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Preparing for Industry 5.0: a methodology for avoiding corporate amnesia

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Abstract

Purpose – This research sought to identify the best strategy for avoiding corporate amnesia in the context of the Industry 5.0 and an aging society.

Design/methodology/approach – To achieve this goal, a multi-phase methodology based on analytic network process was proposed and tested in one of the biggest companies in the bakery industry.

Findings – The results highlight that online communities of practice and storytelling are the best way to avoid corporate amnesia. The most important factors are commitment, work satisfaction and organizational culture. Commitment and work satisfaction also enhance the use of online communities of practice, while work satisfaction and organizational culture foster the use of storytelling.

Originality/value – This article proposes a nexus between knowledge management and operations management. This research also presents a decision-making tool that can help managers determine the most appropriate strategy for avoiding corporate amnesia.

Keywords Corporate amnesia, Knowledge sharing, Knowledge loss, Analytic network process

Paper type Research paper

1. Introduction

History shows that technological developments generate radical changes at the level of industry, but the overall goal remains the same – namely, increasing productivity (Demir *et al.*, 2019) – but the means evolve from mechanization to digitalization (Coronado *et al.*, 2022; Nand *et al.*, 2023; Xu *et al.*, 2021). Industry 1.0 made the transition from manual production to mechanical production by using water and steam power while Industry 2.0 saw the opportunity that electricity can bring to manufacturing companies and made the switch to mass production. Industry 3.0 remained focused on mass production and emphasized the importance of automating production, which involved using electronics and computers to increase the pace of production at lower costs. Industry 4.0 went further and focused on achieving mass production through smart manufacturing, which implied using emerging technologies such as cyber-physical systems, cooperating robots and artificial intelligence. Industry 5.0 takes into account humans' need to be involved in decision-making and product design and has shifted mass production into mass personalization, bringing forward the human side of industry, in particular, and of the economy, in general.

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Unlike the previous industrial revolutions which aimed to obtain increased productivity by eliminating or alienating humans (Santhi and Muthuswamy, 2023), Industry 5.0 places humans back at the center of attention and presents them as the most important resource for sustainable manufacturing (Mukherjee *et al.*, 2023; Santhi and Muthuswamy, 2023). While Industry 4.0 focused on digitalization and interconnected automation (Mukherjee *et al.*, 2023), Industry 5.0 synergizes human–machine collaboration and leverages the creativity of human resources (Modgil *et al.*, 2023). Last but not least, it must be mentioned that Industry 5.0 connects to Industry 4.0 applications and technologies in order to create more accurate and less unstable decision-making models (Maddikunta *et al.*, 2022).

While various scholars have treated Industry 5.0 as a future event (Modgil *et al.*, 2023; Santhi and Muthuswamy, 2023; Yuan *et al.*, 2022; Maddikunta *et al.*, 2022; Mukherjee *et al.*, 2023) argue that it is already in practice in sectors such as healthcare, manufacturing/production and education, and one of the most prominent barriers in its development is represented by the upskilling of employees and talent retention. Industry 5.0 not only emphasizes the importance of skilled human resources but also the challenge of retaining talent and avoiding knowledge loss. In the last decades, the nature of work and careers changed significantly. People are continuously developing their skills and abilities and building their careers across organizations. As Kevin Dorren, CEO of Orbital Software, stated, "the average person stays in a job between two and five years . . . When they move to a new company, their knowledge and experience is no longer accessible to their previous employer. The key is to invest in a system that captures this knowledge and also helps people become more efficient without decreasing their sense of importance in a company". Thus, the policymakers are in need of a solution to avoid "corporate amnesia" (Davenport and Prusak, 1998) or the knowledge loss generated by employees leaving the firm, especially as the threat of the aging workforce is growing stronger (Liboni *et al.*, 2019). The Industry 5.0 paradigm thus requires a reconfiguration of human resource management (Ghobakhloo and Fathi, 2020; Veile *et al.*, 2019; Vereycken *et al.*, 2022) and knowledge management (Cillo *et al.*, 2021; Yin and Yu, 2022).

Given the fact that the study of corporate amnesia is still in its infancy (Sumbal *et al.*, 2020), practitioners and scholars have focused on showing how the classical professional development strategies, such as mentoring (Al-Zoubi *et al.*, 2020; Curtis and Taylor, 2018; Satterly *et al.*, 2018), training (Krull *et al.*, 2022; Pauget and Chauvel, 2018), storytelling (Alfrey *et al.*, 2017; Park *et al.*, 2020; Tenorio *et al.*, 2020) and mixed-aged teams (Weijs-Perree *et al.*, 2020), as well as knowledge sharing strategies, such as the use of enterprise social networks for inter- and intra-organizational knowledge sharing (Leon *et al.*, 2017; Sarra *et al.*, 2020), communities of practice (Al-Zoubi *et al.*, 2022; Jia *et al.*, 2022), and serious games (Spanellis *et al.*, 2020; Sprinkle and Urick, 2018) could serve as viable tools for avoiding knowledge loss. There are, however, several pitfalls occur.

