UNIVERSITY OF TURKU
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The Future of Knowledge Management in Businesses

Master's thesis in Futures Studies

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Abstract

In this thesis, the main objective is to explore the future of knowledge management in large enterprises. In addition to this objective, the research aims to answer two research questions revolving around the challenges of knowledge management and the role of emerging technologies. Future images were created based on the Disaggregative Delphi method.

Out of the 104 invitations sent, 11 individuals participated in the panel. These participants were experts in the fields of knowledge management, strategy, data science, and foresight. For the purpose of the research, five themes were identified to design the statements and questions for the questionnaire and the Delphi panel. These themes were utilized to address the research questions and meet the objectives of the study.

In the following statement, both aspects of probable and desirable were examined to assess the future-oriented responses of the participants. Additionally, they could elaborate on their opinions in the comment box. Quantitative analysis was conducted using hierarchical clustering and the Ward method. After clustering, the qualitative material was thematized to enrich the interpretation of the quantitative clusters for future images. Ultimately, four images for the future of knowledge management were obtained, named Internalization of Knowledge management, Technocracy, Steady Interest, and Strategic Innovation Symphony.

In conclusion, the output images of this research can particularly assist specialists, consultants, and large companies in designing their systems and devising effective strategies for the future of knowledge management in businesses.

Key words: Knowledge Management, Future Images, Delphi Method.

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1 Introduction

1.1 Why The Future of Knowledge Management

We live in an era of rapid change. Technological advancements, the internet, emerging technologies, vast online libraries, various scientific breakthroughs, and other factors have all contributed to the vast generation and abundance of data, information, and consequently, knowledge. According to Taylor (2023) on the Statistica website, the overall volume of data generated, recorded, copied, and consumed, by the year 2025, it is predicted to triple compared to 2020 and reach approximately 180 zettabytes. Our behaviour in dealing with this volume of data is crucial. How we receive, process, store, control, and utilize them will be paramount. How do they transform into knowledge?

I endeavoured to select a topic that posed a challenge. Just as the concept of "pain and gain" is utilized in various business models (Osterwalder et al. 2015), many startups, ideas, and businesses take shape.

During the study and research in the field of the subject “knowledge”, various important words are encountered, and different definitions can be observed from different perspectives. For example, the words encountered and engaged with during the study and deep dive into the topic of “knowledge” included beliefs, facts, sense, observation, wisdom, tacit, explicit, implicit, latent, cognitive, memory, data, information, understanding, concept, awareness, experience, rational, skills, intuition, mental state, perception, epistemic and thoughts. One of the reasons for the breadth of definitional scope of 'knowledge' in literature is that, given its broad and interdisciplinary nature, various expressions and different words have been utilized in different fields such as organization, engineering, epistemology and business, information science, psychology and education.

Knowledge is an intangible (Sveiby 1997; Hunt 2003; Diefenbach 2006) asset. This intangible asset and knowledge management can create and lead to innovation (Nonaka & Von Krogh 2009; Wang & Wang2012; Shujahat et al. 2019), the essence of the process of innovating lies in knowledge (Galunic & Rodan 1998; Quintane et al. 2011; Hoarau & Kline 2014) and enhance decision-making. The explosion of interest in knowledge management among academics, public policy makers, consultants, and businesspeople began as recently as the mid-1990s (Hislop et al. 2018).

It is important to note that with the massive volume of data, resulting in information and knowledge, knowledge management can be more than just structuring knowledge or making it

accessible within companies. Knowledge management may undergo changes, transformations, challenges, and new systems in the future.
Hence, in summarizing the primary rationales underpinning the selection of this topic, knowledge management is likely to become an increasingly discussed topic in both companies and academia in the future. This is due to the ever-changing technological landscape, the growing volume of data and information being generated, and the resulting increase in the various types of knowledge production. Having future images can be crucial for companies and businesses, especially large-scale ones, to effectively navigate these changes and make informed decisions. Furthermore, a pivotal consideration was the deliberate endeavour to elect a subject matter characterized by its future-oriented challenges, envisaging its prospective relevance and impact on the landscape of enterprises in the foreseeable future.

1.2 Objectives and Research Questions

1.2.1 Objectives

The main objective of the thesis is to explore the future of knowledge management in large enterprises.
Although the main objective of the research has been stated, there is also secondary objective that can be addressed during this study. Therefore, the secondary objective of the research is to find images of the future of knowledge management in large enterprises.

1.2.2 Research Questions (RQs)

In this thesis, considering the importance of clarity in the research question (Hair et al. 2011, 93), and the importance of formulation of research questions related to the qualitative and quantitative research methods (Creswell 1999, 470), and considering the nature and importance of research questions, the transformations that have taken place in management fields, the role of emerging technologies, these transformations, and the subsequent challenges that each topic may face in the future of knowledge management, research questions have been structured and designed. The research questions include the following two questions:

1- How can emerging technologies, such as AI, machine learning, and blockchain, enhance knowledge management practices to optimize organizational performance by 2035?
2- What will be the main challenges in knowledge management for large enterprises by 2035?

1.3 Structure Design

To achieve the objectives and answer the research questions that have been posed, the literature review defines what knowledge management is, presents theoretical perspectives on the topic, and discusses related issues, transformation and challenges of knowledge management in foreseeable future in businesses. The methodology section follows, utilizing the Delphi method. A panel composed of experts, managers, and researchers in the fields of foresight, knowledge management, strategy, and data science were invited, and both qualitative and quantitative questions and statements were posed in a future-oriented manner, targeting both the probability and desirability aspects. Subsequently, the research results are analysed in the following section, with these analyses discussed through the presentation of future images. The results will be presented in a crystallized form as future images.

2 Literature Review

2.1 The Concept of Knowledge Management

Knowledge management is a discipline that emerged quickly with substantial intellectual power in the realm of management (Baskerville et al. 2006). Knowledge management (KM) encompasses both a practical approach within business operations and an evolving academic discipline (McInerney 2002, 1009). Definitions of knowledge management therefore typically contain references to the knowledge processes to be managed and the organizational factors that are involved (Hislop et al. 2018). The natural inclination to exchange knowledge makes it peculiar that corporations perceive knowledge management as a novel concept they must invent (McInerney 2002, 1009). Knowledge management encompasses more than simply handling knowledge, suggesting that it involves more than just a technological challenge that can be addressed through the use of knowledge management systems (Hislop et al. 2018, 50).
Given that knowledge management theory is still evolving, it is particularly fitting for professionals in information and technology fields to scrutinize Knowledge management and provide conceptual frameworks to steer deliberate and compassionate knowledge processes (McInerney 2002, 1009). The theory of knowledge management combines various theories from established research fields to establish a cohesive foundation for a discipline with distinct trajectories and original concepts (Baskerville et al. 2006). In a knowledge management initiative, the focus is on managing the knowledge artifact or entity, rather than the knowledge itself, and the representation of knowledge must mirror the process of knowledge acquisition (McInerney 2002, 1011). The significance of knowledge management has grown substantially, sparking considerable research interest due to its potential for enhancing sustainability (Chopra et al. 2021).
Although it is broadly acknowledged that knowledge is a crucial source of competitive advantage, there is limited comprehension of how organizations actively generate and manage knowledge (Nonaka et al. 2000). The connection between knowledge management and its fundamental theoretical roots demonstrates how this field has been methodically elevated into a distinct, significant, and applicable body of management theory (Baskerville et al. 2006). There was very limited insight into how organizations actually generate and manage knowledge (Nonaka et al. 2000). This is partly due to our lack of a comprehensive understanding of knowledge and the process of creating it (Nonaka et al. 2000). Comprehending how established theories have been applied to shape an emerging domain like knowledge management holds significance, as these theories provide support and validation, establishing the field as a

legitimate scientific endeavour (Baskerville et al. 2006). The term 'knowledge management' frequently used by academics and business professionals often simply refers to 'information management'. Traditionally, Western management has treated organizations as information processing machines that collect and handle information from their environment to solve problems and adapt according to specific goals (Nonaka et al. 2000). This passive and static perspective of the organization does not adequately reflect the dynamic process of knowledge creation (Nonaka et al. 2000).

2.2 Knowledge Management in Businesses

Some enterprises have managed to acquire knowledge once deemed intuitive or mere “business know-how,” leveraging it to achieve financial benefits (McInerney 2002, 1012). However, the leaders of thriving organizations are continually seeking enhanced methods to boost performance and achieve better outcomes (Wiig 1997, 6). It's been highlighted that companies aspire to glean insights from their own historical experiences, supplementing them with best practices and insights gathered from other organizations. In such contexts, knowledge management centres on fostering the synergy between knowledge accumulation and learning processes within a company (Baets 2005, 115). Given that knowledge serves as the primary catalyst for the "economics of ideas", it is foreseeable that the central goal of enhancing society will persistently revolve around the creation, advancement, structuring, and utilization of knowledge (Wiig 1997, 6).

Ruggles (1998) highlighted that knowledge management is a term that is now used to describe a wide range of things, from organizational learning initiatives to database management tools. During the mid-1980s, both individuals and organizations started recognizing the growing significance of knowledge within the evolving competitive landscape (Wiig 1997, 6). Forward-thinking leaders in both organizations and nations are actively seeking methods to harness and derive value from the knowledge assets within their respective entities (Wiig 1997, 6).

Reflecting on the past, Wiig (1997, 7-8), from the late 90s indicates that knowledge management, as it was understood then, had not been explicitly defined until a decade earlier, in the 80s. Moreover, it was still not a common concept with managers in the 90s.

According to Wiig (1997, 8), from a managerial viewpoint, systematic knowledge management entails focusing on four key areas:

1- “Top-down monitoring and facilitation of knowledge-related activities.
2- Creation and maintenance of the knowledge infrastructure.
3- Renewing, organizing, and transforming knowledge assets.
4- Leveraging (using) knowledge assets to realize their value.”

Empowering individuals with knowledge fosters innovation and ensures an ongoing capacity to develop and deliver products and services of exceptional quality (Wiig 1997, 8).
According to Wiig (1997, 8) to achieve business value and generate new, competitive assets associated with knowledge, many organizations often opt to pursue one or more of five fundamental strategies focused on knowledge: 1- *Knowledge strategy as business strategy* emphasises on generating, capturing, organizing, updating, sharing, and utilizing knowledge to ensure the most effective information is accessible and employed at every decision point. 2- *Intellectual asset management strategy* focuses on the strategic management of intellectual assets within an organization, including patents, technologies, operational and managerial practices, customer relationships, organizational structures, and another key knowledge asset. 3- *Personal knowledge asset responsibility strategy* stresses individual accountability for investing in knowledge, fostering innovation, maintaining competitiveness, renewing, efficiently utilizing, and making knowledge assets accessible to others within each employee's sphere of responsibility, enabling the application of the most competitive knowledge across the organization's operations. 4- A *Knowledge creation strategy* addresses the acquisition of knowledge, both theoretical and practical through research and development, and encouraging employees to innovate and learn from experiences, all aimed at gaining fresh insights and enhancing competitiveness. 5- *Knowledge transfer strategy* prioritizes systematic methods for transferring knowledge, involving acquiring, organizing, restructuring, storing, and disseminating knowledge to operational points where it can be effectively utilized. This process encompasses sharing knowledge and embracing optimal methodologies.

2.3 Development of Knowledge Management

According to Wiig (1997, 10-11) development of knowledge management between 1975 to 1997, in 1975, being among the pioneers in embracing knowledge-focused management, Chaparral Steel constructed its internal organizational structure and corporate strategy with a direct emphasis on the explicit management of knowledge. After the efforts of various individuals and organizations in the following years, numerous and several knowledge management seminars and conference were held in Europe, Asia, Us, and Africa and Numerous knowledge management (KM) journals have been initiated, and numerous instances of successful KM initiatives and practices have been documented in 1996 and 1997.
It is worth noting that Ikujiro Nonaka is a trailblazer in the realm of knowledge management. He introduced the concept of tacit and explicit knowledge, along with the SECI model, which outlines the processes of socialization, externalization, combination, and internalization for managing knowledge within organizations (Chopra et al. 2021).

