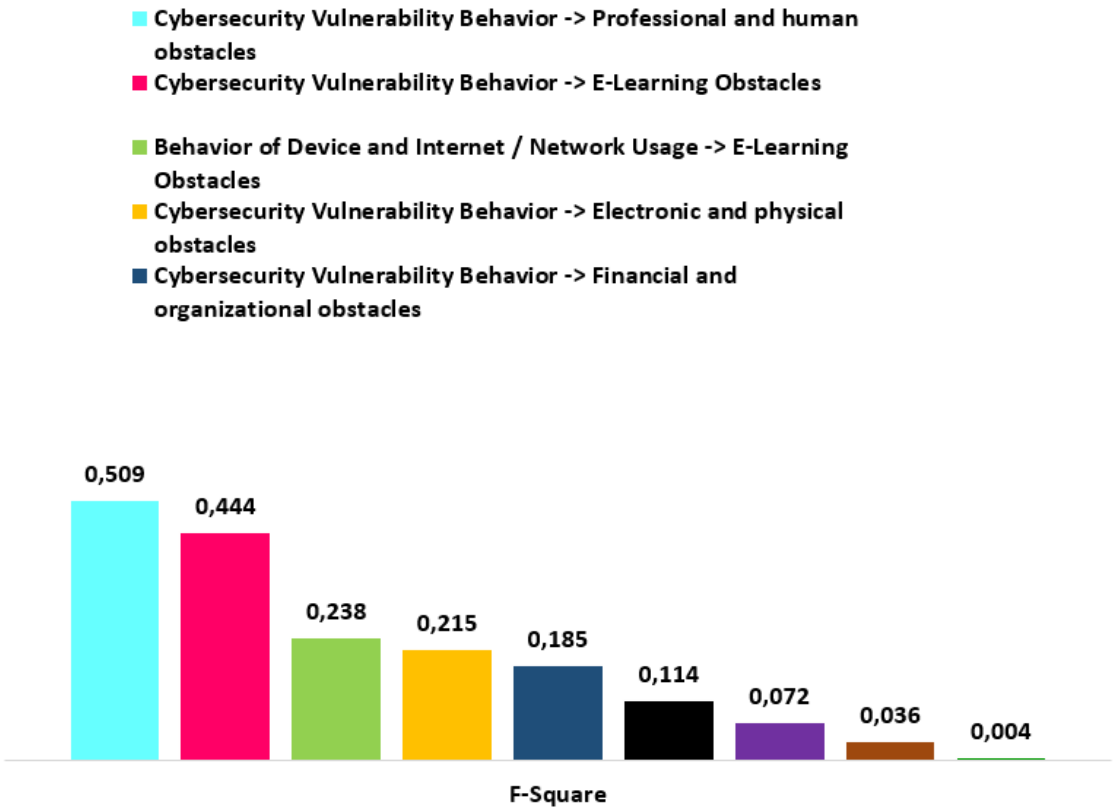

Figure 6: Effect sizes arranged in the order of highest to the lowest

authors found that the digital educational activities, when they are provided in the form of social media, can increase the attentiveness among the students and also attracts them towards the education. It also increases the self-learning motivation. Though the findings may contradict, given the circumstances, environment where the study was conducted, sample population and the possible bias, it can be considered as a suggestion for the future researchers to further explore in this domain.

(Mohamed & Kim, 2023) recommended that the educational institutions must devise their strategies to align with remote learning in a comprehensive and a holistic manner. As per the current study findings, all the hypotheses have been supported (except one) based on which the authors recommend the educational institutions and the governments to focus on developing the technical infrastructure, update the curricula as per the international standards, original applications for the computers, high-speed internet connectivity, conduct awareness programs among the students about cybersecurity issues and the ways to overcome the challenges, refresher training workshops for the faculty members and develop strategies to meet the digital learning requirements in line with the international standards.

8 Conclusion

The current study is a first-of-its-kind attempt to determine the relationship between cybersecurity vulnerability behavior and the obstacles present in e-learning while the study found that the professional and human obstacles had a heavy impact on the cybersecurity vulnerability behaviour. The findings help the educational institutions, policy makers in the governments, cybersecurity experts in the country, students, their parents, faculty members and all the stakeholders involved in imparting digital mode of education to the students in higher educational institutions. There is an urgent need for deploying highly qualified technical staff who are specialized in English language as well as computer proficient. Advanced human-oriented and social engineering strategies must be framed by the educational institutions to overcome the obstacles of e-learning. Future researchers must explore the challenges faced by other university students in Iraq so that a collective initiative can be taken by the educational institutions to bring a digital reform in the country.