First, most studies have been conceptual (Pauget and Chauvel, 2018; Satterly *et al.*, 2018; Sprinkle and Urick, 2018) or based on qualitative analyses (Alfrey *et al.*, 2017; Geeraerts *et al.*, 2018) although decision-makers tend to use quantitative approaches (Spisak, 2022). Second, the quantitative studies that have been employed within this framework have pointed out to the influence of human and structural capital on employees' ability to share and receive knowledge (Csillag *et al.*, 2019; Nisula and Metso, 2019) without taking into account the interdependent relationships established among factors (Agyare *et al.*, 2019; Lunz, 2017). This requires the use of a multi-criteria decision-making model such as the analytic network process (ANP). A growing body of literature has emphasized its efficiency in the operations management area (Liu *et al.*, 2021; Zarbakhshnia *et al.*, 2022), but only a few attempts have been made in employing this method to solve issues related to human resource management (Arda *et al.*, 2017; Leilaee and Rezaeian, 2021) or knowledge management (Yildirim *et al.*, 2022). Third, the analyses developed so far have concentrated on the service industry,

especially education (Alfrey *et al.*, 2017; Geeraerts *et al.*, 2018; Satterly *et al.*, 2018), although the manufacturing industry is the one most exposed to corporate amnesia and the Industry 5.0 transition (European Commission, 2020; Foster-McGregor *et al.*, 2019).

By the time Industry 5.0 is fully adopted, then, avoiding corporate amnesia will become a necessity and not an option, and managers will need a viable tool to select the best strategy for their company, because they will be dealing, like always, with limited resources and unlimited needs. Therefore, the current research proposes a multi-criteria methodology, based on ANP, to answer to the following question:

RQ. Which are the best strategies for avoiding corporate amnesia in the Industry 5.0 context?

This study thus proposes a nexus between knowledge management and operations management, and its main contribution is to present a novel methodology – that is, a decision-making tool to help managers determine the most appropriate strategy for avoiding corporate amnesia, which has been successfully applied to a real-world organization and can be replicated.

The content of this article is divided in six sections. After this first, introductory section, Section 2 establishes the theoretical framework by presenting the concept of corporate amnesia in the Industry 5.0 context and the potential solutions emphasized in the specialist literature. Section 3 sheds light on the main research gaps while Section 4 describes the research methodology that has been pursued in order to achieve the research goal. Section 5 presents the main results and Section 6 closes the article by synthesizing the theoretical and practical implications of the main findings and indicating several research avenues for future research.

2. State of the art

2.1 Corporate amnesia in the Industry 5.0 context

Within the framework of the Industry 5.0 transition, managers are forced to reconsider the reconfiguration of their value chains based on technological, political, environmental and demographical trends (Vereycken *et al.*, 2022; Zhu and Kanjanamekanant, 2023). They must also reconsider their knowledge sharing practices, because they are increasingly exposed to corporate amnesia. The latter is generated by the development of an aging society (United Nations, 2022) and an increase in employees' job mobility (European Commission, 2021).

Kransdorf (1998) defined the concept of corporate amnesia as the situation in which "companies have little experiential advantage because they cannot benefit from their hindsight". Durst and Zieber (2019, p. 8) adopted a more in-depth approach and presented it as "a situation when an organization loses a part or all of its crucial knowledge as a consequence of, for example, employee leaving a company, employee poaching or some technical faults". Thus, whenever employees walk out the front door (developing their career or retiring), firms are in danger of losing their access not only to the employees' skills and abilities but also to their contacts, established relationships, and knowledge about tried and tested solutions. Organizations are therefore exposed to repeating old mistakes or reinventing the wheel if they did not have implemented the proper organizational practices to support knowledge sharing among employees and development of the organizational memory.

2.2 Organizational strategies to avoid corporate amnesia

Against this backdrop, the researchers of knowledge management area have turned their attention to the organizational strategies that can support knowledge sharing and the creation of knowledge repositories. They have tried to determine how individual knowledge

can be transformed into collective knowledge and stored as shared meaning and mental models (Krull *et al.*, 2022; Xiao *et al.*, 2022). Some have focused on the classical knowledge sharing strategies (e.g. mentoring, training, mixed-aged teams and storytelling), while others have concentrated on the modern ones (e.g. the use of enterprise social networks, online communities of practice and serious games).

Classical knowledge sharing strategies focus on the knowledge flows that pass from experienced to the less experienced employees. Thus, mentoring is seen as a short-term one-on-one process that is directly associated with increased knowledge sharing (Curtis and Taylor, 2018); the experienced employees provide guidance to newcomers regarding content knowledge, required abilities (Al-Zoubi *et al.*, 2020; Barnes *et al.*, 2021), and ways of thinking and behaving (Geeraerts *et al.*, 2018). Mentoring often complements training, which is a traditional classroom-style event (courses, seminars, workshops) that focuses on transforming individually shared knowledge into collective knowledge (Krull *et al.*, 2022; Lim *et al.*, 2022), the trainer acts as a knowledge diffuser, while the trainees act as passive knowledge receivers, storing the acquired knowledge as shared meanings and mental models. Storytelling goes further and concentrates on tacit knowledge; experienced employees share their experiences using short, entertaining and persuasive narratives to elicit the desired attitudes and dispositions, as well as how problems could be solved (Park *et al.*, 2020; Tenorio *et al.*, 2020). Hence, mixed-aged teams combine the benefits of these strategies by bringing together experienced and less experienced employees and putting them into specific challenging situations; tacit and explicit knowledge is shared through debates, meetings and advice-seeking activities (Lim *et al.*, 2022; Weijs-Perree *et al.*, 2020).