We understand that establishing a learning or knowledge-based organization is a straightforward idea but executing it is challenging. Developments in Information and Communication Technology (ICT) offer support in this endeavour. Innovations like Case-Based Reasoning Systems (CBRS), Group Decision Support Systems (GDSS), and Artificial Neural Networks hold potential to aid various facets of organizational learning and transformation. Due to space constraints, we can only provide a brief overview of these technologies here (Baets 2005, 74). CBRS primarily comprises a repository of cases and a software platform designed to retrieve and analyse cases deemed similar, along with their relevant information (Baets 2005, 75-76). A Group Decision Support System (GDSS) is a technology-driven system comprising software, hardware, linguistic elements, procedures, and utilities aimed at facilitating collaborative strategy development. GDSS can take various forms and setups to aid group deliberation and planning processes (Baets 2005, 76). Artificial neural networks (ANNs) are instruments stemming from artificial intelligence (AI) and represent a novel approach to information processing that emulates the workings of the human brain. ANNs excel in identifying and organizing patterns autonomously, even in the absence of pre-existing data. They facilitate the organization of implicit knowledge, rendering it accessible without explicit articulation (Baets 2005, 77). Data mining addresses this requirement by integrating methodologies from diverse domains like database technology, machine learning, statistics, and artificial intelligence. In the context of knowledge management, data mining proves valuable as knowledge undergoes continual evolution, necessitating the regular updating of an organization's knowledge repository (Baets 2005, 77).

The advancing capabilities of artificial intelligence (AI) are expected to integrate into various aspects of organizations, potentially impacting all areas, including knowledge management (Jarrahi et al. 2023). In addition, Artificial Intelligence has the potential to play a significant role in enhancing various dimensions (“creation, storage and retrieval, sharing, and application of knowledge”) of knowledge management (Jarrahi et al. 2023).

2.4 Challenges of Knowledge Management

Rather than just solving problems, organizations identify and define problems, generate and apply new knowledge to address them, and then continue to create new knowledge through the process of problem-solving (Nonaka et al. 2000).

It is difficult to communicate tacit knowledge to others, since it is an analogue process that requires a kind of ‘simultaneous processing’ (Nonaka et al. 2000). To grasp the genuine essence

of knowledge and its formation, it's crucial to acknowledge that tacit and explicit knowledge complement each other, both playing indispensable roles in the process (Nonaka et al. 2000). Di Vaio et al. (2021) emphasizes that digital transformation tools are key for creating long-term value through innovation and sustainability. It stresses the role of knowledge management systems (KMS) in fostering these efforts, advocating for new approaches to knowledge creation and sharing to support global and inclusive growth effectively.

2.5 Understanding Knowledge: Definitions and Concepts

Consider all the things you believe to know right now, or at least you think you know: the Earth is round, two plus two equals four and Paris is France's capital. "The Godfather" is a great film, and water's chemical formula is H_2O. What do these diverse examples of knowledge—geographical, mathematical, aesthetic, and scientific—have in common? (Pritchard, 2018). Pritchard (2018) introduces this philosophical domain in the book “What Is This Thing Called Knowledge?”. This is the central question of epistemology, the study of knowledge. He further raises the issue and question that A rarely asked yet fundamental question in epistemology is: why should we care about having knowledge?

If we agree that knowledge equals power, it follows that knowledge is inherently dynamic due to the energy and constant change it embodies (McInerney 2002, 1010).

Knowledge isn't just a tangible item to be positioned, nor should it be conflated with depictions of knowledge found in documents, databases, etc. Instead, it can be viewed as a series of procedures facilitating learning and the internalization of understanding (McInerney 2002, 1010). Knowledge necessitates individuals who possess it, thus its mechanisms are intricately linked with human engagement and lived experiences (McInerney 2002, 1010). Knowledge is gained actively and dynamically through sensory input, observing and listening to others, reading, acknowledging emotions, life experiences, and all learning-related processes. (McInerney 2002, 1010-1011). Throughout history, insightful individuals have ensured long-lasting continuity by passing on profound knowledge to succeeding generations (Wiig 1997). For countless centuries, faculties in universities and other educational institutions have been focused on the processes of transferring knowledge and the creation and practical application of knowledge (Wiig 1997). Indian mathematicians utilized accumulated knowledge spanning generations to craft mathematics that remains remarkably advanced even by contemporary standards (Wiig 1997, 7). According to Ullah (2020) engineering problem-solving relies heavily on the application of knowledge. Therefore, activities that involve “knowledge acquisition,

representation, dissemination, utilization, and management" are crucial in resolving engineering challenges.

Understanding the role of knowledge is crucial in knowledge process design. It's essential, though, to distinguish between information and knowledge. While it's common knowledge that the Internet, through tools like Google and other search engines, provides access to vast amounts of information, the challenge lies in effectively utilizing this information to address problems and bridging the gap between mere information and true knowledge (Hawryszkiewycz 2009).

Knowledge emerges within a spiral that navigates through two seemingly contradictory concepts (Nonaka et al. 2000). In Nonaka et al. (2000) theory regarding the process of knowledge creation, they embrace the conventional understanding of knowledge as "justified true belief". Information transforms into knowledge as individuals interpret it, providing it with context and grounding it in their beliefs and commitments (Nonaka et al. 2000).

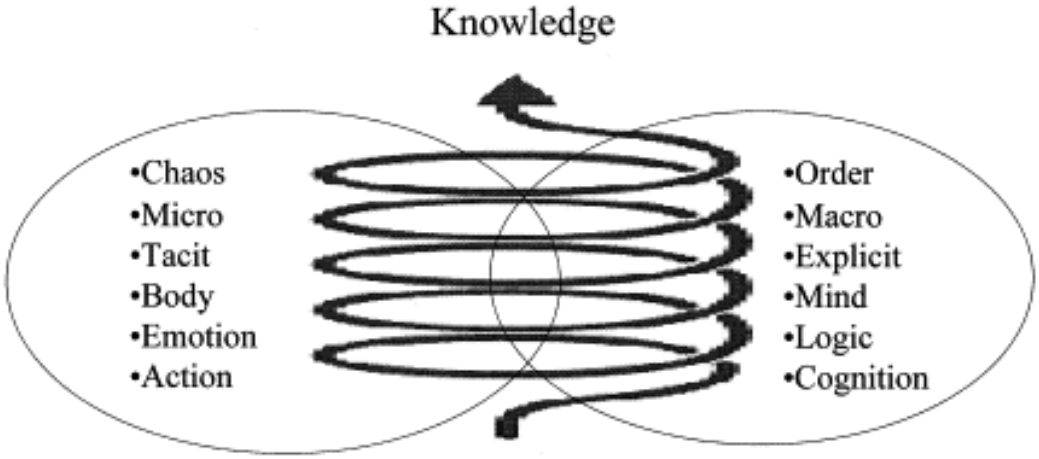

Figure 1: "knowledge created through a spiral" from Nonaka et al. 2000.

2.6 Tacit Knowledge and Explicit Knowledge

Describing tacit knowledge can be challenging due to its inherent qualities that are hard to put into words (Venkitachalam & Busch 2012). Explicit knowledge refers to information that has been clarified, recorded, or documented. When tacit knowledge remains unrepresented and undisclosed within an organization, there may be missed performance opportunities, which other organizations could exploit for their own benefit (McInerney 2002, 1012.). In their article Venkitachalam and Busch (2012) highlight the relevance of tacit knowledge in various domains of knowledge management, including strategies, organizational learning, storytelling, intellectual capital, communities of practice, knowledge networks, and information and communication technology (ICT).

Polanyi (1966, 4) explains the concept of tacit knowledge by illustrating examples such as riding a bicycle and swimming, suggesting that we possess certain knowledge that we are unable to articulate, or in other words, we can tell less than we can know. Another example is that we can recognize a familiar face even among thousands or millions, yet we often cannot explain the specific details of how we identify that face.
Explicit knowledge can be articulated in formal and systematic terms and disseminated through data, scientific formulas, specifications, and similar mediums. Explicit knowledge lends itself to processing, transmission, and storage with relative ease. Conversely, tacit knowledge is inherently personal and challenging to formalize, encompassing subjective insights, intuitions, and hunches (Nonaka et al. 2000.). This type of knowledge is deeply embedded in action, procedures, routines, commitment, ideals, values, and emotions (Nonaka et al. 2000). Explicit knowledge devoid of tacit understanding rapidly loses its significance. Knowledge emerges from the interplay between tacit and explicit knowledge, rather than solely from either tacit or explicit knowledge in isolation (Nonaka et al. 2000.).

2.7 SECI Model

Nonaka et al. (2000) present the SECI model, in which an organization generates knowledge through the interactions between explicit and tacit knowledge. During the conversion process, both implicit and explicit knowledge undergoes growth, both in terms of “its quality and quantity” (Nonaka et al. 2000). The conversion in SECI consists of four modes, which are Socialization, Externalization, Combination, and Internalization. The conversion process in S(socialization) is from tacit knowledge to tacit knowledge, E(externalization) is from tacit knowledge to explicit knowledge, C(combination) is from explicit knowledge to explicit knowledge, I(internalization) is from explicit knowledge to tacit knowledge (Nonaka et al. 2000).

Socialization involves transforming fresh tacit knowledge through communal experiences, often found in traditional apprenticeships. Companies frequently acquire and leverage tacit knowledge inherent in customers or suppliers by engaging in interactions with them (Nonaka et al. 2000.). In this process, individuals gather subjective knowledge, share it through daily interactions, and socially validate it by integrating and broadening it (Maras et al. 2024)

Externalization is the act of expressing tacit knowledge into explicit form. When tacit knowledge is articulated explicitly, it becomes solidified, enabling it to be shared and serving as the foundation for new knowledge. Conceptualizing ideas in the development of new products exemplifies this conversion process. The effective transformation of tacit knowledge into

explicit knowledge relies on the sequential application of metaphor, analogy, and modelling (Nonaka et al. 2000.). A key aspect of externalization is documenting and summarizing tacit knowledge (Maras et al. 2024).

Combination involves transforming explicit knowledge into more intricate and organized sets of explicit knowledge. Explicit knowledge is gathered from internal or external sources, then amalgamated, refined, or processed to generate new knowledge. This newly formed explicit knowledge is subsequently shared among the organization's members. The strategic utilization of computerized communication networks and extensive databases can facilitate this form of knowledge conversion. For instance, when a company's comptroller gathers information from various parts of the organization and consolidates it to produce a financial report, that report represents new knowledge as it consolidates information from diverse origins into one coherent context. The method of knowledge conversion known as combination can involve breaking down concepts. For instance, breaking down a corporate vision into practical business or product ideas also generates clear, systematic knowledge (Nonaka et al. 2000.).

Internalization refers to the transformation of explicit knowledge into tacit knowledge. This process involves individuals within an organization absorbing and integrating explicit knowledge, thus converting it into tacit knowledge that is shared throughout the organization. Internalization is strongly linked to the concept of experiential learning. This involves putting explicit knowledge, like product concepts or manufacturing procedures, into practice through action and repetition. Furthermore, explicit knowledge can also be absorbed through simulations or experiments, facilitating experiential learning. Once knowledge is internalized and becomes ingrained in individuals' tacit knowledge, such as shared mental models or technical expertise, it becomes a valuable resource. This tacit knowledge, amassed at the individual level, can initiate a new cycle of knowledge creation when shared with others through social interaction (Nonaka et al. 2000.). Internalization happens when individuals consider the newly created external knowledge from the previous phase and apply it to their specific context (Maras et al 2024).