Literature

Abbas, A. A. (2020). Educational Competition as a Moderating variable of the relationship between electronic management and intelligent organizations. *Revista Tempos e Espaços Em Educação*, *13*(32), 25. https://doi.org/10.20952/revtee.v13i32.13173

Abdelfattah, F., Al Alawi, A. M., Dahleez, K. A., & El Saleh, A. (2023). Reviewing the critical challenges that influence the adoption of the e-learning system in higher educational institutions in the era of the COVID-19 pandemic. *Online Information Review*, *47*(7), 1225–1247. https://doi.org/10.1108/OIR-02-2022-0085

AbdulAmeer, S. A., Saleh, W. R., Hussam, R., Al-Hareeri, H., Alghazali, T., S. Mezaal, Y., & Saeed, I. N. (2022). Cyber Security Readiness in Iraq: Role of the Human Rights Activists. *International Journal of Cyber Criminology*, *16*(2), 1–14

Abdulhassan Abbas, A., & Hurajah Al Hasnawia, H. (2020). Role of Psychological Contract Breach and Violation in Generating Emotional Exhaustion: The Mediating Role of Job Procrastination. *Cuadernos de Gestión*. https://doi.org/ https://doi.org/10.5295/cdg.181021aa

Abdulla, R., Faraj, H., Abdullah, C., Amin, A., & Rashid, T. (2023). Analysis of Social Engineering Awareness Among Students and Lecturers. *IEEE Access*, *PP*, 1. https://doi.org/10.1109/ACCESS.2023.3311708

Abed, M. G., Abdulbaqi, R. F., & Shackelford, T. K. (2022). Saudi Arabian Students' Beliefs about and Barriers to Online Education during the COVID-19 Pandemic. *Children (Basel, Switzerland)*, *9*(8). https://doi.org/10.3390/children9081170

Abeer, Q. (2022). Obstacles To Effective Use Of E-Learning In Higher Education From The Viewpoint Of Faculty Members. *Turkish Online Journal of Distance Education-TOJDE*, *23*(1), 144–177. https://files.eric.ed.gov/fulltext/EJ1329784.pdf

Aborujilah, H. A., Al-Alawi, E., Al-Hidabi, D., & Al-Othmani, A. (2022). *Exploring Critical Challenges and Factors Influencing E-Learning Systems Security During COVID-19 Pandemic*. https://doi.org/10.1109/ITSS-IoE56359.2022.9990935

Abumandour, E.-S. T. (2022). Applying e-learning system for engineering education–challenges and obstacles. *Journal of Research in Innovative Teaching & Learning*, *15*(2), 150–169.

Al-Janabi, S., & Al-Shourbaji, I. (2016). A Study of Cyber Security Awareness in Educational Environment in the Middle East. *Journal of Information & Knowledge Management*, *15*(01), 1650007. https://doi.org/10.1142/S0219649216500076

Al-kaaf, H. A. (2023). *Machine Learning Approaches for Kids' E-learning Monitoring BT - Kids Cybersecurity Using Computational Intelligence Techniques* (W. M. S. Yafooz, H. Al-Aqrabi, A. Al-Dhaqm, & A. Emara (eds.); pp. 25–36). Springer International Publishing. https://doi.org/10.1007/978-3-031-21199-7_2

Al-Malah, D., Abbas, A., Majeed, B., & Alrikabi, H. (2021). The Influence E-Learning Platforms of Undergraduate Education in Iraq. *International Journal*

of Recent Contributions from Engineering Science & IT (IJES), *9*, 90–99. https://doi.org/10.3991/ijes.v9i4.26995

Al-Sherideh, A. S., Maabreh, K., Maabreh, M., Mousa, M. R. Al, & Asassfeh, M. (2023). Assessing the Impact and Effectiveness of Cybersecurity Measures in e-Learning on Students and Educators: A Case Study. *International Journal of Advanced Computer Science and Applications*, *14*(5). https://doi.org/10.14569/IJACSA.2023.0140516