Researchers focusing on modern knowledge sharing strategies tend to take into account the benefits of the Internet of Things and digitalization and claim that corporate amnesia could be avoided by using online communities of practice (Al-Zoubi *et al.*, 2022; Jia *et al.*, 2022), enterprise social networks (Chatterjee *et al.*, 2021; Leon *et al.*, 2017; Liu *et al.*, 2023) and serious games (Spanellis *et al.*, 2020; Sprinkle and Urick, 2018). Online communities of practice bring together the employees who have a common interest, solve specific problems and create new knowledge by practicing together (Jia *et al.*, 2022); formal and informal networks of peers are established, knowledge is shared and relationships are strengthened (Al-Zoubi *et al.*, 2022; Polat and Kazak, 2015). Following the same principles, the use of enterprise social networks involves connecting employees through a web-based platform, while enhancing experts' identification and providing access to some of their resources even when they are no longer part of the network (Leon *et al.*, 2017). Last but not least, serious games concentrate on using gamification techniques in order to provide exposure to concepts and desired behaviors in a psychological safe environment (Sprinkle and Urick, 2018), they model and reinforce appropriate work behavior.

2.3 ANP – a tool for strategic prioritization

ANP (Saaty, 1996) is a multi-criteria decision aid technique that, taking into account both dependence relationships and feedback, measures the influence between variables. Thus, ANP represents decision-making problems as a network structure, which includes both criteria and alternatives grouped in different clusters according to similar properties. All of the components of such a network might be related, which makes ANP appropriate for modeling real-world decision-making problems. ANP calculates, based on pairwise comparison between components, different matrices that provide decision-makers important additional information.

According to Saaty (2001), the main steps of the ANP are:

(1) Carry out pairwise comparison on the components of the network;

(2) Allocate the relative importance weight (eigenvectors), resulting in an unweighted supermatrix;

(3) Carry out pairwise comparison on the clusters;

(4) Based on the calculated priorities of the clusters, weight the unweighted supermatrix until it becomes column stochastic, obtaining the weighted supermatrix;

(5) Calculate the stable weighted supermatrix, raising the weighted supermatrix to limiting powers until the weights converge, thus obtaining the limit supermatrix.

Unlike its predecessor, the Analytic Hierarchical Process (Saaty, 1980), the ANP is not a strict hierarchy-based method, so it is more flexible in modeling and solving real-world problems. ANP is thus based on building a network for both criteria and alternatives that keep not only interdependence but also feedback relationships and produces supermatrices. In the ANP, the initial supematrix is a two-dimensional element-by-element matrix that calculates the relative importance weights by following pairwise comparison matrices to come up with a new supermatrix formed with the eigenvectors of those relative importance weights (Saaty, 2001).

Given managers' need to prioritize alternatives and the interdependence established among the influence factors, the development of an ANP-based methodology for selecting the most appropriate strategy to avoid corporate amnesia would fill a gap identified in the literature. ANP is the most popular multiple-criteria decision-making technique (Gölcük and Baykasoğlu, 2016) because it converts the qualitative components into quantitative elements to enable the relative analysis of preferences. It also allows correlations within and between groups of components (Asgari and Darestani, 2017; Ignatius *et al.*, 2016). It has also proved to be an excellent technique for selecting suppliers (Giannakis *et al.*, 2020), technologies (Suriyawong *et al.*, 2022) and work permits (Abbasi *et al.*, 2022).

3. Research gaps

Previous studies have highlighted how strategies such as online communities of practice, enterprise social networks or serious games can be used to evade corporate amnesia. Although these seem to respond to the Industry 5.0 requirement of giving a soft, human approach to technology (Leng *et al.*, 2022; Modgil *et al.*, 2023), several gaps can be seen in the literature.

As noted in the introduction, most studies have been conceptual (Pauget and Chauvel, 2018; Satterly *et al.*, 2018; Sprinkle and Urick, 2018) or based on qualitative analyses (Alfrey *et al.*, 2017; Geeraerts *et al.*, 2018) although decision-makers tend to use quantitative approaches (Spisak, 2022). That is, most studies have presented the options that the managers have if they want to avoid corporate amnesia, but they have not provided a viable tool for selecting the most appropriate option. This aspect is critical given that managers are always dealing with limited resources and unlimited needs, so they cannot test each and every solution to see if it works in their company while reconfiguring the value chains (Vereycken *et al.*, 2022; Yuan *et al.*, 2022) and optimizing organizational processes (Destouet *et al.*, 2023; Redchuk *et al.*, 2023). Against this backdrop, the current research provides a viable tool for selecting the most appropriate strategy to avoid corporate amnesia. This will help managers to prioritize the strategies based on the characteristics of their companies and to develop a tailor-made solution. To the best of our knowledge, none of the previously developed studies has provided a methodology for prioritizing and selecting the best strategy to avoid corporate amnesia.