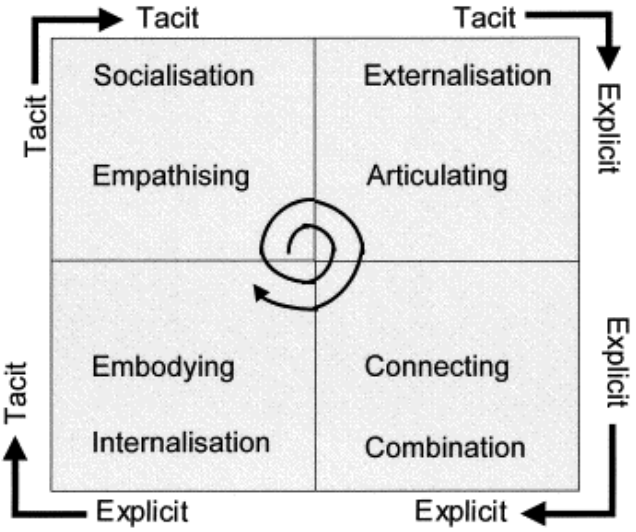

Figure 2: The SECI process from Nonaka et al. 2000.

2.8 Five Themes in Future of Knowledge Management

Based on the findings of the research literature, five themes have been identified to inform the next steps in the quest for the future of knowledge management in business. These themes are: 1- *The level and overall impact of usage of knowledge management* emphasises on two aspects of usage and implementation and impact of competitiveness. 2- *Improving business processes through knowledge management* by focuses on strategic thinking, innovation and optimising operations. 3- *New technologies to boost knowledge management* assesses role of AI, machine learning and other emerging technologies in knowledge management. 4- *Knowledge sharing* focuses on sharing culture within a firm and outsourcing knowledge management practices. 5- *Tacit knowledge becoming explicit knowledge* emphasises on how these two forms of knowledge can be converted.

Table 1: Five themes for exploring future of knowledge management

The level and overall impact of usage of knowledge management	- The level of usage of knowledge management - Impact on competitiveness
Improving business processes through knowledge management	- Strategic thinking - Innovation - Optimising operations
New technologies to boost knowledge management	- AI and Machine learning tools

	- Other Emerging Technologies
Knowledge sharing	- Sharing culture within a firm - Outsourcing knowledge management practices
Tacit knowledge becoming explicit knowledge	- From tacit to explicit knowledge

3 Research Method

3.1 Why Delphi?

Choosing an appropriate research method is important for the success of a study. For this thesis, the Delphi method was selected, which utilizes expert opinions about the future. There are various methods in research that use expert opinions, but this method offered advantages for me in the context of this thesis, which led to its selection. The method was cost-effective and feasible, as it did not require arranging a specific place and time for all experts to be present. In other words, considering that the data collection required experts who were located in different parts of the world with varying time zones from east to west, it was practically impossible to invite and gather these individuals in person or online. Another reason for preferring this approach in this research was to take advantage of one of the benefits and characteristics of the Delphi method, which involves sharing opinions and observing others' perspectives. In fact, questions are not asked individually and in isolation; instead, opinions are shared anonymously among all participants, allowing individuals to become aware of others' perspectives and, if necessary, respond or reply accordingly.
An additional rationale for choosing the Delphi method was to enhance precision and delve deeper into the subject by employing both quantitative and qualitative methods simultaneously. This method allowed me to systematically explore various dimensions of the subject and ensure that all elements are fully understood and examined. In other words, it provided me with the ability to synthesize experts' knowledge. Ultimately, this method is one of the research approaches in futures studies that was chosen based on the subject, nature, and objectives of this thesis.

3.2 What is Delphi?

The Delphi method, a widely used approach for forecasting and decision-making, relies on expert opinions and has been around for more than fifty years (Landeta 2006, 467). The Delphi technique is named after the ancient Greek oracle, renowned for its ability to foresee the future (Thangaratinam & Redman 2005, 120). Developing in the 1950s and 1960s, the Delphi method emerged through the endeavours of the RAND Corporation (Lund 2020, 929). The modern revival of futures research started with the Delphi technique at RAND, the Santa Monica, California think tank, in the early 1960s (Gordon 1994). During that period, RAND researchers mainly focused on the military potential of emerging technologies and the resolution of possible political issues (Gordon 1994). During the 1960s, the Delphi method saw a surge in popularity

following its declassification by the American Armed Forces, transitioning from its prior exclusive military application to widespread usage. Its adoption quickly expanded across various regions and subjects, notably into technological prediction and the assessment of intricate social issues (Landeta 2006, 468). An intriguing feature of the Delphi method is its frequent utilization for future forecasting (Lund 2020, 930).

RAND researchers investigated the use of expert panels to tackle forecasting challenges (Gordon 1994). Emerging from the RAND Corporation and gaining popularity among a widening circle of researchers, the method became increasingly formalized, giving rise to various adaptations (Lund 2020, 929-931). The Delphi method was developed to foster genuine debate, free from the influence of personalities (Gordon 1994). The Delphi method is employed globally to explore a diverse range of topics (Niederberger et al. 2020). An essential reference for Delphi methodology is Linstone and Turoff's (1975) book, "The Delphi method: Techniques and applications." This publication marked a significant milestone in establishing Delphi as a respected research method. It elucidated the philosophy, objectives, and procedural steps of the Delphi method (Lund 2020, 930-931). Its purpose is to cultivate expert-driven opinions on a particular knowledge-based question.

This method operates under the belief that a collective of experts, with their varied perspectives, will yield a more accurate outcome than a single expert's judgment, regardless of that expert's high level of expertise (Niederberger et al. 2020). Anonymity was ensured so that participants remained unaware of each other's identities. Additionally, to neutralize the impact of persuasive speech, researchers synthesized the reasons behind extreme opinions to give them equal consideration before presenting them back to the group for further analysis (Gordon 1994). The discussion rounds are typically conducted anonymously to ensure that the status or organizational affiliations of the experts do not influence the opinions of others (Tapio 2003, 85). These two fundamental elements—anonymity and feedback—are integral to the Delphi method (Gordon 1994). A time series of Delphi publications per year shows that its academic acceptance has been well established, and its popularity and range of research applications have been growing for two decades, predicting unprecedented future use (Flostrand et al. 2020).

3.2.1 Strengths and weaknesses of the Delphi method

Over time, the Delphi Method has expanded its range of uses and has faced intense scrutiny and numerous assessments, revealing both its flaws and advantages, along with its potential (Landeta 2006). Executing Delphi studies effectively is challenging (Gordon 1994). It demands careful consideration in participant selection and meticulous preparation and testing of questionnaires to prevent ambiguity (Gordon 1994). The technique enabled the rapid gathering of insights from a group of experts and eliminated potential biases from group interactions by

ensuring the anonymity of panel members (Flostrand et al. 2020). Anonymity enables experts to freely express their opinions without fearing judgment from potentially more dominant opinion leaders in the profession (Nygren et al. 2017).

Multi-round studies consume considerable time, and inevitably, some participants may drop out during the process (Gordon 1994). The main advantage of the Delphi method lies in its capacity to impartially and objectively examine issues that necessitate judgment. However, a drawback of Delphi is its susceptibility to the formulation of questions for which more effective techniques are available (Gordon 1994). The results might disproportionately reflect the research team's views due to potential bias in selecting panelists or the willingness of like-minded experts to participate (Nygren et al. 2017). To address these issues, a larger expert panel selected based on occupation, membership, or event participation, rather than individually, can be sufficient, simplifying the selection process and reducing reliance on specific experts' commitment (Nygren et al. 2017).

The swift adoption and widespread acceptance of the Delphi method stemmed from its capacity to address inherent issues in traditional group opinion formation, such as mitigating undesirable psychological effects, providing selective feedback, facilitating extensive consideration through repetition, offering statistical results, and featuring a flexible and straightforward methodology (Landeta 2006, 469). Delphi proves to be a potent tool when employed to address relevant inquiries (Gordon 1994). One drawback of the Delphi method is its time-consuming nature. A single round often demands a duration of approximately three weeks (Gordon 1994). The Delphi method is ideal for complex situations where the future outcomes depend on the decisions and ethical considerations of the involved parties (Nygren et al. 2017).

3.3 How to implement Delphi?

The success of a Delphi study primarily depends on choosing the right participants (Gordon 1994). Traditionally, participants in a Delphi study are chosen based on their expertise that is pertinent to the research questions under investigation (Lund 2020, 930-931). Identifying the most competent experts can be challenging, and top experts are often busy, making it difficult to engage them for the entire process or even at all (Nygren et al. 2017, 3). As the outcomes rely on the knowledge and collaboration of the panelists, it's crucial to include individuals who are expected to offer valuable insights (Gordon 1994). In the Delphi method, experts from the relevant disciplines are initially identified and invited to participate in the study (Gordon, 1994).

During the initial contact, the selected individuals are informed about the Delphi method and invited to participate. They are assured that their anonymity will be maintained, meaning their statements will not be attributed to them by name (Gordon 1994). Due to the typically small

number of respondents, Delphi studies are not designed to yield statistically significant results Gordon 1994). In other words, the outcomes from any given panel do not predict the responses of a larger population or even a different Delphi panel. They simply represent the collective opinion of the specific group involved (Gordon 1994).

The Delphi method's merit lies in the ideas it generates, including both those that garner consensus and those that don't (Gordon 1994). Additionally, the arguments supporting extreme positions also serve as valuable outcomes. In certain contemporary uses of the Delphi method, the inquiries center on the worth of independent variables utilized in quantitative simulation models (Gordon 1994.). In this context, consensus isn't obligatory; instead, if discrepancies arise regarding any variable's value, extreme values can be evaluated in quantitative models to gauge their potential significance (Gordon 1994.).

Anonymize and compile the gathered data into a clear and concise report, highlighting key measures of central tendency (such as mean, median, mode, ordinal rank) and measures of variation (such as standard deviation, range, interquartile range) for the panel distribution. If reasoning statements were collected, this report can also incorporate a summary of those statements (Flostrand et al. 2020).

3.4 Future Images and Disaggregative Delphi

The traditional Delphi method aimed to gather expert opinions to estimate the likely future of a topic that is subject to many interpretations and is difficult to formalize using mathematical models (Tapio 2003, 85). Disaggregative Delphi focuses on exploring different images for the future, instead of trying to agree on one single future. Future images are mental tools comprising a mix of ideas, beliefs, and desires that influence human choices and guide decision-making and actions (Rubin et al. 2001). Images of the future are similarly shaped: their construction involves a blend of individual traits—internal processes—and societal norms and models—external influences (Rubin et al. 2001). If a futures researcher relies on subjective views, they risk overlooking the study material's true quality, often resulting in oversimplification (Tapio 2003 page 83). With a sufficiently potent image, considerable resources and time may be invested in such endeavours. Future images frequently play a crucial role in social decision-making by providing methods and tools to address current challenges (Rubin et al. 2001.). The Disaggregative Delphi method contrasts with the traditional consensual Delphi approach (Tapio 2003, 83). The elements of future images are general knowledge, social knowledge, and individual identity (Rubin et al. 2001). The formation of the personal image of the future that Robin presents is as follows:

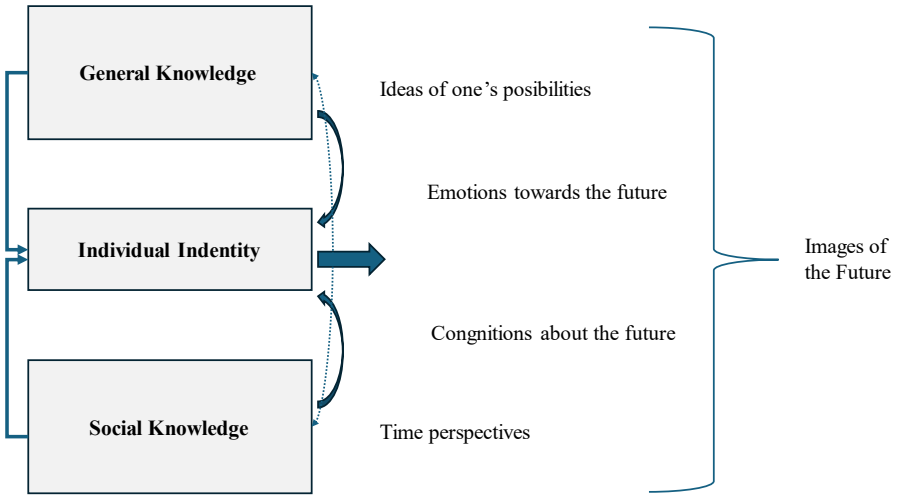

Figure 3: The formation of the personal image of the future from Rubin et al. 2001.