Al-Tae, A. K. J., Al-Dhalimi, H. A.-H., & Al- Shaibani, A. K. (2022). Relationship of Cybersecurity and the National Securityofthe Country: Iraq Case Study. *Sys Rev Pharm*, *11*(12), 469–476. https://www.sysrevpharm.org/articles/relationship-of-cybersecurity-and-the-national-security-of-the-country-iraq-case-study.pdf

Al Shabibi, A. M., & Al-Suqri, M. N. (2023). *Cybersecurity Awareness Among Students During the COVID-19 Digital Transformation of Education: A Case Study at the Muscat (Oman) Schools BT - Future Trends in Education Post COVID-19* (H. M. K. Al Naimiy, M. Bettayeb, H. M. Elmehdi, & I. Shehadi (eds.); pp. 39–51). Springer Nature Singapore.

Al Shamari, D. (2022). Challenges and barriers to e-learning experienced by trainers and training coordinators in the Ministry of Health in Saudi Arabia during the COVID-19 crisis. *PloS One*, *17*(10), e0274816. https://doi.org/10.1371/journal.pone.0274816

Alhamdawee, N. (2023). *online learning in Iraq challanges and opportunities*. *4*, 1...7.

Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, *25*(6), 5261–5280. https://doi.org/10.1007/s10639-020-10219-y

Alzubaidi, A. (2021). Measuring the level of cyber-security awareness for cybercrime in Saudi Arabia. *Heliyon*, *7*(1), e06016. https://doi.org/https://doi.org/10.1016/j.heliyon.2021.e06016

Ameen, N., Willis, R., & Abdullah, M. (2017). *The use of e-learning by students in Iraqi universities:Potential and challenges*. https://doi.org/10.23918/vesal2017.a27

Arul, E., & Punidha, A. (2022). Artificial Intelligence to Protect Cyber Security Attack on Cloud E-Learning Tools (AIPCE). *International Conference on Computing, Communication, Electrical and Biomedical Systems*, 29–37.

Barakat, M., Farha, R. A., Muflih, S., Al-Tammemi, A. B., Othman, B., Allozi, Y., & Fino, L. (2022). The era of E-learning from the perspectives of Jordanian medical students: A cross-sectional study. *Heliyon*, *8*(7), e09928. https://doi.org/https://doi.org/10.1016/j.heliyon.2022.e09928

Bottyan, L. (2023). Cybersecurity awareness among university students. *Journal of Applied Technical and Educational Sciences*, *13*(3 SE-Articles and Studies), ArtNo: 363. https://doi.org/10.24368/jates363

Byrne, B. (2016). *Structural equation modeling with AMOS*. Routledge.

Darawsheh, S. R., Alshurideh, M., Al-Shaar, A. S., Barsom, R. M. M., Elsayed, A. M., & Ghanem, R. A. A. A. (2023). *Obstacles to Applying the E-Learning Management System (Blackboard) Among Saudi University Students (In the College of Applied Sciences and the College of Sciences and Human Studies) BT - The Effect of Information Technology on Business and Marketing Intelligence Systems* (M. Alshurideh, B. H. Al Kurdi, R. Masa'deh, H. M. Alzoubi, & S. Salloum (eds.); pp. 389–414). Springer International Publishing. https://doi.org/10.1007/978-3-031-12382-5_21

Ewoh, P., & Vartiainen, T. (2024). Vulnerability to Cyberattacks and Sociotechnical Solutions for Health Care Systems: Systematic Review. *J Med Internet Res*, *26*, e46904. https://doi.org/10.2196/46904

Faez Hasan, M., & Al-Ramadan, N. S. (2021). Cyber-attacks and Cyber Security Readiness: Iraqi Private Banks Case. *Social Science and Humanities Journal*, *5*(8), 2312–2323.

Fauzi, M. A. (2022). E-learning in higher education institutions during COVID-19 pandemic: current and future trends through bibliometric analysis. *Heliyon*, *8*(5), e09433. https://doi.org/https://doi.org/10.1016/j.heliyon.2022.e09433

Geogiana Buja, A., Deraman, N. A., Wahid, S. D. M., & Mohd Isa, M. A. (2021). Cyber Security Featuresfor National E-Learning Policy. *Turkish Journal of Computer and Mathematics Education*, *12*(5), 1729–1735. https://turcomat.org/index.php/turkbilmat/article/download/2169/1889/4085

Gourisetti, S. N. G., Mylrea, M., & Patangia, H. (2020). Cybersecurity vulnerability mitigation framework through empirical paradigm: Enhanced prioritized gap analysis. *Future Generation Computer Systems*, *105*, 410–431. https://doi.org/https://doi.org/10.1016/j.future.2019.12.018

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis* (7th ed.). Pearson.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Thousand Oaks.