Second, the studies developed so far have tended to emphasize that the efficiency of the knowledge sharing strategies depends on the elements related to both human and structural capital, but they neglect the interdependency that exists among them. Thus, some scholars

have turned their attention to human capital and highlighted the influence of commitment (Curtis and Taylor, 2018; Lim *et al.*, 2022), rewards (Wang *et al.*, 2021), work satisfaction (Akosile and Olatokun, 2020) and job design (Baran and Klos, 2014) on knowledge sharing strategies such as mentoring, mixed-aged teams and online communities of practice. Other researchers have argued that employees' ability to disseminate and receive knowledge is strongly influenced by company's size (Coetzer *et al.*, 2017; Csillag *et al.*, 2019), organizational culture (Kumari and Saharan, 2021; Ni *et al.*, 2018), organizational structure (Castaneda and Duran, 2018) and technology (Egloffstein and Ifenthaler, 2017; Kaminska and Borzillo, 2018). However, while these studies have treated human and structural factors as independent, scholars from the fields of knowledge management (Lunz, 2017; Molino *et al.*, 2020) and human resource management (Agyare *et al.*, 2019; Dasgupta and Gupta, 2019; Sirca *et al.*, 2013; Tansel and Gazioglu, 2014) claim that they are interdependent. Agyare *et al.* (2019) showed that organizational culture moderates the relationship between interpersonal trust and commitment, while Lunz (2017) proved that reward management has a powerful impact on organizational culture. Sirca *et al.* (2013) highlighted that organizational structure influences work satisfaction, while Tansel and Gazioglu (2014) showed that work satisfaction depends on company's size. Furthermore, Dasgupta and Gupta (2019) emphasized that organizational culture influences employees' acceptance and use of the Internet technology, and Molino *et al.* (2020) highlighted that technology acceptance has a positive effect on job satisfaction. The current research will fill this gap not only by highlighting how human and structural factors influence each another but also by showing how this interdependence affects the prioritization of strategies. Thus, by using an ANP-based decision-making model and performing a perspective analysis, managers can determine the most appropriate strategy for avoiding corporate amnesia, assuming that the importance of a certain factor changes. Within this framework, managers will be able not only to determine the best strategy for their company but also to develop scenarios for how things could change if predefined factors related to human or structural capital change in importance.

Last but not least, the strategies that could be used to confront corporate amnesia have thus far been analyzed in the service industry (Alfrey *et al.*, 2017; Geeraerts *et al.*, 2018; Satterly *et al.*, 2018) although the manufacturing industry is the one most exposed to this phenomenon in the context of Industry 5.0 (European Commission, 2020; Foster-McGregor *et al.*, 2019). The current research thus fills a gap by applying a multi-criteria decision-making model for selecting the best strategy to avoid corporate amnesia in the bakery industry.

4. Research methodology

4.1 Research goal and unit of analysis

To identify the best strategy to avoid corporate amnesia in the context of the Industry 5.0, a multi-phase methodology is proposed (Figure 1) and tested in one of the biggest companies in

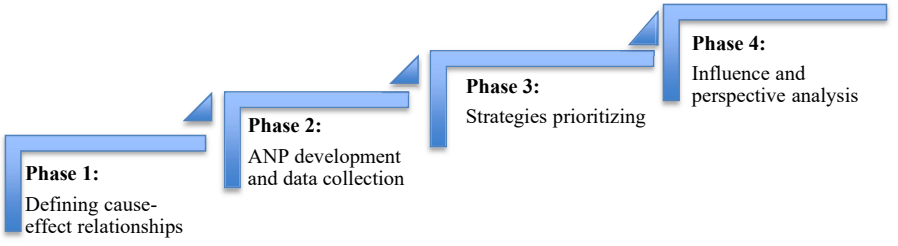

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Figure 1.
Proposed multi-phase methodology

the Romanian bakery industry. The company has more than 2.000 employees and a market share of 20%. It leads the national market, acting as a "model to follow" for its competitors, and in the last year, it had a turnover of more than 100 million euros. Given its interest in maintaining its competitive advantage and the facts that 17% of the employees are about to retire in the next 5 years and almost 10% of the employees leave each year in search of better job opportunities, the management team is preoccupied about finding the best solution to avoid corporate amnesia, to store, or keep employees' knowledge within the firm's boundaries even after they leave the company.

Phase 1. *Defining cause-effect relationships*: this step focuses on determining the strategies that could be implemented, given company's characteristics and interests, and the factors that could affect their efficiency. Using a focus group approach, a cause-effect map is obtained.

Phase 2. *ANP development and data collection.* This phase uses as its starting point the cause-effect map developed in the previous phase. The identified strategies and influencing factors thus define the components of the ANP model. From this, a questionnaire that includes pairwise comparison is developed and sent to the management team.

Phase 3. *Prioritization of strategies.* Based on the collected data, the strategies are ranked from the most to least appropriate, given their priority vector.