The upcoming passage outlines eight Delphi pitfalls based on (Tapio 2003) identified through critical analysis and elaborates on how these pitfalls were addressed in this study. These eight pitfalls (Tapio 2003) are as follows: “Biased selection of the panelists”, “Disregarding organisations”, “Forgetting disagreements”, “Ambiguous questionnaires”, “Oversimplified structured inquiry”, “Feedback reports without analysis”, “Forgetting the arguments”, and “Lack of theory”.

4 Data Gathering

4.1 Delphi Panel

The Delphi panel was selected from four different scientific fields based on our objectives and research questions and included three categories of positions within these fields. Accordingly, experts, managers, and researchers in the fields of foresight, data science, strategy, and knowledge management were chosen. The rationale for selecting individuals from the field of foresight was that the topic of this thesis is future-oriented, and it is crucial to leverage insights from this group to achieve the research objectives and answer the questions.

The next field was knowledge management, which is the most important part as experts, researchers, and managers in this field provided their perspectives in the panel, both based on their experience and theoretical knowledge. The following field was strategy, given that the subject of strategy, although implicitly present, is significant in the questionnaire questions and the nature of this thesis. The direct relationship between business strategies and the role of knowledge management in these strategies necessitated the inclusion of individuals from this field.

The next topic was data science, and data analysts were invited to share their insights. Considering the critical and essential role of emerging technologies, it was imperative to utilize their perspectives. It should be noted that a significant portion of emerging technologies in the new era are data-driven. For example, cloud computing, machine learning, artificial intelligence, blockchain, and so on. It should be noted that this thesis has a future-oriented nature, objective and goals, and given the prominent role of emerging technologies, it is important to consider that this range of experts, managers, and researchers can provide crucial and problem-solving insights.

Finally, an expert matrix was formed, which is detailed in the table to show their numbers more precisely. It is also important to note that, given the interdisciplinary nature of these fields, some individuals had expertise or managerial experience in more than one field or had conducted research across multiple fields.

Out of 104 invitations sent to various individuals at different universities around the world, large and small international companies, and independent researchers. The invitations were sent via email and some as messages on LinkedIn, based on the resume and background of the invitees. In the message sent to the participants, the reason for their selection was mentioned, and the conditions were explained in detail. They were informed that the panel would be opened on the website edelphi.org at a specified time, and within the given timeframe, they could

respond to both quantitative and qualitative questions and also provide feedback on others' opinions. This was because all comments were visible to everyone but remained anonymous (i.e., the identity of the person who wrote each comment was not disclosed, but the comments could be read and replied to).

The formation of the Delphi panel, as well as the process of data collection, was conducted through eDelphi.org. The stages included sending the acceptance or rejection links to participants, followed by their participation in responding, and subsequently obtaining the necessary output files through the platform. A total of 12 people participated in this panel. One participant withdrew during the process, and 11 people fully participated. These individuals were selected from different geographical locations. Considering the anonymous nature of the Delphi method, this level of detail suffices.

Table 2: Expertise matrix of participants distribution

	Knowledge management	Data Analyst Data Science	Foresight	Strategy
Manager	1	2	1	2
Expert	7	7	6	3
Scholar	6	0	2	5

When participants decided to take part in this panel, they were referred by accepting the link to the website edelphi.org. They were then provided with more detailed information about the topic of the panel, which was framed as follows: "Undertaking a Master's thesis in the futures studies major, focusing on the future of knowledge management in large businesses utilizing the Delphi method, represents a significant research endeavor. Through a real-time Delphi approach and a disaggregative Delphi, this thesis aims to provide insights into the implications for organizational strategies, foresight practices, and more. In today's world, we are inundated with vast amounts of data and knowledge in both our personal lives and across firms and organizations of various sizes. Consequently, it becomes increasingly imperative for us to envision potential future images".

A Likert scale was used in this data collection. A Likert scale is a type of psychometric scale that offers several categories for respondents to select from, allowing them to express their opinions, feelings about a specific topic, or attitudes (Nemoto & Beglar 2014). Some benefits of Likert-scale questionnaires include (a) the ability to quickly collect data from a large number of participants, (b) the production of highly reliable estimates of individual abilities, (c) the capacity to validate the interpretations derived from the data through various methods, and (d)

the potential to effectively compare, contrast, and integrate the data with qualitative data collection techniques like open-ended questions, observing participants, and conducting interviews (Nemoto & Beglar 2014).
Well-designed Likert items typically feature an odd number of response options. This setup allows for a central neutral choice, flanked by an equal number of positive and negative responses on either side of the neutral option (Emerson 2017).

4.2 Questionnaire Design

In line with the data gathering for this thesis, it was necessary to design and create a questionnaire to solicit the opinions of the panelists. This was essential for answering the research questions and achieving the research objectives. Thus, the questionnaire was designed with both qualitative and quantitative sections. In the first part, the statements were quantitative (with a qualitative component added) addressing two aspects: probable and desirable.
This task was conducted using a 7-point Likert scale. In the "probable" section, responses ranged from one to seven, allowing respondents to choose from the following options: 1: Extremely unprobable, 2: Very unprobable, 3: Somewhat unprobable, 4: Neutral, 5: Somewhat probable, 6: Very probable, 7: Extremely probable. In the "desirability" section, responses ranged from one to seven, allowing respondents to choose from the following options: 1: Extremely undesirable, 2: Very undesirable, 3: Somewhat undesirable, 4: Neutral, 5: Somewhat desirable, 6: Very desirable, 7: Extremely desirable.
After submitting their responses on the Likert scale, a section was designed for the respondents to provide explanations and elaborations on their answers in the comment box. This questionnaire included 10 qualitative-quantitative statements and two open questions. The statements and questions addressed various aspects of knowledge management, with each question covering an important component of knowledge management, as explained below:
In the first question, the focus was on the level of implementation of knowledge management in organizations and businesses. Given that some companies do not specialize in this area within their businesses, and considering the discussions at the beginning of the thesis about the increasing volume of data and information, which necessitates the conversion of this data into knowledge for businesses, knowledge management systems can be a good option. This statement was presented as follows: *By 2035, most businesses implement knowledge management in their organizations.* The second statement aimed to examine the topic from the perspective of competitive tools for companies in the future. In other words, can knowledge management in businesses play this role and become an important competitive tool in the

future? Therefore, the question was presented as follows: *By 2035, Knowledge management is one of the most important competitiveness tools for businesses.*

The third question addressed the profitability and benefits of knowledge management in strategic thinking within the company. Since almost all major businesses prioritize strategic thinking discussions, this question aimed to assess the desirability and probability of these perspectives. Therefore, the statement was formulated as follows*: By 2035, most businesses benefit from knowledge management in their strategic thinking*. The fourth statement explored the desirability and probability of the significant positive impacts of knowledge management on business innovation. Since the positive relationship between knowledge and innovation has always been a topic of discussion in studies, this statement was crucial in assessing how experts perceive the desirability and probability of knowledge management and organizational innovation. Therefore, the statement was formulated as follows: *By 2035, knowledge management will have a significant positive impact on business innovation.*

The fifth statement addresses the impact of knowledge management on the performance efficiency of businesses. Statement 5: *By 2035, knowledge management will have a significant positive impact on the efficiency of operations in businesses.*

The sixth and seventh statements directly relate to knowledge management and emerging technologies. In this research, the statements were not solely focused on artificial intelligence but also included other emerging technologies. Specifically, in the sixth statement, the improvement of knowledge management activities and initiatives through the use of artificial intelligence and machine learning was assessed. In the seventh statement, the desirability and probability of other emerging technologies were explored. These statements were: *By 2035, businesses will use AI and machine learning to enhance knowledge management practices*, and: *By 2035, businesses will use other emerging technologies (cloud, IoT, blockchain, etc.,) to enhance knowledge management practices.*

The eighth statement delves into the topic of knowledge sharing. In other words, organizational culture in businesses can potentially encourage employees to share knowledge in the future. Assessing the desirability and probability of this situation is important. The statement was: *By 2035, most businesses develop a culture to encourage employees to share knowledge.*

The ninth statement related to the topic of outsourcing. Specifically, it inquired whether the analysis and collection of data, primarily through knowledge management systems, are desirable or probable to be outsourced. Therefore, the designed statement was as follows: *By 2035, most businesses will outsource data gathering and data analysis for their knowledge management systems.*

Statement number ten pertained to the significant topic of tacit knowledge. As mentioned, one of the crucial types of knowledge is tacit knowledge and transforming it into explicit knowledge is a major concern for organizations. Therefore, the statement arises as to whether knowledge

management can act as a facilitator in this regard. To what extent is this approach desirable, and to what extent is it probable? Accordingly, the tenth statement was formulated as follows: *By 2035, knowledge management will significantly facilitate the transformation of tacit knowledge into explicit knowledge.*

Following that, two open-ended questions were posed. Respondents were asked to provide detailed answers to these questions. The first question in this section, entirely qualitative in nature, addressed the topic of challenges in knowledge management. It was formulated as follows: *What are the major challenges in adopting and integrating knowledge management in businesses by 2035?* The final question of the questionnaire was tailored to be specialized and specific, focusing on foresight and knowledge management. It was formulated as follows: *How could foresight practices and knowledge management be integrated in the future?*

5 Data Analysis

5.1 Cluster Analysis of Quantitative Data

Respondents were asked to provide both probable and desirable futures by 2035 and clustering was used for the analysis. In cluster analysis, we look for patterns within a data set by categorizing the observations into groups. The aim is to achieve an ideal grouping where observations or objects within each group are similar, while the groups themselves are distinct from one another (Rencher & Christensen, 2012, 501).
cluster analysis cannot definitively determine the number of scenarios, as this decision lies with the researcher. However, it does provide a well-reasoned basis for making this choice (Tapio 2003, 83). Hierarchical cluster analysis does not prescribe the final count of clusters. Instead, it starts with each case treated individually and then gradually merges them into fewer clusters until all cases are combined into a single cluster (Tapio et al. 2017, 35).
To organize observations into clusters, many methods start by examining the similarities between all pairs of observations (Rencher & Christensen, 2012, 501). In the hierarchical cluster analysis, Ward's method and squared Euclidean distance were used. The Ward method resulted in a more balanced and clearly interpretable set of clusters (Tapio et al. 2017, 34). Distance measurement relied on a seven-step Likert scale. Since all variables were standardized to the same scale, no further standardization of variables was needed. Additionally, no weighting of variables was considered important, as the questions provided a balanced description of the topic. In this analysis, a process was undertaken that involved the utilization of software for data analysis. These software tools included SPSS 29.0.0 and Microsoft Excel.

5.2 Qualitative Analysis of Data

Since all statements were part of the elaboration and explanatory commenting section, qualitative data was collected in this way. Two questions were also asked in a qualitative manner. Thematizing of this data was done through clusters. First cluster analysis was conducted, followed by thematizing the qualitative material to enhance the interpretation of the quantitative clusters for future images. Some participants showed enthusiasm and emphasized potential benefits and opportunities, while others raised concerns, challenges, and uncertainties. In various aspects, participants elaborated on their perspectives regarding knowledge management in the future.

6 Images of The Future of Knowledge Management

6.1 Choice of Clusters

The output generated by the SPSS software based on the data indicated that initially six clusters were obtained according to Figure 4. Each of these clusters was categorized based on participant's opinions.