Hameed, L. M. (2023). E-learning in Iraq from Defensive to supportive Strategies: Facts and Obstacles. *Proceedings of the Iraqi Academics Syndicate 3rd International Conference on Arts and Humanities Sciences*.

Ibrahim, A. F., Attia, A. S., Bataineh, A. M., & Ali, H. H. (2021). Evaluation of the online teaching of architectural design and basic design courses case study: College of Architecture at JUST, Jordan. *Ain Shams En-*

gineering Journal, *12*(2), 2345–2353. https://doi.org/https://doi.org/10.1016/j.asej.2020.10.006

Ibrahim, A. H., Madhush, qadir eabd alhusayn, & Farhan, B. I. (2019). Obstacles to the application of e - learning in the Faculty of Information University of Dhi Qar. *Lark Journal for Philosophy, Linguistics and Social Sciences*, *2*(33), 306–315.

K. Elberkawi, E., Maatuk, A., F. Elharish, S., & M. Eltajoury, W. (2022). A Comparative Study of the Challenges and Obstacles Facing E-Learning During the COVID-19 Pandemic from the Perspectives of University Instructors and Students. *Proceedings of the 2022 Australasian Computer Science Week*, 186–192. https://doi.org/10.1145/3511616.3513114

Khadija Hassan, S., & Mustafa Jawad, R. (2022). Internal and External Factors to Adopt a Cyber Security Strategy in Iraqi Organisations. *Webology*, *19*(1), 5181–5198. https://www.webology.org/data-cms/articles/20220123025726pmWEB19349.pdf

Khan, M., Nabi, M. K., Khojah, M., & Tahir, M. (2020). Students' perception towards e-learning during COVID-19 pandemic in India: An empirical study. *Sustainability*, *13*(1), 57.

Khan, N. F., Ikram, N., Saleem, S., & Zafar, S. (2022). Cyber-security and risky behaviors in a developing country context: a Pakistani perspective. In *Security Journal* (pp. 1–33). https://doi.org/10.1057/s41284-022-00343-4

Khan, N. T., & Ahmed, S. (2018). Impact of Facebook addiction on studentsacademic performance. *Research Medical and Engineering Sciences*, *5*(2), 424–426.

Khlifi, Y. (2020). An Advanced Authentication Scheme for E-evaluation Using Students Behaviors Over E-learning Platform. *International Journal of Emerging Technologies in Learning (IJET)*, *15*(04 SE-Papers), 90–111. https://doi.org/10.3991/ijet.v15i04.11571

Klaib, A. A., Talooh, M. A. M., & Arbi, A. (2022). E-Learning, Challenges and Opportunities of Instructors in Libyan Higher Institutes. *International Conference on Engineering & MIS (ICEMIS)*, 1–6.

Kumar, A., Pandit, A., & Singh, S. (2022). Reliable Cyber Security And Improvement In E-Learning System. *Journal of Positive School Psychology*, *6*(11), 1743–1752. https://journalppw.com/index.php/jpsp/article/view/14307/9274

Leguina, A. (2015). A primer on partial least squares structural equation modeling (PLS-SEM). *International Journal of Research & Method in Education*, *38*(2), 220–221. https://doi.org/10.1080/1743727X.2015.1005806

Maatuk, A. M., Elberkawi, E. K., Aljawarneh, S., Rashaideh, H., & Alharbi, H. (2022). The COVID-19 pandemic and E-learning: challenges and opportunities from the perspective of students and instructors. *Journal of Computing in Higher Education*, *34*(1), 21–38.