Phase 4. *Influence and perspective analysis.* This phase elicits the changes that could occur in the ranking of strategies if a certain factor becomes more important than all of the others.

4.2 Data collection and processing

The proposed multi-phase methodology was implemented in one of the biggest companies from the Romanian bakery industry.

Phase 1. *Defining cause–effect relationships.* The strategies and influencing factors were determined during a focus group of national and regional human resource managers. As a starting point for the discussion, a list of knowledge sharing strategies and influencing factors was used; this was established by reviewing the specialized literature and is presented in Table 1.

During the focus group the following topics were discussed: (1) Which knowledge sharing strategies do you use to avoid corporate amnesia?; (2) Which factors influence your decisions? ; (3) Are there any relationships established among the factors that you take into account? The list was thus reduced to six influencing factors (three of them are related to human capital: commitment, reward management and work satisfaction; the other three are related to structural capital: company's size, organizational culture and technology). Furthermore, four knowledge sharing strategies were identified, namely: mixed-aged teams, storytelling, the use of online communities of practice and the use of enterprise social networks. The company gave up using mentoring and training, because they provided unsatisfactory results in the past; the return on investment of the training programs was less than expected and, in some cases, the relationship established between mentors and mentees was used as a leverage in employee poaching. The management team was also skeptical about using serious games; they saw it as "way too expensive", "a waste of time" and "inappropriate for the working environment".

Phase 2. *ANP development and data collection*: Based on the results of the focus group, an ANP model was developed (Figure 2). A questionnaire that included pairwise comparison

Categories	Criteria	Variables	References
Factors	Human capital	Commitment	Curtis and Taylor (2018), Ro *et al.* (2021), Umar *et al.* (2021)
		Reward management	Ropes (2014), Wang *et al.* (2021)
		Work satisfaction	Akosile and Olatokun (2020), Sang *et al.* (2020)
		Inclusiveness	Holste and Fields (2010), Schauer *et al.* (2015)
		Job design	Baran and Klos (2014), Liu *et al.* (2010)
	Structural capital	Company's size	Coetzer *et al.* (2017), Csillag *et al.* (2019)
		Organizational structure	Castaneda and Duran (2018)
		Organizational culture	Kumari and Saharan (2021), Ni *et al.* (2018)
		Technology	Egloffstein and Ifenthaler (2017), Kaminska and Borzillo (2018)
Strategies	Mentoring		Alfrey *et al.* (2017), Al-Zoubi *et al.* (2020), Curtis and Taylor (2018), Geeraerts *et al.* (2018)
	Mixed-aged teams		Geeraerts *et al.* (2018), Weijs-Perree *et al.* (2020)
	Storytelling		Alfrey *et al.* (2017), Geeraerts *et al.* (2018), Park *et al.* (2020), Tenorio *et al.* (2020)
	Training		Geeraerts *et al.* (2018), Krull *et al.* (2022), Pauget and Chauvel (2018)
	Communities of practice		Al-Zoubi *et al.* (2022), Jia *et al.* (2022)
	Enterprise social networks		Chatterjee *et al.* (2021), Leon *et al.* (2017)
	Serious games		Spanellis *et al.* (2020), Sprinkle and Urick (2018)

Source(s): Authors' own work

Table 1.
Factors and solutions to corporate amnesia according to literature

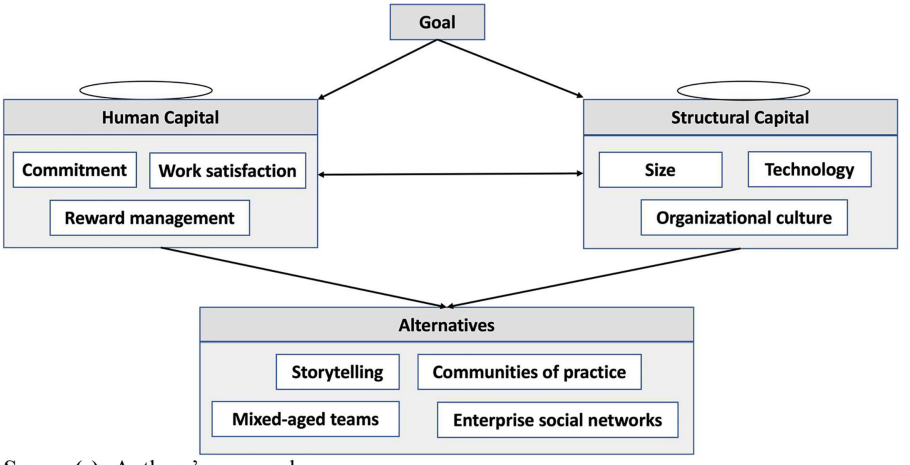

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Figure 2.
The ANP model designed for the company

was developed, with the questions built on the following pattern: "With regard to factor S, how important is Alternative 1 compared with Alternative 2?" (for example, with regard to commitment, how important is storytelling compared with the use of enterprise social networks?). To evaluate the importance, the nine-point priority scale of Saaty (2008) was used.

The questionnaire was included in a two-rounds Delphi study; in the first round, the respondents rated the factors and alternatives, while in the second round, based on the consolidated results, they adjusted their answers if they considered it appropriate.

