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**Navigating the digital landscape in Hungary: exploring  
the interaction between knowledge management and  
emerging technologies in the era of digital  
transformation**

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## Table of Contents

List of Tables .....	4
1. Research purpose and objectives.....	5
2. Research questions .....	6
3. Conceptual definition and operationalisation.....	8
4. Hypotheses.....	17
5. Research method.....	18
5.1. The quantitative method of research.....	18
5.2. The qualitative method of research.....	20
6. Research results .....	21
6.1. Hypotheses testing .....	21
6.2. Additional results .....	28
6.3. Answers to research questions .....	29
7. Collection of Theses .....	31
8. Novelty, practical implications.....	33
8.1. Practical implications.....	36
References.....	39
Publications.....	42

## **List of Tables**

Table 1. Research questions.....	7
Table 2. Conceptualisation and operationalisation summary - company characteristics.....	14
Table 3. Conceptualisation and operationalisation summary – KM, emerging technologies .....	16
Table 4. Research hypotheses .....	17
Table 5. Summary of hypotheses tests with results .....	27

## **1. Research purpose and objectives**

The purpose of this study is to provide a thorough, meaningful, and practical evaluation of organisational knowledge management (KM) in the context of digital transformation and emerging technologies in Hungary. It intends to fill a significant gap in the literature and suggests findings that may be valuable to other scholars pursuing this particular subject.

The primary objective of this research is to provide a holistic overview of the interplay between industrial characteristics, strategic knowledge management approaches, external factors, and the adoption of emerging technologies. To achieve this, the study employs empirical analysis methodologies, ensuring that the findings are both robust and grounded in real-world data. The central research question guiding this endeavour is: ‘How do industrial characteristics, strategic knowledge management approaches, external factors (including global events and sectoral differences), and the adoption and impact of emerging technologies collectively shape the implementation, challenges, and outcomes of knowledge management in organisations?’

In addressing this question, the study explores several sub-themes. These include understanding how different industries in Hungary approach knowledge management, the strategies they employ, and the challenges they face. The research also delves into the role of external factors, such as global events and sectoral differences, in influencing knowledge management practices. A significant portion of the study is dedicated to understanding the impact of emerging technologies. As digital tools and platforms become increasingly integral to organisational operations, it is imperative to understand how they intersect with knowledge management practices and what implications they hold for organisations.

## **2. Research questions**

In this chapter, research questions related to the empirical study are articulated and concepts considered having fundamental importance for understanding the research questions are introduced.

Research questions serve the purpose of showcasing the key questions that arise in the researcher's mind. Answering them can help understanding the mechanisms in organisational knowledge management in firms operating in Hungary in the light of digitalisation.

The research aims to find answer for the research questions summarised in the following table.

<b>RQ1:</b>	<b>How different sectors approach and integrate knowledge management in the context of their technological capabilities and operational processes?</b>
RQ1a:	Are there any sectoral differences with regards to technological intensity of products and processes?
RQ1b:	Are there any sectoral differences with regards to knowledge management strategy integration?
RQ1c:	Are there any sectoral differences with regards to knowledge management project?
RQ1d:	Are there any sectoral differences in the impediments faced during integration of knowledge management?
<b>RQ2:</b>	<b>How is the relationship between sectoral and ownership-related differences and the implementation of permitted knowledge management technologies?</b>
<b>RQ3:</b>	<b>How is the relationship between knowledge management strategies and information gathering by employees?</b>
RQ3a:	Is there a relationship between knowledge management strategies and information sources of employees?
RQ3b:	Is there a relationship between knowledge management strategies and the implementation of emerging technologies?
<b>RQ4:</b>	<b>How is the relationship between emerging technologies in use and knowledge management?</b>
RQ4a:	Is there a relationship between the volume of emerging technologies used by organisations and the level of implementation of their knowledge management strategies and projects?
RQ4b:	Is there a relationship between the volume of emerging technologies used by organisations and technological intensity of their products and services, as well as corporate operational processes?
RQ4c:	Is there a relationship between the volume of emerging technologies used by organisations and information-seeking sources of their employees?
<b>RQ5:</b>	<b>Which characteristics (company size, income, knowledge management project &amp; strategy, technological intensity of products and processes) influence the adoption of emerging technologies in organisations?</b>

*Table 1. Research questions  
Source: own edition*

### **3. Conceptual definition and operationalisation**

To apply the right measures, a precise definition of the research variables is necessary. However, a number of theories were used and thoroughly discussed in the literature review section in order to construct the variables needed to validate the study hypotheses.

A variable refers to a characteristic or attribute of an individual or an organisation that can be measured or observed and that varies among the people or organisation being studied. A variable typically will vary in two or more categories or on a continuum of scores, and it can be measured or assessed on a scale (Creswell, 2009).

This section outlines the key variables that were employed in the study to support the research goals and answer the research questions. The task of conceptualisation is to provide a framework for the questions appearing in the research.

#### **Sectors**

The classification of economic activities into primary, secondary, and tertiary sectors is a conventional approach to categorising the different segments of an economy based on the nature of their activities. Classification is defined by the European Commission in branches from NACE rev.2 (Eurostat, 2023).

The primary sector is the segment of the economy that extracts or harvests products from the earth. This sector includes activities like agriculture, fishing, forestry, and mining. It is the foundation of all other sectors as it provides the raw materials needed for manufacturing and production. Primary sector includes ‘agriculture, forestry and fishing’ (Eurostat, 2023).