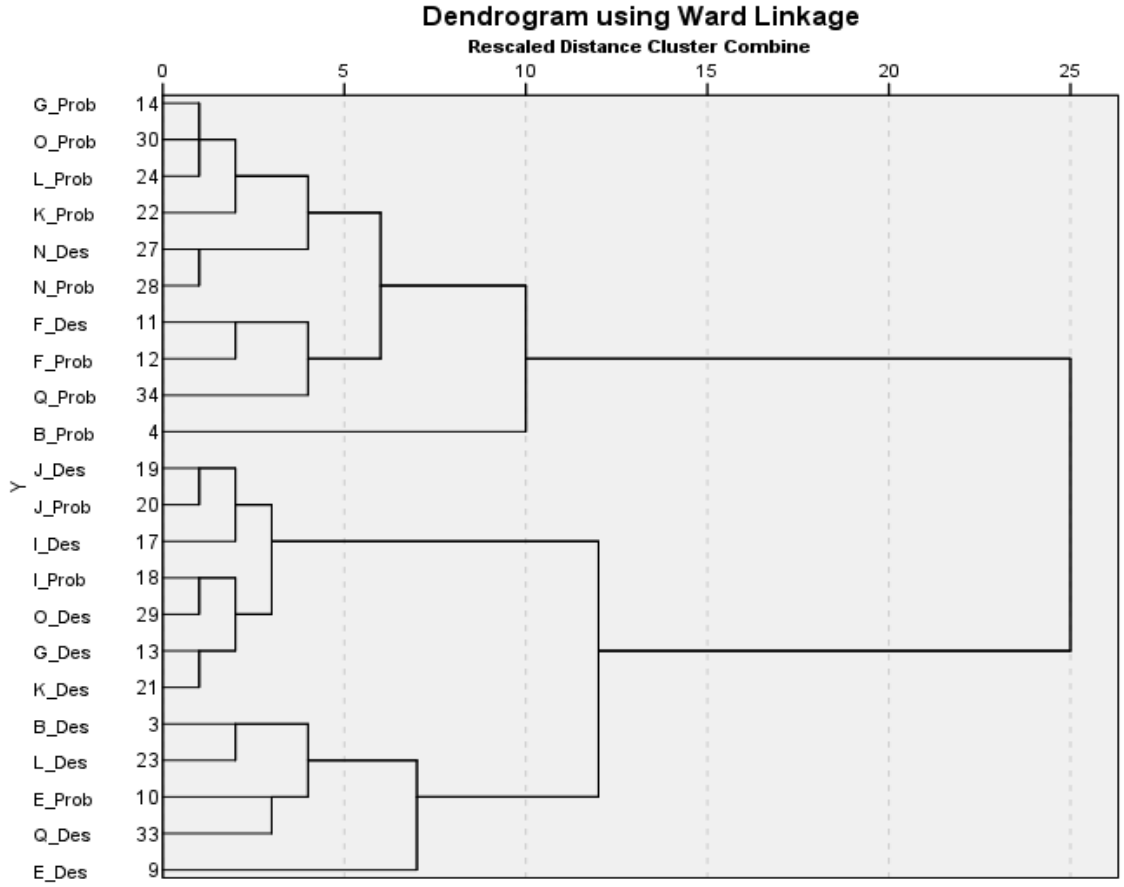

Figure 4: Dendrogram using Ward's method

Based on both qualitative and quantitative feedback, the clusters were reduced to 4. Clusters with similar opinions were merged to achieve a better combination, resulting in the output depicted in figure number 6, where four clusters were obtained. These clusters each represent a fundamental basis for future images of this thesis.

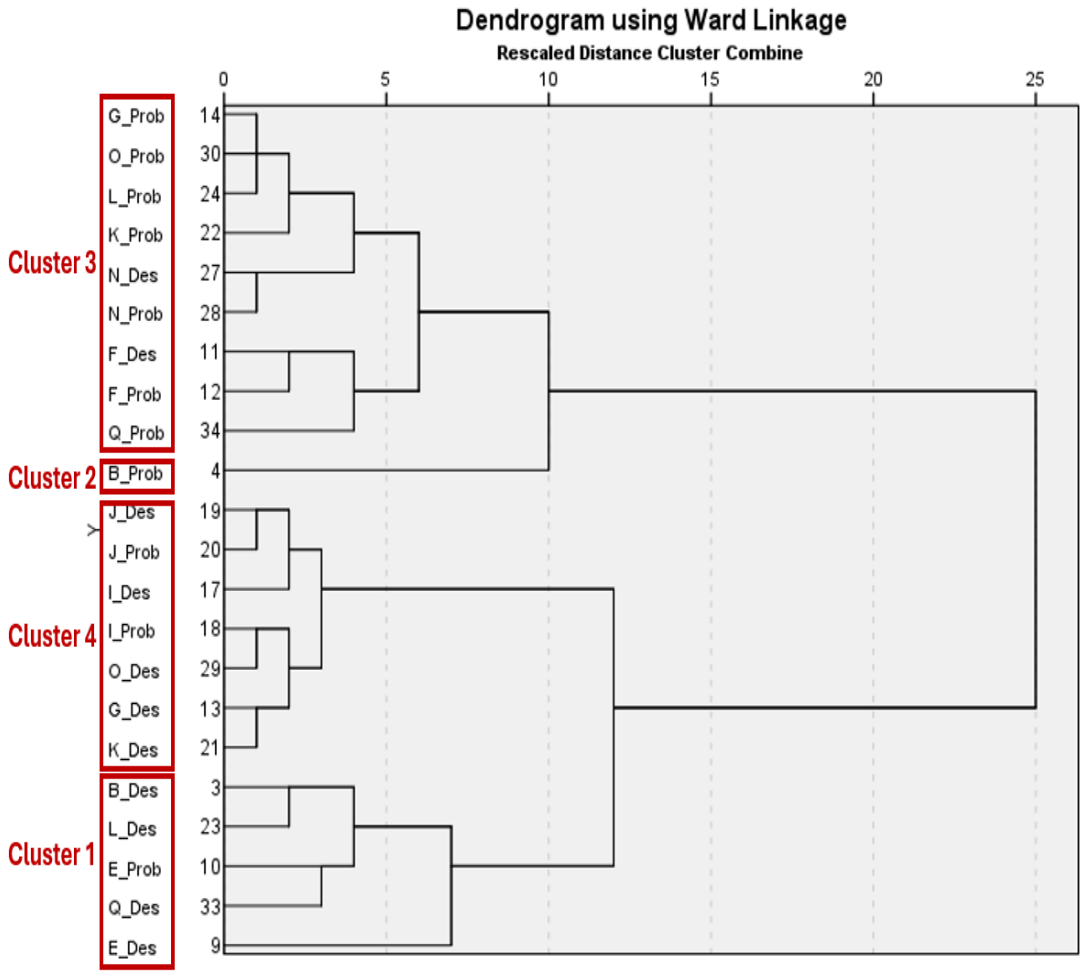

Figure 5: Clustering from Dendrogram result

6.2 Overview of Clusters

An important point to note is that Cluster 1 and Cluster 4 exhibit significant similarities in topics related to execution, artificial intelligence, machine learning, and other emerging technologies, as well as the subject of tacit knowledge. Respondents in these two clusters have similar opinions, particularly in these areas. However, it should be noted that there is a noticeable divergence of opinion in the subject of outsourcing, while the topic of strategic thinking, competitive tools, and organizational culture of sharing knowledge somewhat differs. Clusters 2 and 3 share a lot of perspectives on the implementation of knowledge management, artificial intelligence, and tacit knowledge. However, contrary to this alignment, significant disparities emerge in the topics of competitive tools, strategic thinking, innovation, and knowledge sharing, indicating a considerable difference in viewpoints. Although in the context of outsourcing and performance, these differences tend to diminish.

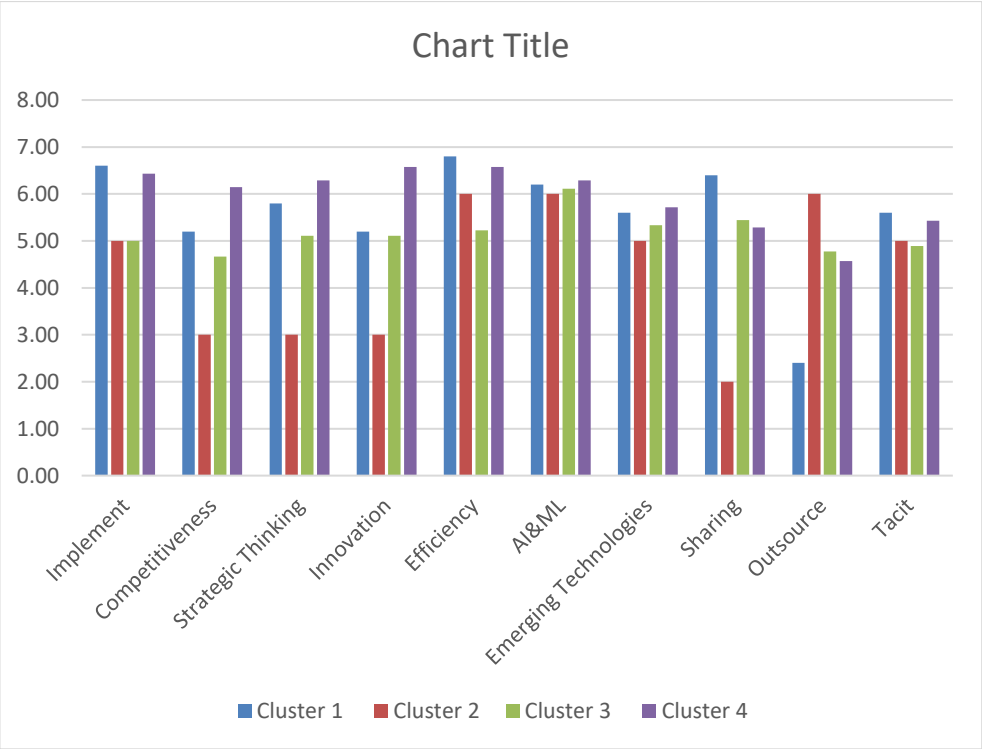

Figure 6: Overview of clusters for each statement

6.3 Image 1- The Internalization of Knowledge Management

In Cluster 1, it is observed that implementation, performance, sharing, and artificial intelligence are at the highest levels, between 6 and 7. In contrast, outsourcing is at the lowest level, below the neutral point of 4. Tacit knowledge, emerging technologies, competitive tools, and strategic thinking are all noted to be at levels between 5 and 6.

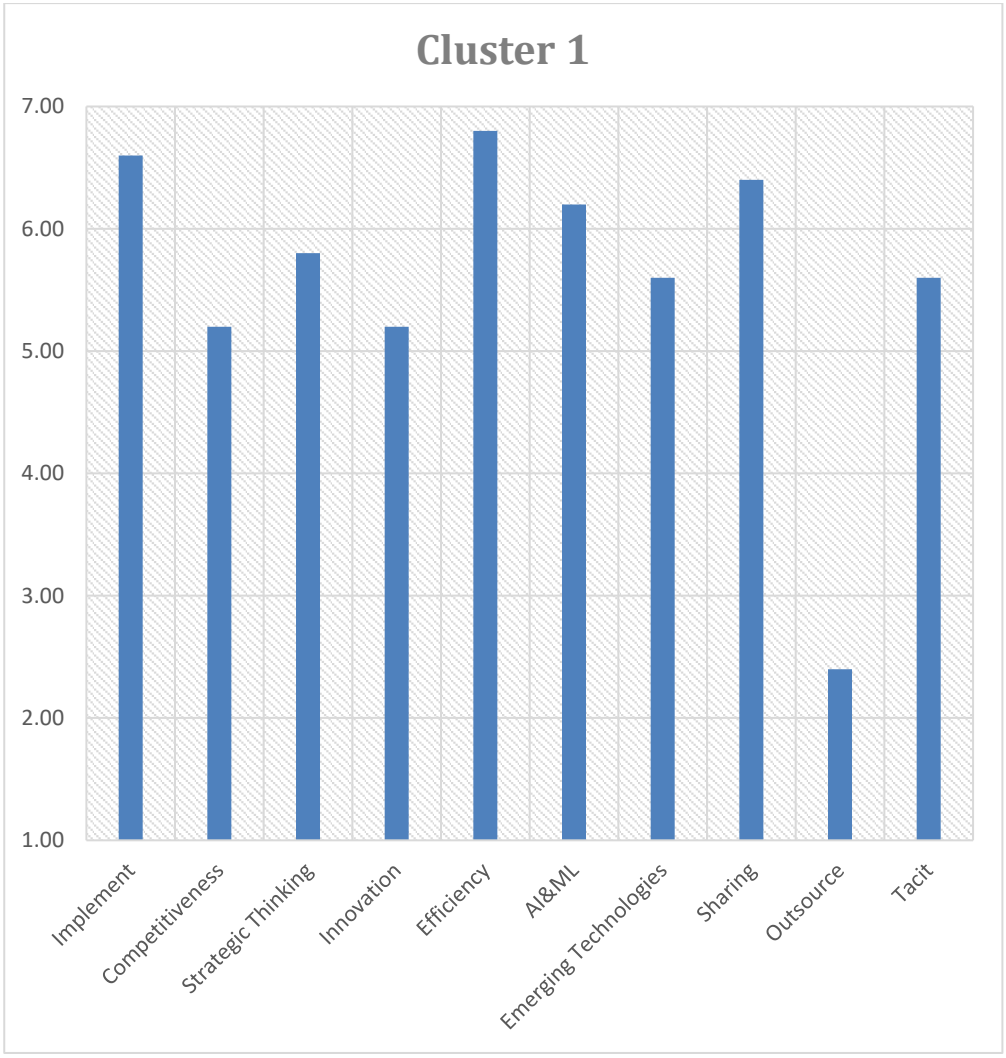

Figure 7: Cluster 1 (Internalization of knowledge management)

In Image 1, the internalization of knowledge management, utilizing emerging technologies, particularly artificial intelligence and machine learning, will accelerate the implementation of knowledge management systems in businesses. It should be noted that given the existing risks and threats in the data domain, the enthusiasm and interest in outsourcing data collection and analysis will be low. Therefore, in this image, consulting companies in the fields of management, especially knowledge management, should choose a service area that does not include this aspect. In this image, data analysts and knowledge management experts are more directly employed by businesses, and having these services provided internally within companies for data gathering and analyzing.