The use of integrated Delphi and ANP was chosen because it manages to combine the subjective nature of the analyzed issue (corporate amnesia) with the quantitative approach required by the policymakers. Thus, the Delphi study was able "to coordinate and structure the general lines of thinking in a different and unexplored field of social relations, and to transfer the future development of such an area from mere accident to carefully consider decisions" (Rauch, 1979, p. 164) while ensuring the quasi-anonymity of the respondents; it made it possible to refine and draw upon collective opinion and expertise until consensus was obtained. On the other hand, unlike other techniques such as AHP, TOPSIS, PROMETHEE, ELECTRE or VIKOR, ANP takes into account the interdependence established among the decisional elements (Teng *et al.*, 2012) and converts it into priority vectors. Thus, it takes into account not only the influence of factors but also the relationships established among factors, which have tended to be neglected in the previous studies.

Phase 3. *Prioritization of strategies.* Based on the collected data, the pairwise comparison matrices were constructed as follows:

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & 1 \end{bmatrix} \quad (1)$$

where a_{ij} reflects the relative importance of the variable in the ith row compared to that in the jth column. In other words, for each factor of influence, the matrix reflects how important each knowledge sharing strategy is compared with all the other ones.

Further, the eigenvectors (W) were determined, based on the following equation:

$$W = \left(\prod_{j=1}^{n} a_{ij} \right)^{1/n} \Big/ \sum_{i=1}^{n} \left(\prod_{j=1}^{n} a_{ij} \right)^{1/n} \quad (2)$$

where n is the number of variables being compared in the matrix.

Then, the consistency ratio (CR) was estimated, based on:

$$CR = \frac{CI}{RI} \quad (3)$$

where: CI is the consistency index of the pairwise comparison;

RI is the random consistency index.

The consistency index of the pairwise comparison (CI) was obtained by:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (4)$$

The consistency ratio of the developed pairwise comparison matrices ranges from 0 to 0.09325. Given that its value is less than 0.1 (Saaty, 2008), data are considered to be consistent.

The unweighted supermatrix was developed and transformed into a weighted supermatrix by factorizing the elements of each column based on their relative weight.

Hence, all of the columns were summed to unity, and the weighted supermatrix became a stochastic matrix. The weighted supermatrix was then raised to limiting powers to obtain the global priorities and then, the alternatives were ranked from best (the one with the highest priority vector) to worst (the one with the lowest priority vector). The following equation was applied:

$$s = \lim_{k \to \infty} S^k \tag{5}$$

The results reflect the relative importance of each strategy and influencing factor.

Phase 4. *Influence and perspective analysis.* Influence analysis reflects the factors that have a strong influence in the ranking and, according to Adams (2014), it brings forward the factors that can easily change the ranking (with just a small variation)s while the perspective analysis emphasizes how the ranking could change if a certain factor varies.

5. Strategies to avoid corporate amnesia and influence factors

5.1 Best strategies for avoiding corporate amnesia

As previously mentioned, the pairwise comparison matrices and the limit supermatrix were developed based on the results of the Delphi study. The values obtained for each strategy in the limit supermatrix represent their relative priority and are highlighted in Table 2. These values were normalized in order to sum to 1 by dividing the relative priority of each strategy by the sum of all of the relative priority vectors. Further, to highlight the best strategies, the ideal values were determined by dividing each normalized value by the largest one; as a consequence, the most appropriate strategy is associated with a priority of 1. With all of that taken into account, it appears that the best strategies to avoid corporate amnesia are represented by the use of online communities of practice and storytelling (Table 2). The former tends to bring people together, create a trustful climate, support tacit and explicit knowledge sharing, as well as simultaneously allowing knowledge storage because it acts as a transactive memory system. In other words, it makes knowledge available at any time and to any employee who decides to become a member of the community. On the other hand, storytelling encourages classical face-to-face knowledge sharing and the development of shared mental models as well as appealing to emotional knowledge to raise awareness of the desired behavior and practices (tacit and explicit knowledge).

5.2 The main influencing factors

Influence analysis was performed to identify the most influential factors. The sensitivity parameter was modified from 0.5 to 0.1, or to 0.9, to determine the factors capable of changing the order of the most appropriate strategies for avoiding corporate amnesia. Thus, a variation from 0.5 to 0.9 defines a linear increase of 80% while a variation from 0.5 to 0.1 highlights a linear decrease of 80% in factor's importance. As it can be observed in Table 3, the factors

Strategies	Relative priority	Normal	Ideal
Communities of practice	0.1842	0.4316	1.000
Storytelling	0.1283	0.3007	0.6966
Mixed-aged teams	0.0628	0.1471	0.3409
Enterprise social networks	0.0514	0.1204	0.2790