The secondary sector comprises activities that transform, process, or manufacture goods from raw materials into finished or semi-finished products. This includes



industries like manufacturing, construction, and utilities. The goods produced in this sector serve as a base for the provision of services in the tertiary sector. Secondary sector includes industry and construction, namely ‘mining and quarrying’ (B), ‘manufacturing’ (C), ‘electricity, gas, steam and air conditioning supply’ (D), ‘Water supply; sewerage, waste management and remediation activities’ (E), and ‘construction’ (F) (Eurostat, 2023).

The tertiary sector is the sector of the economy that concerns services. It is distinct from the secondary sector (manufacturing) and the primary sector (which concerns extraction such as mining, agriculture and fishing). Tertiary sector covers ‘wholesale and retail’ (G), ‘transportation and storage’ (H), ‘accommodation and food service activities’ (I), ‘information and communication’ (J), ‘financial and insurance activities’ (K), ‘real estate activities’ (L), ‘professional, scientific and technical activities’ (M), ‘administrative and support service activities’ (N), ‘public administration and defence; compulsory social security’ (O), ‘education’ (P), ‘human health and social work activities’ (Q), ‘arts, sports and recreation’ (R), ‘other service activities’ (S), ‘activities of households as employers and undifferentiated goods - and service-producing activities of households for own use’ (T), and ‘activities of extraterritorial organisations and bodies’ (U) (Eurostat, 2023).

### **Ownership of companies (foreign vs domestic)**

A domestic corporation refers to a company that is incorporated in and conducts business affairs in its own country. A domestic corporation is often compared to a foreign corporation, which conducts business in a country other than the one where it originated or was incorporated. Foreign companies are enterprises that are ultimately majority controlled by a non-resident entity, either a natural or legal person (European Commission, 2001).

## **Company size**

Micro enterprises are having fewer than 10 persons employed; small enterprises are having 10 to 49 persons employed; medium-sized enterprises are employing 50 to 249 persons; and large enterprises are having 250 or more persons employed (Eurostat, 2023).

## **Net income**

Net income is the value for the fiscal year of sold (finished and semi-finished) products, materials, goods, and performed services, increased with surcharges and mark-ups, containing registration, excise, and energy taxes, reduced by discounts, and excluding value-added tax (VAT). This category also includes the invoiced, VAT-excluded value of product sales and services provided to a foreign-based company or another Hungarian branch of a foreign-based company (KSH, 2023). Net income of Hungarian companies is a public data available at <https://www.nemzeticegtar.hu>.

## **Knowledge**

Knowledge encompasses the information that individuals process, which includes ideas, facts, expertise, and judgments that are pertinent to the performance of individuals, teams, and organisations (Alavi & Leidner, 2001; Bartol & Srivastava, 2002).

Explicit knowledge is knowledge that can be articulated clearly and systematically using a set of symbols or a formal language (Nonaka, 1995).

Tacit knowledge is personal and inherent (Polanyi, 1962; Nonaka, 1995), which renders its codification and dissemination particularly challenging (Nonaka, 1995).

## **Knowledge management**

'Knowledge management describes the process of acquiring, developing, sharing, exploiting and protecting organisational knowledge in order to improve the competitiveness of organisations' (Gaál et al., 2009).

## **Knowledge management strategy**

The term 'knowledge management strategy' represents the set of objectives related to knowledge management within a company and the methods aimed at achieving them (Zack, 1999).

## **Knowledge management project**

Knowledge management projects initiated within organisations have a key objective of capturing, recording, and sharing the knowledge residing in people's minds, transforming individual knowledge into organisational knowledge (KPMG, 2006, Obermayer-Kovacs, 2007).

## **Knowledge management practices**

Knowledge management practices ensure that knowledge flows seamlessly across the organisation, fostering innovation, and driving competitive advantage.

Lloyd (1996) considers the knowledge value chain model, starting with ideas, know-how, and other intangible intellectual capital assets transformed into measurable, tangible intellectual assets as knowledge management practices.

## **Problem solving - Information source**

During knowledge management, it is interesting to see whether the source of knowledge is originated from a person or from a technology-based solution, mainly a tool in case a problem needs to be solved. Therefore, as information source the following major knowledge management practices are considered during the research: turning to a colleague, turning to external sources (e.g.

internet), and checking the organisational database (training, document management system, groupware, intranet, etc.) (KPMG, 2014).

### **Emerging technologies**

An emerging technology is ‘a relatively fast growing and radically novel technology characterised by a certain degree of coherence persisting over time and with the potential to exert a considerable impact on the socio-economic domain(s) which is observed in terms of the composition of actors, institutions and the patterns of interactions among those, along with the associated knowledge production processes. Its most prominent impact, however, lies in the future and so the emergence phase is still somewhat uncertain and ambiguous’ (Rotolo et al., 2015).

### **Technological intensity**

Technological intensity refers to the extent to which machines and technology in general support autonomous human action during work processes.

Technological intensity refers to the extent of knowledge embedded in the products of companies across various industrial sectors. This metric is commonly calculated by dividing a firm's average research and development (R&D) expenditure by its revenue. The Organisation for Economic Cooperation and Development (OECD) oversees the categorisation of industrial sectors based on their technological intensity levels (OECD, 2003, 2007).

### **Digital transformation**

Digital transformation is ‘a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies’ (Vial, 2019).

## **Industry 4.0**

‘Industry 4.0 covers the digitalisation and automation of the manufacturing environment, and also the creation of digital value chains for the purposes production, environment and communication between business partners’ (Lasi et al., 2014).

## **Industry 5.0**

Industry 5.0 emphasizes a human-centered approach where collaborative robots (cobots) and humans work together to achieve personalized autonomous manufacturing facilitated by enterprise social networks. This collaboration allows humans and machines to complement each other's capabilities. Unlike traditional programmable machines, cobots are designed to sense and interact with human presence safely. In this setting, cobots are deployed for repetitive and labor-intensive tasks, while humans focus on customisation, critical thinking, and creative problem-solving (Maddikunta et al., 2021).