This internal process, by fostering a culture of knowledge sharing within the business, enhance efficiency in operations, playing an important role in the company's strategic thinking, which is desirable for the business. Startups focused on converting tacit knowledge into explicit knowledge will become more prevalent.

“AI has the potential to collect volumes of data and with appropriate vetting, remove the noise to provide useful information. Using techniques like design teams, focus groups, ethics panels and other people-oriented capabilities, the information can be reshaped into useful knowledge with practical application.”
“What we know often blinds us to what is becoming, is possible or seen through a different lens, contradicts our knowledge”
“Resilience also needs to be a core knowledge management capability as change accelerates and requires faster or breakthrough responses.”
“I believe that knowledge management offers a lot possibilities to optimaze processes and this is probably the easiest way to profit from knowledge management,”
“I think knowledge management has the potential to drive business innovation but think the forces of short-term profitability will minimize its impact”

6.4 Image 2- Technocracy

In Cluster 2, performance, artificial intelligence and machine learning, and outsourcing are at a high level, all at 6. On the other hand, competitive tools, strategic thinking, and innovation are below the neutral level, all at 3. The lowest level is for knowledge sharing, which is at 2. Implementation, tacit knowledge, and emerging technologies are all at 5.

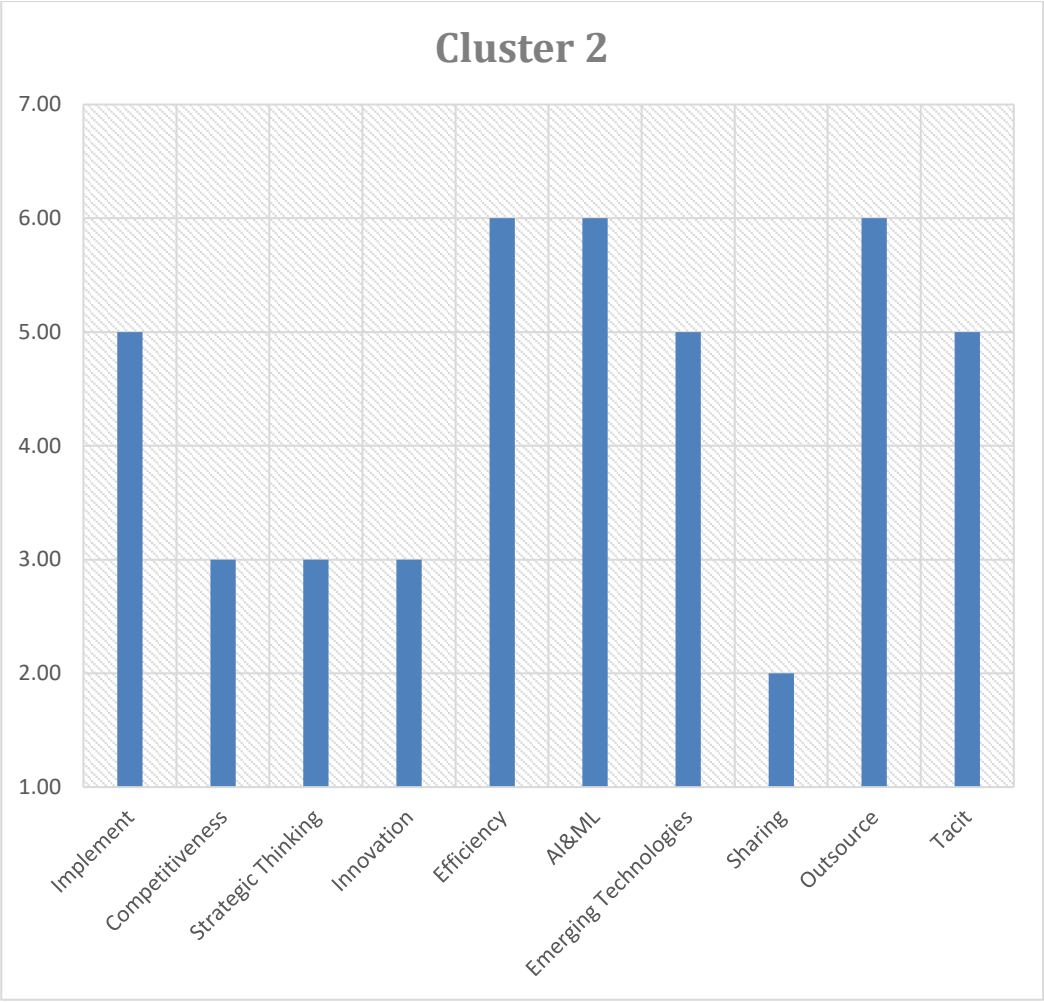

Figure 8: Cluster 2 (Technocracy)

In this image, Technocracy, we can see that the rapid growth in the use of artificial intelligence and machine learning is improving business performance and converting tacit knowledge into tangible knowledge.

However, knowledge management is not seen as a tool for competitiveness. Knowledge sharing between employees is minimized and they have no interest in doing so. As artificial intelligence will reduce people's motivation day by day, managers' attention will be focused on emerging technologies, especially artificial intelligence and machine learning, instead of employees and valuing them. The impact of this on innovation is another confirmation of the lack of employee participation, effort and motivation.

In response to the efforts of international organizations, especially European ones, regulations will be developed to reduce risks and hazards. In other words, data collection and analysis will be subject to stricter frameworks and regulations, creating a great opportunity for consulting firms to provide specialized data knowledge management services through their

entrepreneurship. As illustrated in this image, this will create opportunities for people with expertise in this field to be employed by such companies.

6.5 Image 3- Steady Interest

In Cluster 3, almost all elements are at a high level, with artificial intelligence and machine learning being at the highest levels. From the perspective of this cluster, emerging technologies, knowledge sharing, and artificial intelligence and machine learning are particularly elevated.

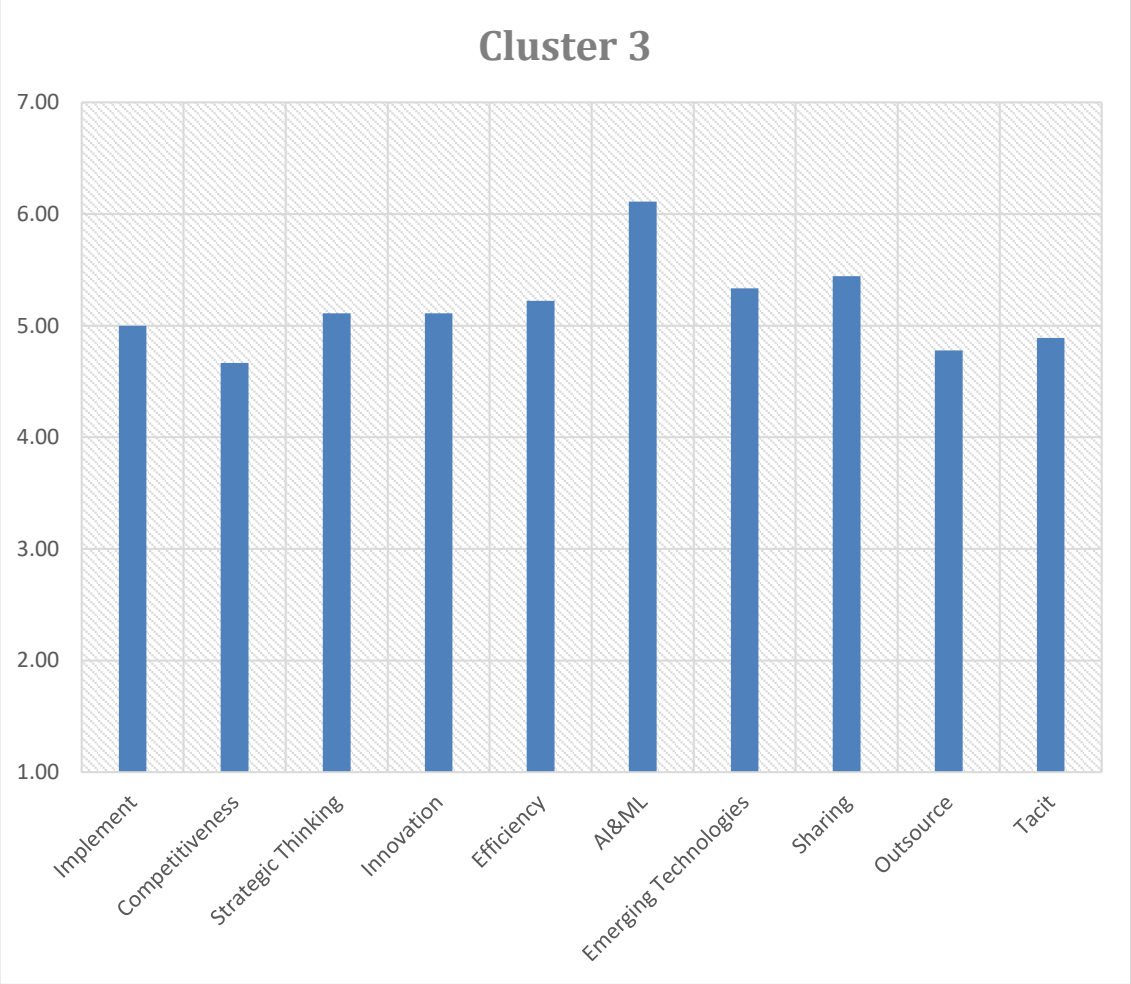

Figure 9: Cluster 3 (Steady Interest)

In this image, we are in an intermediate position. Not insignificant, but not crucial either. This image shows that by 2035, the use of artificial intelligence and machine learning for knowledge management will be at a high level. However, the importance of knowledge management has not yet become a necessity for companies. It will be used to some extent for innovation, strategic thinking and to increase performance efficiency. We still do not have a consensus on its seriousness and vitality for enterprises. In some businesses, it is used and some prefer to use

parallel or similar units for their companies and do not consider the need for knowledge management systems to be a necessity.

“One big challenge is the GenAI and its development and how companies can utilize it. I guess other could be still getting the right information from the flow of data. It is crucial also today.”
“Strategy has to be connected to knowledge management, and vice versa, to make a clear vision of future actions.”
“It seems that in the future they will emerge with new businesses that have significant levels of security and may not allow outsourcing to occur.”
“If we succeed in promoting foresight in the organization, knowledge management will automatically integrate with this way of thinking.”