Source(s): Authors' own work

Table 2.
Strategies prioritizing

Top-level network	Parameter	Communities of practice	Enterprise social networks	Mixed-aged teams	Storytelling
Original values	0.5	0.4316	0.1204	0.1471	0.3007
Commitment: upper	*0.9*	*0.4411*	*0.1318*	*0.2869*	*0.1401*
Reward management: upper	0.9	0.4316	0.1204	0.1471	0.3007
Work satisfaction: upper	*0.9*	*0.4396*	*0.1075*	*0.0906*	*0.3621*
Organizational culture: upper	*0.9*	*0.4202*	*0.1203*	*0.0831*	*0.3762*
Size: upper	0.9	0.4316	0.1204	0.1471	0.3007
Technology: upper	0.9	0.4316	0.1204	0.1471	0.3007
Commitment: lower	*0.1*	*0.4265*	*0.1171*	*0.0927*	*0.3636*
Reward management: lower	0.1	0.4316	0.1204	0.1471	0.3007
Work satisfaction: lower	*0.1*	*0.4293*	*0.1250*	*0.1697*	*0.2759*
Organizational culture: lower	*0.1*	*0.4400*	*0.1198*	*0.1880*	*0.2521*
Size: lower	0.1	0.4316	0.1204	0.1471	0.3007
Technology: lower	0.1	0.4316	0.1204	0.1471	0.3007

Table 3.
Results of the influence analysis

Note(s): In italics appear the elements that highlight the changes in the ranking
Source(s): Authors' own work

that have a strong influence on strategy selection are commitment, work satisfaction and organizational culture. In other words, to avoid corporate amnesia, managers have to make sure that their employees are committed to the company and that they have a high level of job satisfaction. The third element, organizational culture, is part of the company's structural capital and involves ensuring the common set of emotional and spiritual knowledge (values, beliefs, norms) among the employees.

The importance given to these factors influences the ranking of the knowledge sharing strategies (Table 4). Thus, if the importance of commitment increases, the use of mixed-aged teams becomes a more appropriate way to avoid corporate amnesia than the use of storytelling. On the other hand, an increase in work satisfaction discourages the use of mixed-aged teams and enterprise social networks and favors storytelling. Moreover, a positive change at the level of organizational culture can significantly increase the importance of storytelling. So sum up, (1) the use of online communities of practice is enhanced by commitment and work satisfaction; (2) the use of enterprise social networks and mixed-aged teams is supported by commitment; and (3) the use of storytelling is encouraged by work satisfaction and organizational culture.

The perspective analysis highlighted how the knowledge sharing strategies could change their position in the ranking if the importance of influencing factors varies. Thus, considerable changes occur if the importance of commitment, work satisfaction and organizational culture varies (Table 5). If the management team decides to focus more on fostering employees' commitment, then the use of online communities of practice and mixed-aged teams becomes highly recommended; storytelling falls from the second position to the fourth while enterprise social networks move from the fourth to the third position. On the other hand, if the management team decides to foster and exploit employees' work satisfaction or the potential of the organizational culture, the use of online communities of practice and storytelling remain the most suitable knowledge sharing strategies to avoid corporate amnesia, but enterprise social networks and mixed-aged teams switch positions.

Influence factor	IGL activity	Parameter 0.1 Value	Change (%)	0.5	0.9 Value	Change (%)
Commitment	Communities of practice	0.4265	−1.18	0.4316	0.4411	2.20
	Enterprise social networks	0.1171	−2.74	0.1204	0.1318	9.47
	Mixed-aged teams	0.0927	−36.98	0.1471	0.2869	95.04
	Storytelling	0.3636	20.92	0.3007	0.1401	−53.41
	Total change (%)		*−19.99*			53.30
Work satisfaction	Communities of practice	0.4293	−0.53	0.4316	0.4396	1.85
	Enterprise social networks	0.1250	3.82	0.1204	0.1075	−10.71
	Mixed-aged teams	0.1697	15.36	0.1471	0.0906	−38.41
	Storytelling	0.2759	−8.25	0.3007	0.3621	20.42
	Total change (%)		*10.40*			−26.85
Organizational culture	Communities of practice	0.4400	1.95	0.4316	0.4202	−2.64
	Enterprise social networks	0.1198	−0.50	0.1204	0.1203	−0.08
	Mixed-aged teams	0.1880	27.80	0.1471	0.0831	−43.51
	Storytelling	0.2521	−16.16	0.3007	0.3762	25.11
	Total change (%)		*13.09*			*21.12*

Note(s): In italics appear the elements that highlight the changes in the ranking
Source(s): Authors' own work

Table 4. Sensitivity analysis to the main influence factors

Top-level network	Parameter	Communities of practice	Enterprise social networks	Mixed-aged teams	Storytelling
Commitment	0.9992	0.4438	0.1367	0.3408	0.078
Work satisfaction	0.9984	0.4418	0.1024	0.0630	0.3927
Organizational culture	0.9937	0.4195	0.1200	0.0774	0.3829
Reward management	0.9500	0.4316	0.1204	0.1471	0.3007
Size	0.9500	0.4316	0.1204	0.1471	0.3007
Technology	0.9500	0.4316	0.1204	0.1471	0.3007

Source(s): Authors' own work

Table 5. Perspective analysis

From this starting point, the management team decided to develop online communities of practice at the department level and to use storytelling as an internal tool, not just for branding purposes. These strategies will be implemented with a small group of employees in the first six months and further, depending on the generated outputs, may be implemented at the company level.