MacKenzie, S. B., & Podsakoff, P. M. (2012). Common Method Bias in Marketing: Causes, Mechanisms, and Procedural Remedies. *Journal of Retailing*, *88*(4), 542–555. https://doi.org/https://doi.org/10.1016/j.jretai.2012.08.001

Mohamed, O., & Kim, J. (2023). Adult E-Learning Issues in Middle East Educational Organizations Due to Covid-19 Pandemic: Challenges and Recommendations. *Https://Newprairiepress.Org/Aerc*. https://newprairiepress.org/cgi/viewcontent.cgi?article=4318&context=aerc

Mojarad, F. A., Hesamzadeh, A., & Yaghoubi, T. (2023). Exploring challenges and facilitators to E-learning based Education of nursing students during Covid-19 pandemic: a qualitative study. *BMC Nursing*, *22*(1), 278. https://doi.org/10.1186/s12912-023-01430-6

Morrow, E. (2024). Scamming higher ed: An analysis of phishing content and trends. *Computers in Human Behavior*, *158*, 108274. https://doi.org/https://doi.org/10.1016/j.chb.2024.108274

Muhammad, F. J. (2022). E-learning and The Obstacles to its Application From The Point of View of Secondary School Teachers. *Basic Education College Magazine For Educational and Humanities Sciences*, *14*(57).

Nagham Oudeh Alhamdawee. (2023). Online Learning In Iraq: Challenges And Opportunities. *European Journal of Humanities and Educational Advancements*, *4*(1 SE-), 1–7. https://scholarzest.com/index.php/ejhea/article/view/3089

Pandian, T. (2023). Information And Multimedia Security In An Online Learning Environment. *INTED2023 Proceedings*, 1166–1171.

Peng, B. (2023). Analysis on the Relationships of Smartphone Addiction, Learning Engagement, Depression, and Anxiety: Evidence from China. *Iranian Journal of Public Health*, *52*(11), 2333–2342. https://doi.org/10.18502/ijph.v52i11.14033

Salman, A. M., & Shahadab, F. H. (2022). Obstacles of Teaching Distance Universities Courses in Light of E-Learning Quality Standards. *Cypriot Journal of Educational Sciences*, *17*(4), 1244–1257.

Sefriani, R., Yunus, Y., Ambiyar, Syah, N., & Fadhilah. (2023). Correlation of Social Media Addiction to Academic Achievement in E-Learning. *Indonesian Journal of Computer Science*, *12*. https://doi.org/10.33022/ijcs.v12i6.3581

Sobaih, A. E. E., Palla, I. A., & Baquee, A. (2022). Social Media Use in E-Learning amid COVID 19 Pandemic: Indian Students' Perspective. *International Journal of Environmental Research and Public Health*, *19*(9). https://doi.org/10.3390/ijerph19095380

Sunday, O. J., Adesope, O. O., & Maarhuis, P. L. (2021). The effects of smartphone addiction on learning: A me-

ta-analysis. *Computers in Human Behavior Reports*, *4*, 100114. https://doi.org/https://doi.org/10.1016/j.chbr.2021.100114

Syed, R. (2020). Cybersecurity vulnerability management: A conceptual ontology and cyber intelligence alert system. *Information & Management*, *57*(6), 103334. https://doi.org/https://doi.org/10.1016/j.im.2020.103334

Tarrad, K. M., Al-Hareeri, H., Alghazali, T., Ahmed, M., Al-Maeeni, M. K. A., Kalaf, G. A., E. Alsaddon, R., & S. Mezaal, Y. (2022). Cybercrime Challenges in Iraqi Academia: Creating Digital Awareness for Preventing Cybercrimes. *International Journal of Cyber Criminology*, *16*(2), 15–31.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics & Data Analysis*, *48*(1), 159–205. https://doi.org/https://doi.org/10.1016/j.csda.2004.03.005

Vishal Verma, & Janardan Pawar. (2024). Assessment Of Students Cybersecurity Awareness And Strategies To Safeguard Against Cyber Threats. *Journal of Advanced Zoology*, *45*(S4 SE-Articles), 82–89. https://doi.org/10.53555/jaz.v45iS4.4156

Wetzels, M., Odekerken-Schroder, G., & van Oppen, C. (2009). Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. *MIS Quarterly*, *33*(1), 177–195. https://aisel.aisnet.org/misq/vol33/iss1/11/

Wijayanto, H., & Prabowo, I. A. (2020). Cybersecurity Vulnerability Behavior Scale in College During the Covid-19 Pandemic. *Jurnal Sisfokom (Sistem Informasi Dan Komputer)*, *9*(3), 395–399. https://doi.org/10.32736/sisfokom.v9i3.1021