Following the conceptualisation, measurements of research concepts are described in depth since operationalisation is the process of turning concepts into measurable variables. Operationalisation is a method used to arrange how data required is collected based on certain variables (Creswell, 2009).

The next table summarises the conceptualisation and operationalisation of company-characteristic-related variables.

Research variable	Content	Definition	Source	Measurement
Sector	Primary	The sector of the economy that extracts or harvests products from the earth. This sector includes activities like agriculture, fishing, forestry, and mining. It is the foundation of all other sectors as it provides the raw materials needed for manufacturing and production.	Eurostat, 2023	Nominal
	Secondary	Comprises activities that transform, process, or manufacture goods from raw materials into finished or semi-finished products. This includes industries like manufacturing, construction, and utilities. The goods produced in this sector serve as a base for the provision of services in the tertiary sector.		
	Tertiary	The sector of the economy that concerns services. It is distinct from the secondary sector (manufacturing) and the primary sector (which concerns extraction such as mining, agriculture and fishing).		
Ownership	Foreign	Enterprises that are ultimately majority controlled by a non-resident entity, either a natural or legal person.	European Commission, 2001	Nominal
	Domestic	Enterprises that are incorporated in and conduct business affairs in its own country.		
Company size	Micro	Micro enterprises are having fewer than 10 persons employed.	Eurostat, 2023	Ordinal
	Small	Small enterprises are having 10 to 49 persons employed.		
	Medium	Medium-sized enterprises are employing 50 to 249 persons.		
	Large	Large enterprises are having 250 or more persons employed.		
Net income	Net income of companies (public data)	The value for the fiscal year of sold (finished and semi-finished) products, materials, goods, and performed services, increased with surcharges and mark-ups, containing registration, excise, and energy taxes, reduced by discounts, and excluding value-added tax (VAT). This category also includes the invoiced, VAT-excluded value of product sales and services provided to a foreign-based company or another Hungarian branch of a foreign-based company.	KSH, 2023; nemzeticegter.hu	Interval
Technological intensity	Technological intensity of products and services	The extent to which machines and technology in general support autonomous human action during work processes. Technological intensity is defined as the level of knowledge incorporated in companies' products in every industrial sector, and this indicator is typically measured by dividing the average R&D spending by the firm's revenue.	OECD, 2003, 2007	Ordinal, Likert-scale (1-4)
	Technological intensity of company operational processes			

*Table 2. Conceptualisation and operationalisation summary - company characteristics*

*Source: own edition*

It lists the variables, their content, a definition considered during the course of the study, the related source(s) and the measurement. In addition to the table, it is important to note that all the following primary data has been collected by quantitative method. The next table, based on the same structure like the previous table presents the conceptualisation and operationalisation of characteristics related to technological intensity, knowledge management and emerging technologies related variables that has been collected during the empirical research, primarily by quantitative then by post-qualitative methods.

<b>Research variable</b>	<b>Content</b>	<b>Definition</b>	<b>Source</b>	<b>Measurement</b>
<b>Knowledge management</b>	KM strategy	Represents the set of objectives related to knowledge management within a company and the methods aimed at achieving them. Including: KM strategy is part of the corporate strategy; sub-strategy of an independent area; or not existent.	Zack, 1999	Ordinal
	KM project	KM projects initiated within organisations have a key objective of capturing, recording, and sharing the knowledge residing in people's minds, transforming individual knowledge into organisational knowledge. Including: there is no information about KM projects; the assessment is in progress currently whether there is a need for such a project; have a KM project; do not have a KM project and do not plan to introduce one; KM project is being developed; thought about introducing a project but rejected it.	KPMG, 2006, Obermayer -Kovacs, 2007	Ordinal
	KM practice	KM practices ensure that knowledge flows seamlessly across the organisation, fostering innovation, and driving competitive advantage. The knowledge value chain model, starting with ideas, know-how, and other intangible intellectual capital assets transformed into measurable, tangible intellectual assets. Including: Document management and knowledge base system; Communities of Practice; Knowledge map; Intra-organisational social technologies; Internal blogs; Information sharing; Enterprise social network; Corporate instant messaging; Participation in professional communities; Trainings.	KPMG, 2014; Lloyd, 1996	Nominal

<b>Emerging technologies</b>	Business intelligence software	A rapidly evolving and fundamentally innovative technology is characterised by a consistent level of coherence over time and possesses the potential to significantly influence socio-economic domains. This influence is noticeable in the changing composition of actors and institutions, as well as in the interaction patterns among them, coupled with the processes of knowledge creation. However, the most significant impact of such technology is anticipated in the future, making the initial phase of emergence somewhat uncertain and ambiguous.	Rotolo et al., 2015	Nominal
	Ticket management system			
	Chatbot			
	E-HR			
	Biometric authentication			
	VR technologies			
	3D printing			
	Management Information System (MIS)			
	Collaborative technologies			
	Artificial intelligence			
	Fraud detection software			
	Content-based recommendation system			
	Virtual assistant			
	Robotic process automation			
	Customer relationship management			
Drones				
Internet of Things (IoT)				
Big data, data mining				

*Table 3. Conceptualisation and operationalisation summary – KM, emerging technologies*  
*Source: own edition*



## 4. Hypotheses

The hypotheses are formulated based on the research questions, previous research and the literature review, which are presented in the following table.