6.6 Image 4- Strategic Innovation Symphony

Cluster 4 is a combination of the highest levels. All its elements are very high, with the lowest among them being outsourcing, which is at levels 4 and 5.

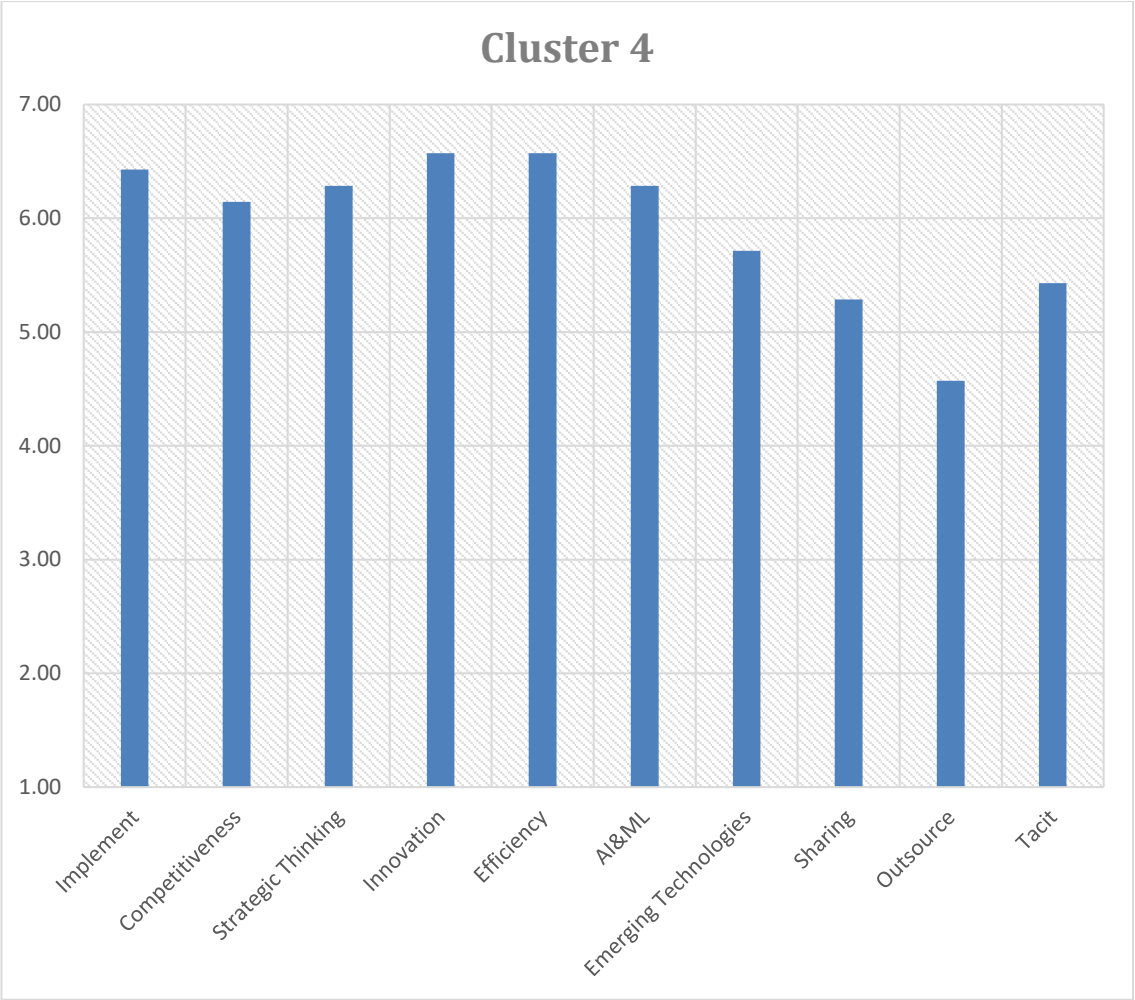

Figure 10: Cluster 4 (Strategic Innovation Symphony)

In this image, companies are making it mandatory to have knowledge management systems. And the implementation is happening in large businesses. Knowledge management will be used as a competitive tool, for decision-making and strategic thinking, to create innovation and improve performance. This will happen through emerging technologies such as Artificial Intelligence, Machine Learning, Cloud, IoT, and Blockchain. Companies prefer to handle most of the work internally, only outsourcing some parts of data collection and analysis. Efforts to convert tacit knowledge into explicit knowledge continue in this image, but a complete breakthrough and definitive solution have not yet been achieved.

“there is a high emphasis on exploring on how to advance knowledge management particularly with the advent of AI and LLM application in organizations.”
“As businesses continue to operate in increasingly complex and information-rich environments, the adoption of knowledge management practices becomes essential for staying competitive and maximizing efficiency.”

“Knowledge is power and if it is power, it is comparative advantage. Knowledge may be available but not all are interested in knowledge”
“Can there be strategy without knowledge? I think not.”
“By leveraging AI, businesses will be able to analyze vast amounts of data more efficiently, identify patterns and insights that were previously unnoticed, and foster innovation at a pace never seen before.”
“To make a real innovation is not prossible without knowledge management.”
“Advanced knowledge management systems, powered by AI and machine learning, will significantly enhance operational efficiency in businesses by automating the collection, analysis, and dissemination of information, automating tasks, etc. Companies that won't adopt the use of AI (and thus knowledge management practices in this regard), will die.”
“Foresight practices require knowledge management as 'knowing the future' depends on combining different types of knowledge from different sources”

7 Conclusion

In summary, after extensive research on the topic of knowledge management, five key themes emerged. These themes encompassed aspects 1- *The level and overall impact of usage of knowledge management*, 2- *Improving business processes through knowledge management* , 3- *New technologies to boost knowledge management*, 4- *Knowledge sharing*, and 5- *Tacit knowledge becoming explicit*, representing critical areas within the field. Based on this in-depth analysis, a series of targeted questions and statements were developed. These were designed to delve deeper into the various challenging aspects of knowledge management identified within the five themes.

The questions and statements were then presented to a group of participants through a Delphi panel. The Delphi panel approach was chosen due to its strength in gathering expert opinion on complex topics for the future. This iterative process allows for anonymous feedback and controlled discussion, leading to a more robust understanding of the challenges and opportunities within each theme.

The participants, who were experts in the fields of knowledge management, foresight, strategy, and data science, included researchers, managers, and experts. The Delphi method proved advantageous for example, it enabled the gathering of expert opinions from across the globe, fostering a diverse and comprehensive perspective and the method facilitated both qualitative and quantitative analysis, providing an understanding of the research topic.

The disaggregative Delphi method employed in this research yielded valuable outcomes, including the generation of diverse future images rather than a consensus view. Aligned with the research objectives and questions, the method effectively facilitated the identification of challenges and the delineation of the role of emerging technologies like artificial intelligence and machine learning in shaping the future of knowledge management.

Ultimately, images with various features were obtained, which included Internalization of knowledge management, Technocracy, Steady Interest, and Strategic Innovation Symphony.

As with many research endeavors, this thesis study encountered limitations and challenges. The primary limitations stemmed from data collection. Given the Delphi method's reliance on expert participation, the study faced difficulties in recruiting participants. Due to factors such as busy schedules, unfamiliarity with the researcher, or other reasons, many experts declined to participate. However, those who did participate, recognizing the voluntary nature of the study, were highly engaged and provided thoughtful responses.

For further research into knowledge management futures scenarios, researchers are encouraged to explore other emerging technologies, such as blockchain. Additionally, investigating the potential applications of new algorithms and systems in knowledge management could yield

valuable insights. Furthermore, conducting case studies of leading companies and involving their experts in Delphi panels could provide rich perspectives.

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Appendices

Appendix 1 Questionnaire

By 2035, most businesses implement knowledge management in their organizations.
By 2035, Knowledge management is one of the most important competitiveness tools for businesses.
By 2035, most businesses benefit from knowledge management in their strategic thinking.
By 2035, knowledge management will have a significant positive impact on business innovation.
By 2035, knowledge management will have a significant positive impact on the efficiency of operations in businesses.
By 2035, businesses will use AI and machine learning to enhance knowledge management practices.
By 2035, businesses will use other emerging technologies (cloud, IoT, blockchain, etc.,) to enhance knowledge management practices.
By 2035, most businesses develop a culture to encourage employees to share knowledge.

By 2035, most businesses will outsource data gathering and data analysis for their knowledge management systems.
By 2035, knowledge management will significantly facilitate the transformation of tacit knowledge into explicit knowledge.
What are the major challenges in adopting and integrating knowledge management in businesses by 2035?
How could foresight practices and knowledge management be integrated in the future?

Appendix 2 Invitation

Email Invitation:

Considering individuals' abilities and areas of expertise, invitations were emailed to them as follows:

In the era of information and diverse networks, data holds tremendous importance for us. How we manage knowledge has become a crucial aspect.
My name is Hadi Erfanian. I am a master's student in Futures Studies at the University of Turku in Finland.
Throughout my master's thesis, I used the Delphi method to explore the Future of Knowledge Management in Businesses.
Given your expertise in the field of ……, I have invited you to participate in responding to this questionnaire.
This questionnaire consists of 12 questions. The link will be sent to you at 13:00 EET (Eastern European Time) on March 28th. If you haven't received the email, please check your junk/spam box. You have 10 days to answer the questions.
I appreciate your participation in the survey. Your responses will be kept confidential and used solely for academic purposes.
If you have any questions, feel free to contact me at moerfa@utu.fi.

Participation in this survey is voluntary, and your candid responses are poised to significantly enhance the depth and quality of my research findings.

Thank you once again for your time and cooperation. I look forward to receiving your thoughtful responses.

LinkedIn invitation:

My name is Hadi Erfanian. I am a master's student in Futures Studies at the University of Turku in Finland.

Throughout my master's thesis, I used the Delphi method to explore the Future of Knowledge Management in Businesses.

Given your expertise in the field of ……, I have invited you to participate in responding to this questionnaire.

This survey consists of 12 questions.

If you agree, I need your email address. I would appreciate it if you sent it to me.

I appreciate your participation. Participation in this survey is voluntary, and your candid responses will greatly enhance my research quality. Your responses will be kept confidential and used solely for academic purposes.

Thank you once again for your time and cooperation. I look forward to receiving your thoughtful responses.

Warm Regards,

Hadi Erfanian

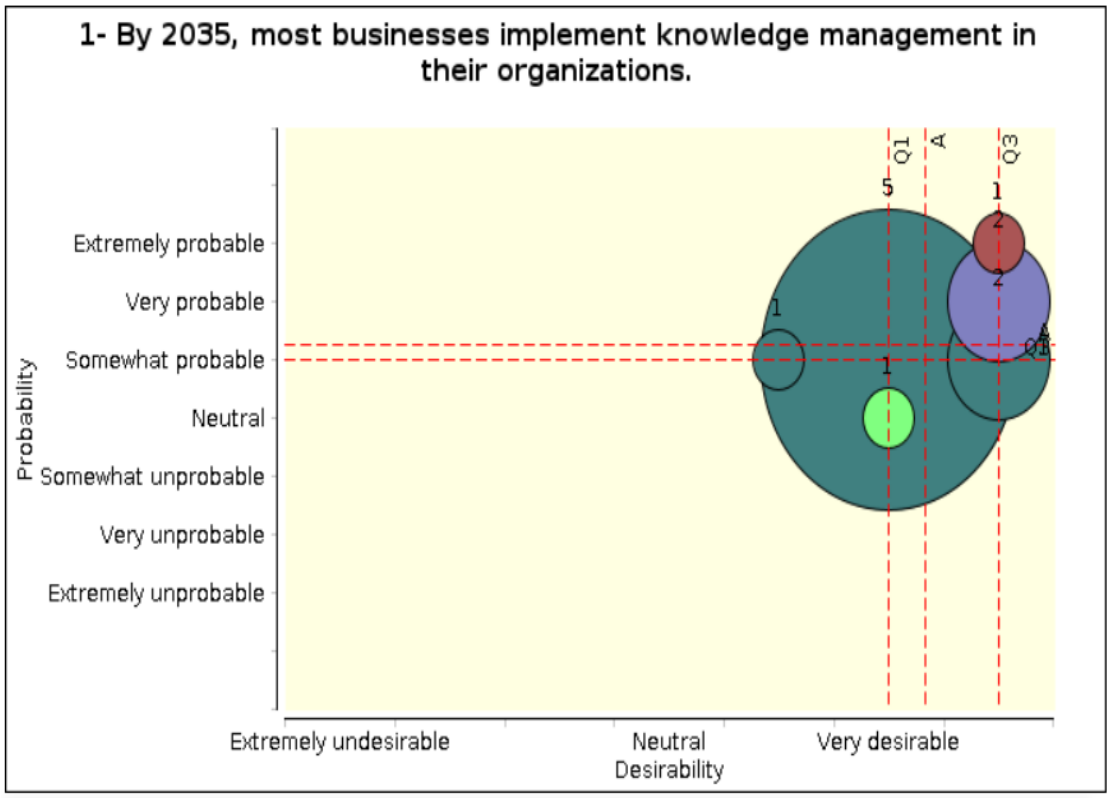
Appendix 3

1- By 2035, most businesses implement knowledge management in their organizations.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