Yahiaoui, F., Aichouche, R., Chergui, K., Brika, S. K. M., Almezher, M., Musa, A. A., & Lamari, I. A. (2022). The Impact of e-Learning Systems on Motivating Students and Enhancing Their Outcomes During COVID-19: A Mixed-Method Approach. *Frontiers in Psychology*, *13*. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.874181

Yeh, C.-Y., & Tsai, C.-C. (2022). Massive Distance Education: Barriers and Challenges in Shifting to a Complete Online Learning Environment. *Frontiers in Psychology*, *13*. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.928717

Yusif, S., & Hafeez-Baig, A. (2023). Cybersecurity Policy Compliance in Higher Education: A Theoretical Framework. *Journal of Applied Security Research*, *18*(2), 267–288. https://doi.org/10.1080/19361610.2021.1989271

Zahid, I., Hussein, S., & Mahdi, S. (2023). Measuring Individuals Cybersecurity Awareness Based on Demographic Features. *Iraqi Journal for Electrical and Electronic Engineering*, *20*, 58–67. https://doi.org/10.37917/ijeee.20.1.6

Zhang, C., Hao, J., Liu, Y., Cui, J., & Yu, H. (2022). Associations Between Online Learning, Smartphone Addiction Problems, and Psychological Symptoms in Chinese College Students After the COVID-19 Pandemic. *Frontiers in Public Health*, *10*, 881074. https://doi.org/10.3389/fpubh.2022.881074

Zhang, J., & Zeng, Y. (2024). Effect of College Students' Smartphone Addiction on Academic Achievement: The Mediating Role of Academic Anxiety and Moderating Role of Sense of Academic Control. *Psychology Research and Behavior Management*, *17*, 933–944. https://doi.org/10.2147/PRBM.S442924

Zou, C., Li, P., & Jin, L. (2022). Integrating smartphones in EFL classrooms: students' satisfaction and perceived learning performance. *Education and Information Technologies*, *27*(9), 12667–12688. https://doi.org/10.1007/s10639-022-11103-7

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Vpliv vedenja študentov glede ranljivosti kibernetske varnosti na ovire pri e-učenju

Povzetek Ozadje/Namen: Študija preučuje razmerje med vedenjem študentov glede ranljivosti kibernetske varnosti in ovirami pri e-učenju. Z hitrim razvojem spletnega izobraževanja je zagotavljanje varnosti in zasebnosti digitalnih platform postalo ključno. V tem kontekstu je trenutna študija prvi poskus razumevanja razmerja med tema dvema spremenljivkama v ozadju visokošolskih ustanov v Iraku.
Metode: Za to študijo so raziskovalci leta 2023 zbrali podatke od študentov, starih med 19 in 25 let, vpisanih na Univerzo v Karbali, Irak, z uporabo polstrukturiranega raziskovalnega vprašalnika, izbranih z metodo naključnega vzorčenja. Vprašalnik je vseboval vprašanja, povezana z dimenzijami tako odvisne kot neodvisne spremenljivke. Skupno je bilo za analizo upoštevanih 350 veljavnih odgovorov, pri čemer je bila izvedena metoda PLS-SEM.
Rezultati: Rezultati so pokazali, da imajo strokovne in človeške ovire visoko povezavo z vedenjem glede ranljivosti kibernetske varnosti. Študija je tudi ugotovila, da imajo splošne ovire pomemben vpliv na vedenje glede ranljivosti kibernetske varnosti. Vse hipoteze so bile preverjene in rezultati potrjujejo, da obstaja učinkovito razmerje med vedenjem glede ranljivosti kibernetske varnosti in ovirami pri e-učenju.
Zaključek: Na podlagi rezultatov študije so avtorji predlagali nekaj priporočil za vse deležnike v procesu e-učenja, kot so izobraževalne ustanove, vlade, člani fakultete, študenti in njihovi starši. Čeprav je bila trenutna študija omejena na eno univerzo v Iraku, se lahko prihodnji raziskovalci osredotočijo na razširitev študije na druge visokošolske ustanove, da bi na podlagi raziskovalnih dokazov lahko pripravili nacionalno pobudo na ravni politike.

Ključne besede: *Vedenje glede ranljivosti kibernetske varnosti, Ovire pri e-učenju, Visokošolsko izobraževanje, PLS-SEM, Motivacija študentov, Vedenje pri učenju*

AUTHOR GUIDELINES / NAVODILA AVTORJEM

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