<b>Hypotheses</b>	
<b>H1: There are sectoral differences in the integration of knowledge management in the context of technological capabilities and operational processes of organisations.</b>	
H1a:	Technological intensity of products and processes is the highest within the secondary (manufacturing) sector.
H1b:	Knowledge management strategy is implemented within the tertiary (services) sector to a greater extent than within the other sectors.
H1c:	Knowledge management projects are initiated within the tertiary (services) sector to a greater extent than within the other sectors.
H1d:	Impediments due to the lack of knowledge management strategy or project are different depending on sectors.
<b>H2: Sectoral and ownership-related differences have relationship with permitted and used knowledge management practices.</b>	
H2a:	Knowledge management practices are permitted and used to a greater extent within the tertiary sector.
H2b:	Knowledge management practices are permitted and used to a greater extent by subsidiaries of foreign companies.
<b>H3: The integration of knowledge management strategies has relationship with the information sources employees using to solve problems.</b>	
H3a:	The higher the knowledge management strategy implementation the lower the possibility that employees turn to external sources in case of information need.
H3b:	The higher the knowledge management strategy implementation the higher the possibility that employees use more emerging technologies.
<b>H4: There is relationship between emerging technologies in use and knowledge management strategies and projects, as well as technological intensity if products and processes.</b>	
H4a:	There is relationship between the volume of emerging technologies used by organisations and the level of implementation of their knowledge management strategies and projects.
H4b:	There is relationship between the volume of emerging technologies used by organisations and technological intensity of their products and services, as well as corporate operational processes.
H4c:	There is relationship between the volume of emerging technologies used by organisations and information-seeking sources of their employees.
<b>H5: The adoption of emerging technologies in organisations is influenced by organisational characteristics (company size, income, knowledge management project &amp; strategy, technological intensity of products and processes).</b>	

*Table 4. Research hypotheses*

*Source: own edition*

## **5. Research method**

The implementation of empirical research is influenced by several factors, among which the role of research questions and the empirical substantiation of hypotheses are prominent, as these determine the applicable research approaches.

This research applies a mixed method (also called as hybrid or integrating method) including quantitative and qualitative research in order to provide in-depth understanding and validation of the studied phenomenon. First, the quantitative study was conducted based on prior analysis of literature and related research. As a second step, the qualitative study was realised building on the previous information that served as a baseline for the quantitative part and based on the results of the quantitative research. Thus, the qualitative part of the study could be also called as a post-qualitative investigation.

### ***5.1. The quantitative method of research***

In the quantitative part of the research, a large-scale quantitative survey was developed and carried out online via LimeSurvey web application between September – December 2021.

More than 200.000 contacts from various companies from the Orbis (Bureau van Dijk Editions) global database were addressed and invited via e-mail to participate and fill-in the questionnaire. Participation in the study was voluntary, responses are anonymous. The questionnaire fill-in was advised as approx. 10 minutes.

The survey questionnaire composed of three main parts has been applied: information about the organisation, knowledge management and emerging technologies within the organisation and general information on the respondent.

In the course of the survey, 2703 (n=2703) full responses were included in the database. It was completed mainly by managers and white-collar workers (99%

of total) representing organisations operating in Hungary. Such sample size with 2703 full responses in a survey typically allows for more accurate and reliable results. A substantial sample size can reduce the margin of error and increase the confidence level of the findings, which means the results are likely to be closer to the true values for the entire population. In addition, when the majority of respondents are managers and white-collar workers, the data can provide targeted insights into organisational behaviours and attitudes, which is valuable for understanding business trends and dynamics in Hungary. The diversity and representativeness within a large sample size can also enhance the generalisability of the findings, making it possible to apply the conclusions to a broader context within the sector or industry being studied.

The result of the questionnaire was analysed using econometric methods using IBM SPSS 22.0 (all analysis excluding PLS-SEM) and Smart-PLS 4 statistical analysis softwares. The econometric methods (descriptive statistics; Crosstab and its checks: Cramer's V, Pearson's Chi-Square; T-test: Levene statistics, Tamhane; One-way ANOVA; Pearson correlation; Partial Least Squares – PLS).

In preparation and validation of the survey structure, in 2019, a research has been conducted by an international Hungarian-Finnish researchers' group (Saukkonen et al., 2019) to explore levels of adoption of emerging technologies in the human resource management field that serves as preparation for the current research by piloting a set of questions via an online survey conducted in Finland between April-May 2019.

## ***5.2. The qualitative method of research***

During the empirical research, to establish a more in-depth understanding on findings of the quantitative research, qualitative methodology is used. This primary data collection is chosen to explore the most important information and trends in the focus area by interviewing subject matter experts, since no such previous research has been published yet in the aimed research area.

Semi-structured interviews were carried out in the course of the qualitative investigation. These interviews contained specific questions as well as allowed the participants to share their views freely, while still providing data pertinent to the study objectives. An interview questionnaire guide was designed to support the research. The guide consisted of four major parts; general understanding and impression about-, organisational practice and individual experience in emerging technologies in the business, and organisational strategy of knowledge management and emerging technologies. All data were audio-recorded,- and subsequently transcribed verbatim for use in the analysis that also included the researcher's notes. Confidentiality and anonymity concerns were verified. All participants signed a confirmation letter outlining the purpose of the study, verifying the interviewee's voluntary participation, and outlining how the data will be used. Every personal detail was deleted. Open-ended questions from a pre-written interview framework were given to responders in advance to their interview appointments to ensure ample time to prepare to any particular subjects they thought would be pertinent.

The duration of each interview took between 1-1,5 hours via an online communication platform (Zoom). To conduct interviews, direct sampling method was followed.