6. Conclusion and further research directions

This research sought to identify the best strategy to avoid corporate amnesia in the context of Industry 5.0 and the aging society. To achieve this goal, a multi-phase methodology, based on ANP, was proposed and tested in a firm from the bakery industry. The results highlighted that the use of online communities of practice and storytelling are the best way to avoid corporate

amnesia and the most important factors are commitment, work satisfaction and organizational culture. Furthermore, it was observed that: (1) the use of online communities of practice as a way to avoid corporate amnesia is enhanced by commitment and work satisfaction; (2) the use of enterprise social networks and mixed-aged teams is supported by commitment; and (3) the use of storytelling is fostered by work satisfaction and organizational culture.

6.1 Theoretical and practical implications

These findings have both theoretical and practical implications. At the theoretical level, the current research provides a nexus between knowledge management and operations management by showing how a multi-phase methodology based on ANP can be used to solve a knowledge management issue such as corporate amnesia. It thus complements the work of Eslamkhah and Hosseini Seno (2019) which used ANP to rank the knowledge management tools and techniques that affect organizational information security improvement. In this case, knowledge management was treated as a means to solve information technology issues and not as a purpose.

Second, these findings are in line with Al-Zoubi *et al.* (2022) and Jia *et al.* (2022) who claimed that online communities of practice support knowledge sharing among employees and can also act as a transactive memory system, allowing access to employees' knowledge even when they are no longer part of the company. Nevertheless, the current results complement the aforementioned studies by highlighting that the use of online communities of practice is enhanced by commitment and work satisfaction. Thus, the literature from the field of knowledge management is extended not only by identifying the best strategy to avoid corporate amnesia but also by highlighting the influence of various factors related to human and structural capital.

The results of the current research also complement the findings of Curtis and Taylor (2018), Ro *et al.* (2021) and Umar *et al.* (2021) by quantifying the effect of employee commitment on the knowledge sharing strategies. As presented in the previous section, if the importance of commitment decreases by 90%, the overall change in the knowledge sharing strategies that aim to avoid corporate amnesia is −19.99%. On the other hand, if the importance of commitment increases by 90%, the overall change is 53.30%. Therefore, commitment facilitates the implementation of the knowledge sharing strategies.

The current results do, however, contradict the findings of Akosile and Olatokun (2020) and Sang *et al.* (2020) by showing that work satisfaction acts as an inhibitor when it comes to avoid corporate amnesia. Thus, if the importance of work satisfaction decreases by 90%, the overall change in the knowledge sharing strategies is 10.40%; if the importance of work satisfaction increases by 90%, the overall change is −26.85%. In other words, satisfied employees may be reluctant to transform their knowledge into collective knowledge. Further research is required at this level, especially because work satisfaction has a strong positive influence on storytelling (20.42%) and a negative one on mixed-aged teams (−38.41%). This situation may be related to employees' image and reputation; satisfied employees might be interested in sharing stories about their experiences if these improve their position and status in the group, but this should be assessed through further research.

From a practical point of view, this study presented a decision-making tool that can help managers determine the most appropriate strategy to avoid corporate amnesia. The steps that have to be followed have therefore been presented, as have the potential solutions and influence factors. As previously mentioned, if managers want to avoid corporate amnesia in the Industry 5.0 framework, they should focus on using online communities of practice and storytelling. This would not only emphasize the human side of their activity as Industry 5.0 aims but it will also facilitate explicit and tacit knowledge sharing within the company's boundaries and creation of organizational knowledge. This in itself is not a successful recipe,

however, and it needs to be adapted to each company's characteristics and managers' interests. As reflected earlier, if the managers decide to focus on increasing employee commitment, then the most appropriate strategies would be online communities of practice and mixed-aged teams.

To synthesize the overall findings, the proposed methodology helps managers understand how they can face corporate amnesia and the relationship established among human capital, structural capital and strategies. The tool can also be customized based on managers' interests and company characteristics. As previously mentioned, the managers from the analyzed company excluded the use of mentoring, training and serious games due to their past experience and personal opinion.

6.2 Limits and future research directions

Despite the aforementioned contributions, the current research is limited by its design. First, it used a single case-study approach and emphasized the best strategies for the analyzed company; different results could be obtained if the same methodology is applied in a different company and/or industry. Second, it reflects managers' perspective on the subject, because they are the ones involved in deciding which strategies are going to be implemented at the company level. However, different results could be obtained if the employees have to evaluate the influence of factors on the organizational strategies or if their preferences were taken into account. Starting from these points, future research avenues can be identified, namely: (1) extending the analysis at the industry level to determine whether there is any strategy that could be generally implemented to avoid corporate amnesia in the bakery industry; (2) performing a cross-sectional analysis to determine which factors are crucial to corporate amnesia in the Industry 5.0 context and which strategies could be used to avoid knowledge loss; and (3) analyzing employee preferences related to organizational strategies for fostering knowledge sharing and creating knowledge repositories. This methodology could also be used in conjunction with other multi-criteria decision aid techniques to obtain weights for the factors, such as the Best and Worst Method, or by incorporating uncertainty into the study and applying fuzzy-ANP.

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