Interview results then were summarised in case studies, including the analysis of responses.

## **6. Research results**

This section presents the findings of the quantitative and qualitative empirical research, including hypotheses testing and answers to the research questions

### ***6.1. Hypotheses testing***

In the following section hypotheses testing are presented resulting in either acceptance, partial acceptance or rejection of hypotheses. These are all based on the results of the quantitative analysis, while qualitative findings were used mainly for validation of answers to the research questions.

#### ***Testing H1***

*Hypothesis 1. There are sectoral differences in the integration of knowledge management in the context of technological capabilities and operational processes of organisations.*

In the process of testing H1 and its four sub-hypotheses, Crosstab, Pearson's Chi-Square, and Cramer's V have been used during the quantitative analysis to examine the relationship between sectors (based on industries, including technological intensity factors) and knowledge management.

Testing technological intensity of products and services, and corporate operational processes (*H1a*), results of the analysis showed that in terms of proportions according to the sectoral approach, the services sector had the highest technological intensity of products and services, followed by the secondary then the primary sectors. . This finding underscores the varying levels of technological advancement and innovation across sectors, with a pronounced emphasis on technology in the services sector.

Second, knowledge management characteristics (knowledge management strategy, projects, and impediments) were in focus. Testing knowledge

management strategy in the sectoral approach (*H1b*), the findings indicated that there is no variation in the degree of knowledge management strategy integration by sectors. A significant majority of firms (approx. 68%), regardless of sector, do not possess a formal knowledge management strategy, suggesting a widespread underutilisation of knowledge management practices in business strategies. Regarding knowledge management project-related potential differences by sectors (*H1c*), the degree of knowledge management projects are implemented in the tertiary sector to a greater extent than to the other sectors. However, it is noteworthy that only a minority of firms (approx. 35%) have active knowledge management projects, indicating a gap in the adoption of these practices across all sectors.

The analysis of various impediments to knowledge management implementation (*H1d*), revealed no significant differences across sectors. This suggests that the challenges in implementing knowledge management are universally experienced, regardless of the sector's technological intensity or nature.

Therefore, overall there is a proven finding out of testing H1, which is the following: **knowledge management projects are initiated within the tertiary (services) sector to a greater extent than within the other sectors.**

### ***Testing H2***

*Hypothesis 2. Sectoral and ownership-related differences have relationship with permitted and used knowledge management technologies.*

During the quantitative study to investigate the relationship between sectoral and ownership-related approach and knowledge management technologies, the following statistical tests were used: Crosstab, Pearson's Chi-Square, and Cramer's V.

Testing knowledge management technologies in the sectoral approach (*H2a*), conclusion was drawn that most of the significant relationships found between

knowledge management practices and sectors are confirming that these knowledge management practices are used in a greater extent within the tertiary sector. Checking knowledge management technologies in the ownership approach (*H2b*), it was found that there is a significant relationship between only a few of the knowledge management practices applied and ownership type of the companies. External professional communities are used to a significantly greater extent by foreign companies' subsidiaries, external messaging network technologies are used significantly greater extent by purely domestic companies. To conclude finding out of testing H2, it has been proven that **knowledge management practices are permitted and used to a greater extent within the tertiary sector.**

### ***Testing H3***

*Hypothesis 3. The integration of knowledge management strategies has relationship with the information sources employees using to solve problems.*

The following statistical analyses were employed in the quantitative study to investigate the relationship between strategic knowledge management implementation and information gathering by employees, therefore to test H3: One-way ANOVA, Levene statistic, Tamhane and Scheffe post-hoc tests.

The analysis suggested that employees are more likely to turn to their colleagues for information when a knowledge management strategy is part of the corporate strategy, as opposed to when there is no such strategy or when it is merely a sub-strategy of an independent area. This indicates that a more integrated knowledge management strategy fosters a culture of internal knowledge sharing and collaboration.

Conversely, the more integrated the corporate strategy is, the less likely employees are to turn to external sources for information. This suggests that a well-embedded knowledge management strategy may make internal resources

more accessible or perceived as more reliable, reducing the need to seek external information. These findings are aligned with the suggestions based on the literature. The organisational database is used more when the knowledge management strategy is more integrated (*H3a*), according to the results of the one-way ANOVA. This implies that comprehensive knowledge management strategies may enhance the organisation, accessibility, and utility of internal databases, making them a preferred source of information.

Furthermore, out of the results of Chi-square analysis it can be stated that the higher the overall knowledge management strategy implementation level, the higher the possibility that employees use more emerging technologies (*H3b*). The integration of technologies like business intelligence applications, which are associated with significant differences in information-seeking behavior, should be done thoughtfully to ensure they complement existing workflows and enhance organisational knowledge sharing.

In conclusion, main findings of this part of the analyses are that **the higher the knowledge management strategy implementation the lower the possibility that employees turn to external sources in case of information need**, and that **the higher the knowledge management strategy implementation the higher the possibility that employees use more emerging technologies**.

#### ***Testing H4***

*Hypothesis 4. There is relationship between emerging technologies in use and knowledge management strategies and projects, as well as technological intensity of products and processes.*

In the process of testing H4, Crosstab, Pearson's Chi-Square, and Cramer's V have been utilised during the quantitative analysis to examine the relationship between emerging technologies and knowledge management strategies, projects, and the technological intensity of products, services, and operational processes.



The findings showed correlation between the number of emerging technologies utilised by an organisation and the implementation level of its knowledge management strategy and projects. This suggests that organisations employing a greater variety of technologies are more likely to have advanced and effective knowledge management strategies and projects in place. This aspect of the thesis highlights the critical role of technology in enhancing the capability of organisations to manage and leverage knowledge effectively.

The analysis also revealed that the number of technologies in use correlates to the level of technological intensity of products and services. This finding underscores the idea that the adoption of a diverse range of emerging technologies contributes to the development and offering of technologically advanced products and services, thereby enhancing the organisation's competitive edge in the market.

Similarly, relationship is observed in the technological intensity of operational processes within organisations. This indicates that the integration of multiple emerging technologies leads to more technologically sophisticated operational processes, potentially improving efficiency, innovation, and overall operational excellence.

The study also examined the relationship between the number of technologies in use and information-seeking behaviour of employees within organisations. It was found that the higher the number of technologies the more the employees turn to their colleagues and check the organisational database in case of information needs. However, interestingly, the extent of turning to external sources had no relationship with the number of technologies in use, indicating no significant correlation in this aspect.

The key findings from testing H4 is that **the volume of emerging technologies used by an organisation is closely linked to knowledge management strategies and projects.** Furthermore, **the volume of emerging technologies in**

**use correlates with the technological intensity of both products and services, as well as corporate operational processes.**

### ***Testing H5***

*Hypothesis 5. The adoption of emerging technologies in organisations is influenced by organisational characteristics (company size, income, knowledge management project & strategy, technological intensity of products and processes).*

During of testing H5, PLS, Durbin-Watson test, and VIF have been used to investigate the potential influence of organisational characteristics to the volume of emerging technologies in use.

According to the analyses, it was concluded that the volume of the used emerging technologies is mostly influenced by the implementation level of the knowledge management project, followed by the net income (after all, this has to be financed from something) and the technological intensity of the product and services.

Proven finding out of testing H5 is that **the organisational characteristics (company size, income, knowledge management project and strategy, technological intensity) has influence on the volume of emerging technologies in use.**

Overall, out of the five main hypotheses one was fully accepted and four were partially accepted due to some rejected sub-hypotheses.

The following table demonstrates the summary of hypotheses testing and their results.

<b>Hypotheses</b>		<b>Result</b>
<b>H1: There are sectoral differences in the integration of knowledge management in the context of technological capabilities and operational processes of organisations.</b>		PARTIALLY ACCEPTED
H1a:	Technological intensity of products and processes is the highest within the secondary (manufacturing) sector.	REJECTED
H1b:	Knowledge management strategy is implemented within the tertiary (services) sector to a greater extent than within the other sectors.	REJECTED
H1c:	Knowledge management projects are initiated within the tertiary (services) sector to a greater extent than within the other sectors.	ACCEPTED
H1d:	Impediments due to the lack of knowledge management strategy or project are different depending on sectors.	REJECTED
<b>H2: Sectoral and ownership-related differences have relationship with permitted and used knowledge management practices.</b>		PARTIALLY ACCEPTED
H2a:	Knowledge management practices are permitted and used to a greater extent within the tertiary sector.	ACCEPTED
H2b:	Knowledge management practices are permitted and used to a greater extent by subsidiaries of foreign companies.	REJECTED
<b>H3: The integration of knowledge management strategies has relationship with the information sources employees using to solve problems.</b>		ACCEPTED
H3a:	The higher the knowledge management strategy implementation the lower the possibility that employees turn to external sources in case of information need.	ACCEPTED
H3b:	The higher the knowledge management strategy implementation the higher the possibility that employees use more emerging technologies.	ACCEPTED
<b>H4: There is relationship between emerging technologies in use and knowledge management strategies and projects, as well as technological intensity if products and processes.</b>		PARTIALLY ACCEPTED
H4a:	There is relationship between the volume of emerging technologies used by organisations and the level of implementation of their knowledge management strategies and projects.	ACCEPTED
H4b:	There is relationship between the volume of emerging technologies used by organisations and technological intensity of their products and services, as well as corporate operational processes.	ACCEPTED
H4c:	There is relationship between the volume of emerging technologies used by organisations and information-seeking sources of their employees.	PARTIALLY ACCEPTED
<b>H5: The adoption of emerging technologies in organisations is influenced by organisational characteristics (company size, income, knowledge management project &amp; strategy, technological intensity of products and processes).</b>		PARTIALLY ACCEPTED

*Table 5. Summary of hypotheses tests with results*

*Source: own edition*

## ***6.2. Additional results***

This dissertation extends its analysis beyond the hypotheses to explore the nuanced dynamics of how the COVID-19 pandemic has accelerated the adoption and utilisation of emerging technologies across various sectors. Utilising a comprehensive quantitative methodology, which included Crosstab, Pearson's Chi-Square, and Cramer's V tests, the investigation delved into the shifts in technology usage patterns precipitated by the global crisis. Based on previous findings in related research it was predicted that the pandemic served as a catalyst for increased deployment of emerging technologies.

The analytical outcomes revealed a statistically significant correlation with a subset of the technologies that had been previously identified, indicating an augmentation in the engagement with a broad spectrum of emerging technologies. Notably, findings resulted in significant relationship with some of the pre-listed technologies, and there was an overall increase in the usage in majority of the emerging technologies. Furthermore, the top technologies (collaborative technologies, business intelligence application, MIS, big data, data mining, IoT and chatbots) showed growth due to the pandemic regardless of sectors.

This trend reflects a broader digital transformation driven by the pandemic, as organisations and sectors as a whole turn to emerging technological solutions to adapt to the new normal. The extensive use of these technologies not only reflects a tactical response to immediate operational challenges but also indicates a strategic realignment towards a more resilient and agile operational paradigm.

### ***6.3. Answers to research questions***

The research aimed to provide understanding on the multifaceted dimensions of knowledge management and its interplay with various factors, including the influence of external and internal characteristics of organisations and emerging technologies.

Starting with **RQ1**, the study sought to discern how different sectors approach and integrate knowledge management in the context of their technological capabilities and operational processes. The overarching hypothesis suggested that there are sectoral differences in the integration of knowledge management in the context of their technological capabilities and operational processes, which was partially accepted. Delving deeper, the research found that the technological intensity of products and processes was not the highest within the manufacturing sector, contrary to the initial hypothesis. Interestingly, while it was hypothesised that the tertiary (services) sector would implement knowledge management strategies and initiate projects to a greater extent than other sectors, only the latter was accepted.

**RQ2** aimed to understand the relationship between sectoral and ownership-related differences on the implementation of permitted knowledge management technologies. The results were mixed. Knowledge management practices were found to be more prevalent in the tertiary sector. However, contrary to expectations, subsidiaries of foreign companies did not use these practices more than domestic entities.

**RQ3** explored the relationship between knowledge management strategies and information gathering by employees. The findings were affirmative. Higher implementation of knowledge management strategy resulted in employees relying less on external sources for information. Furthermore, a strong correlation

was found between the level of knowledge management strategy implementation and the likelihood of employees using more emerging technologies.

**RQ4** delved into the relationship between emerging technologies and knowledge management. The research found that there is relationship between the volume of emerging technologies used by organisations and the level of implementation of their knowledge management strategies and projects, as well as technological intensity of their products and services, and corporate operational processes.

Lastly, **RQ5** sought to identify the factors influencing the adoption of emerging technologies. Organisational characteristics, including company size, income, and the presence of a knowledge management project, were found to have a partial influence on the adoption of emerging technologies.

In conclusion, the research provided invaluable insights into the intricate dynamics of knowledge management and its interrelation with various sectors, emerging technologies. The findings underscore the importance of adapting to technological advancements and understanding sectoral differences to harness the full potential of knowledge management.

## **7. Collection of Theses**

Thesis 1 posits that the technological intensity of products and processes is highest within the tertiary (services) sector. Contrary to the initial hypothesis that the manufacturing sector would dominate in this regard, the research findings underscore the pivotal role of the services sector in driving technological intensity. This shift can be attributed to the rapid digital transformation and the increasing reliance on technology-driven solutions in service delivery.

***Thesis 1.** Technological intensity of products and processes is the highest within the tertiary (services) sector.*

Thesis 2 emphasises that knowledge management projects are predominantly initiated within the tertiary sector. This aligns with the growing recognition of the importance of knowledge as a critical asset in service-oriented industries. The emphasis on knowledge management projects in this sector underscores the need for continuous learning, innovation, and adaptation to changing market dynamics.

***Thesis 2.** Knowledge management projects are initiated within the tertiary (services) sector to a greater extent than within the other sectors.*

Thesis 3 and Thesis 4 examine into the different aspects of knowledge management practices. While the research confirms that these practices are more prevalent in the tertiary sector, it challenges the notion that subsidiaries of foreign companies are more inclined towards these practices than domestic entities. This finding suggests that local companies are equally, if not more, proactive in harnessing knowledge management practices to drive organisational success.

***Thesis 3.** Knowledge management practices are permitted and used to a greater extent within the tertiary sector.*

*Thesis 4. Ownership type influences participation in external professional communities (are used to a significantly greater extent by foreign companies' subsidiaries) and usage of external messaging network technologies (are used significantly greater extent by purely domestic companies).*

Thesis 5 highlights the relationship between knowledge management strategies and employees' information-seeking behaviours. A higher implementation of knowledge management strategy correlates with a reduced reliance on external information sources. Furthermore, a robust knowledge management strategy encourages employees to embrace emerging technologies, emphasising the mutual benefits between strategic planning and technological adoption.

*Thesis 5. Implementation of knowledge management strategies has relationship with information gathering by employees.*

*The higher the knowledge management strategy implementation the lower the possibility that employees turn to external sources in case of information need.*

*The higher the knowledge management strategy implementation the higher the possibility that employees use more emerging technologies.*

Thesis 6 encapsulates the relationship between emerging technologies and knowledge management. The volume of these technologies in has relationship with the integration of knowledge management strategies and projects, and the technological intensity of products, services, and corporate operational processes.

*Thesis 6. Organisations that utilise higher volume of emerging technologies will exhibit more advanced knowledge management strategies and projects.*

*A greater volume of emerging technologies adopted by organisations correlates with increased technological intensity of products and services and corporate operational processes.*



## **8. Novelty, practical implications**

The field of academic research is continually evolving, with scholars striving to address gaps, introduce new methodologies, and provide fresh perspectives on existing knowledge. This section is to highlight novelty and innovation encompassed within this dissertation centred on knowledge management, digitalisation and emerging technologies in Hungary.

### **New, novel results**

One of the primary novelties of this research is its extensive sample-based quantitative analysis pertaining to knowledge management in Hungary that fills a critical gap in the literature. Such a comprehensive approach ensures a robust and representative understanding of the subject.

The research introduces the application of a new analysis technique, namely Partial Least Squares Structural Equation Modelling (PLS-SEM), in the context of knowledge management. This advanced statistical method offers a nuanced understanding of complex relationships.

The research delves into the intricate relationship between organisational knowledge management and emerging technologies, providing insights into how the two domains intersect and influence each other which was underexplored in existing research. The detailed investigation into sector-specific technological intensity and its influence on knowledge management provides a more granular understanding than the broader analyses typically found in the literature.

The dissertation contributes to the advancement of innovation studies by expressing relationships among constructs that are autonomous (organisational knowledge management, emerging technologies) and do not appear to be to be not well-connected in the literature yet. The study newly establishes a detailed exploration of various relationships, such as the relationship between sectors and

the technological intensity of products, services, operational processes, knowledge management projects, and the application of knowledge management practices. It also examines the influence of ownership type on participation in external professional communities and the usage of external messaging network technologies. According to the literature review, this has not yet been investigated in such form before.

### **Innovative Aspects of the Research**

Building upon previous studies, this research offers a renewed examination of knowledge management practices in Hungary including an extensive and representative sample, ensuring that the findings are up-to-date and relevant.

The study provides an unprecedented overview of the current status of knowledge management in Hungary. It investigates various facets, including technological intensity, knowledge management strategies, projects, initiators, and the primary challenges that hinder the implementation of knowledge management within Hungarian companies.

The research offers a holistic understanding of digitalisation, especially from a sectoral perspective. It also ensures a comparative analysis with findings of public reports by the European Union (e.g., DESI, EIBIS). However, this research takes a step further by dissecting the implications of these findings for Hungarian organisations specifically, thereby offering targeted insights that have practical relevance and applicability.

Furthermore, it also assesses the impact of the COVID pandemic on the increased usage of emerging technologies and the association between knowledge management strategy implementation and the information sources utilised by employees, with a particular focus on external information sources and emerging technologies.

In conclusion, this PhD research introduces novel methodologies, exploring uncharted relationships, and building upon previous studies. This research not only addresses current gaps but also lays a solid foundation for subsequent studies. It paves the way for exploring the potential benefits of applying knowledge management from a practical standpoint, such as e.g. the development of an emerging technologies based knowledge management maturity model.

## ***8.1. Practical implications***

As technology advances, businesses are becoming more flexible and adaptable to change, even at the strategic level. In the evolving landscape of business, the relationship between knowledge management and technological adoption has emerged as a critical determinant of organisational efficacy. The research offers significant implications for enterprises.

The analysis of sectoral differences in knowledge management integration, particularly in the context of technological intensity and operational processes, underscores the necessity for a sector-specific approach in organisational strategy development. The finding that technological intensity is most pronounced within the services sector within the examined organisations from Hungary underscores the sector's pivotal role in driving innovation and adaptation. Organisations operating within this domain are thus forced to continually invest in technological advancements, ensuring they remain at the forefront of service delivery and operational efficiency. The emphasis on knowledge management initiatives within the tertiary sector highlights the sector's recognition of knowledge as a key asset. This suggests a pressing need for organisations to foster a culture that values continuous learning, promotes knowledge sharing, and implements systems for knowledge management. The universal challenges in implementing knowledge management, regardless of the sector's technological intensity, indicate a common set of barriers that organisations face. By developing a culture that values knowledge sharing and continuous learning, organisations can minimise these impediments and maximise the potential of their human capital.

Interestingly, the research challenges the notion that subsidiaries of foreign companies are more inclined towards knowledge management practices than domestic entities. This finding underscores the universality of knowledge

management practices, suggesting that their adoption is not strictly contingent upon organisational origin.

In addition, the democratisation of technology through digital transformation offers smaller businesses the opportunity to compete on a larger scale. By leveraging cloud computing, AI, and other emerging technologies, smaller firms can offer innovative services and products that were previously the domain of larger corporations. This levels the playing field and fosters a more dynamic and competitive business environment.

The marked influence of the COVID-19 pandemic on the adoption of emerging technologies provides a clear directive for organisations. In an era marked by remote work and digital collaboration, the integration of collaborative tools has transitioned from being a luxury to a necessity. Organisations must, therefore, be proactive in taking the initiative to apply these technologies to ensure agility, business continuity and effective stakeholder communication.

The alignment of knowledge management strategies with employee information-seeking behaviours emerges. Organisations are responsible for making sure that their knowledge management strategies resonate with the informational needs of their employees. This alignment not only optimises information flow and reliability but also enhances overall organisational efficiency.

The research underscores the significance of digital literacy not just among employees but also within leadership teams. Leaders must understand the potential and limitations of emerging technologies to make informed decisions that drive digital transformation efforts. This leadership digital literacy is pivotal in navigating the complexities of the digital landscape and steering organisations towards successful digital adoption.

Lastly, the relationship between emerging technologies and knowledge management is evident. The integration of cutting-edge technologies can

significantly amplify knowledge management processes, enabling organisations to derive actionable insights and foster innovation. Organisations should focus on strengthening their internal capabilities and ensuring adequate financial resources to support the adoption of emerging technologies, thereby enhancing their technological intensity and operational excellence.

However, the advancements that promise increased efficiency, innovation, and competitiveness come with major challenges. The human challenge, including the digital skills gap and resistance to change, directly opposes the need for a digitally literate workforce and leadership essential for leveraging emerging technologies. Technological challenges, such as the digital divide and security concerns, hinder the seamless integration of collaborative tools and advanced technologies crucial for remote work and digital collaboration.

Financial constraints pose a barrier to the required investments in technology, contrasting with the need for substantial financial commitment to foster innovation and digital growth. Organisational rigidity and a traditional attitude resist the cultural shift towards continuous learning and knowledge sharing, which are vital for digital adaptation. Legal and environmental barriers could further complicate the adoption of emerging technologies, highlighting the need for supportive regulations and government investment in digital infrastructure.

Addressing these challenges requires a multi-faceted approach, including enhancing digital literacy, fostering a culture of adaptability, securing necessary financial resources, and advocating for supportive legal and environmental frameworks. By acknowledging and tackling these barriers, organisations can harness the benefits of digital transformation and navigate the complexities of the digital era.

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