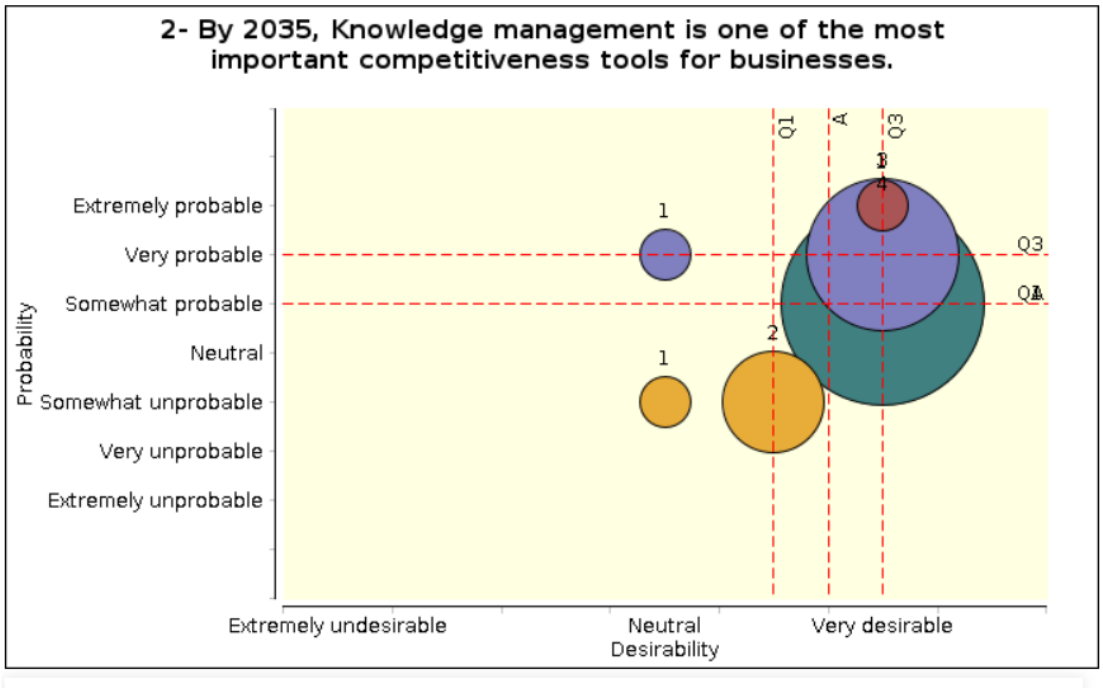


2- By 2035, Knowledge management is one of the most important competitiveness tools for businesses.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

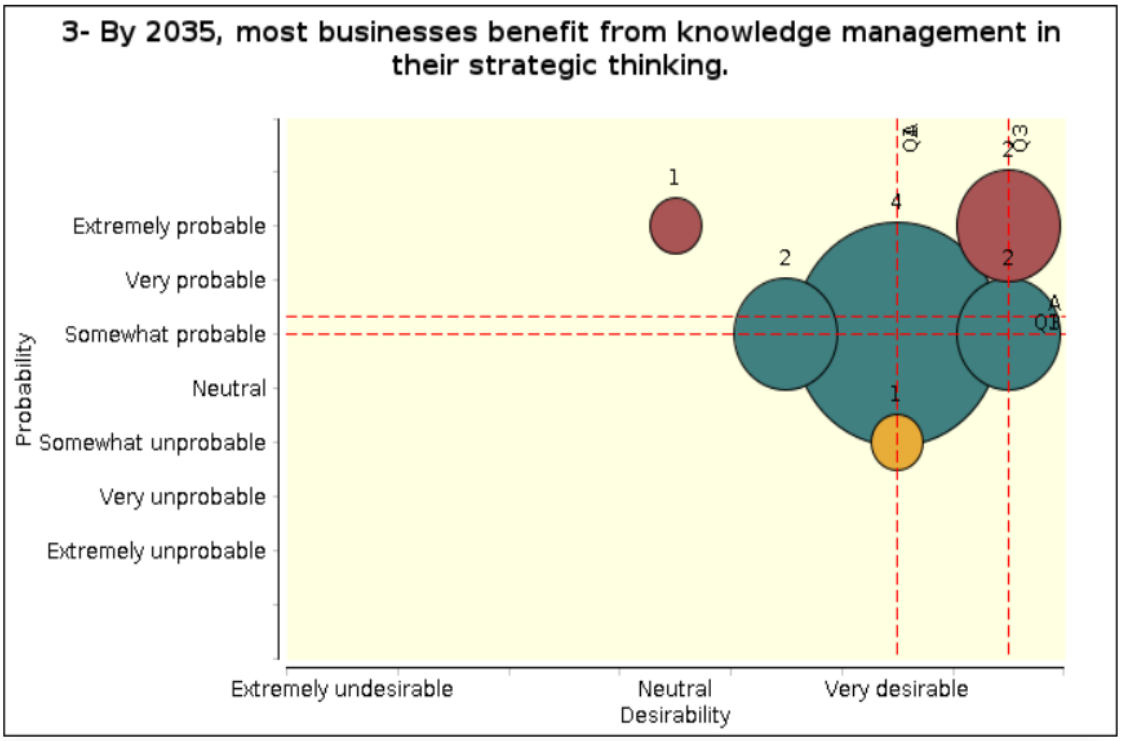


3- By 2035, most businesses benefit from knowledge management in their strategic thinking.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

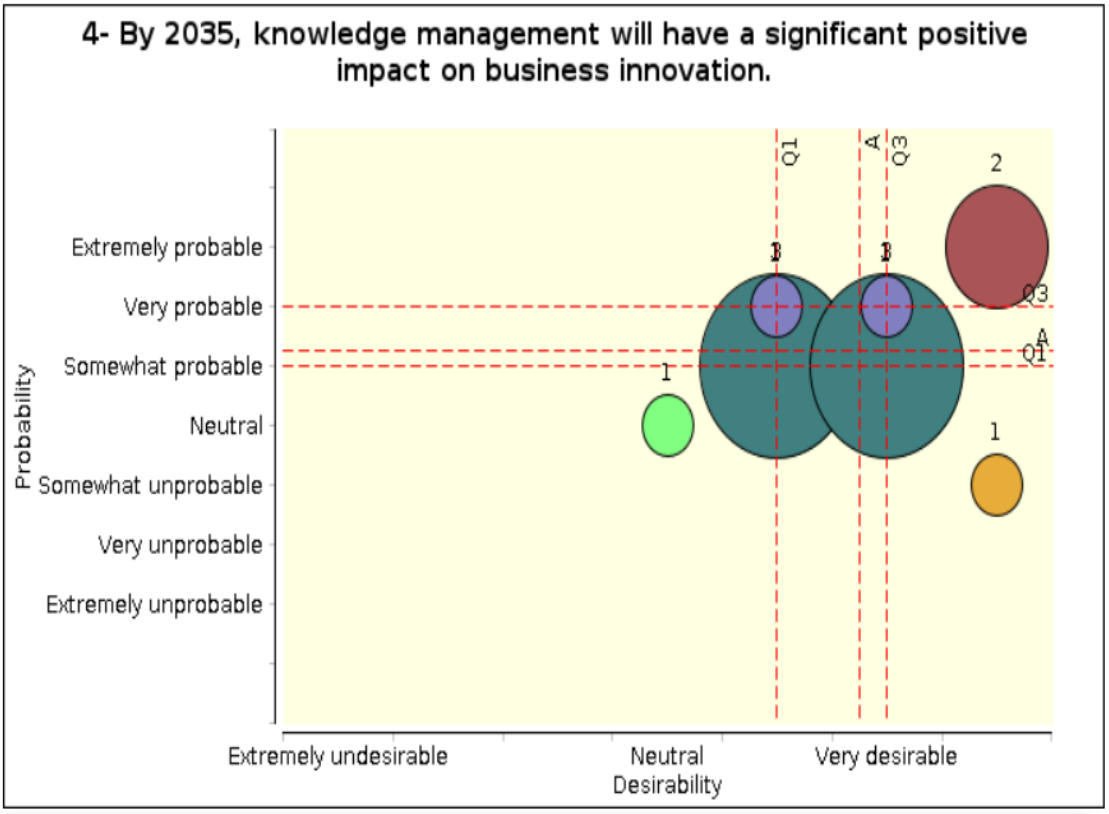


4- By 2035, knowledge management will have a significant positive impact on business innovation.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

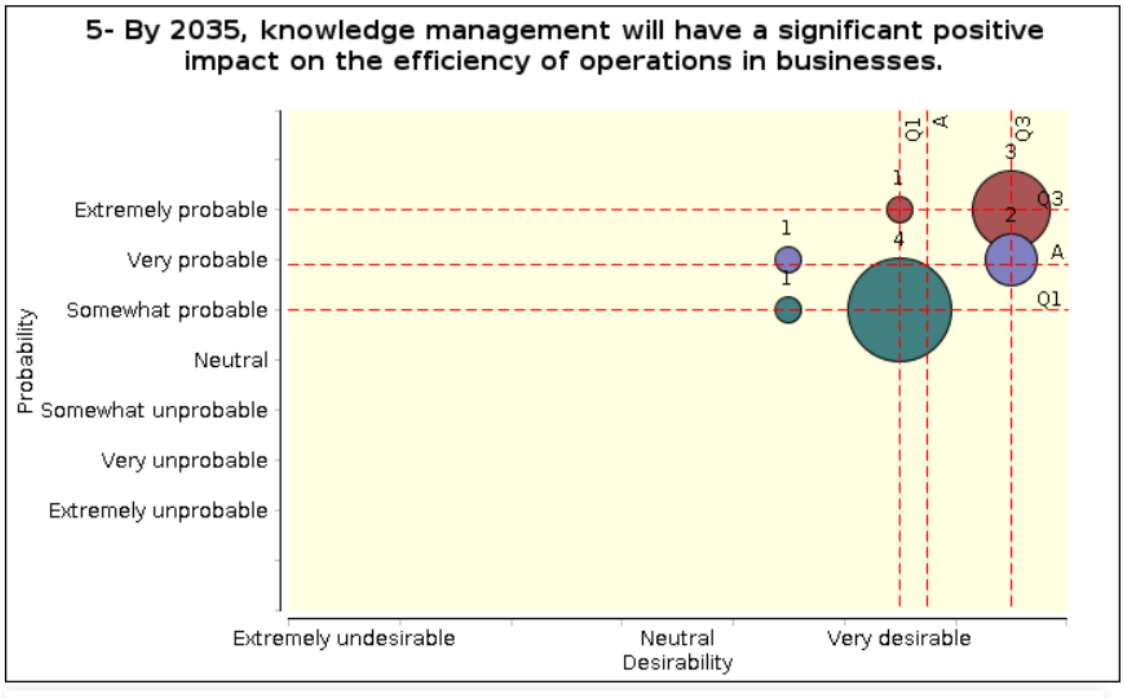


5- By 2035, knowledge management will have a significant positive impact on the efficiency of operations in businesses.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

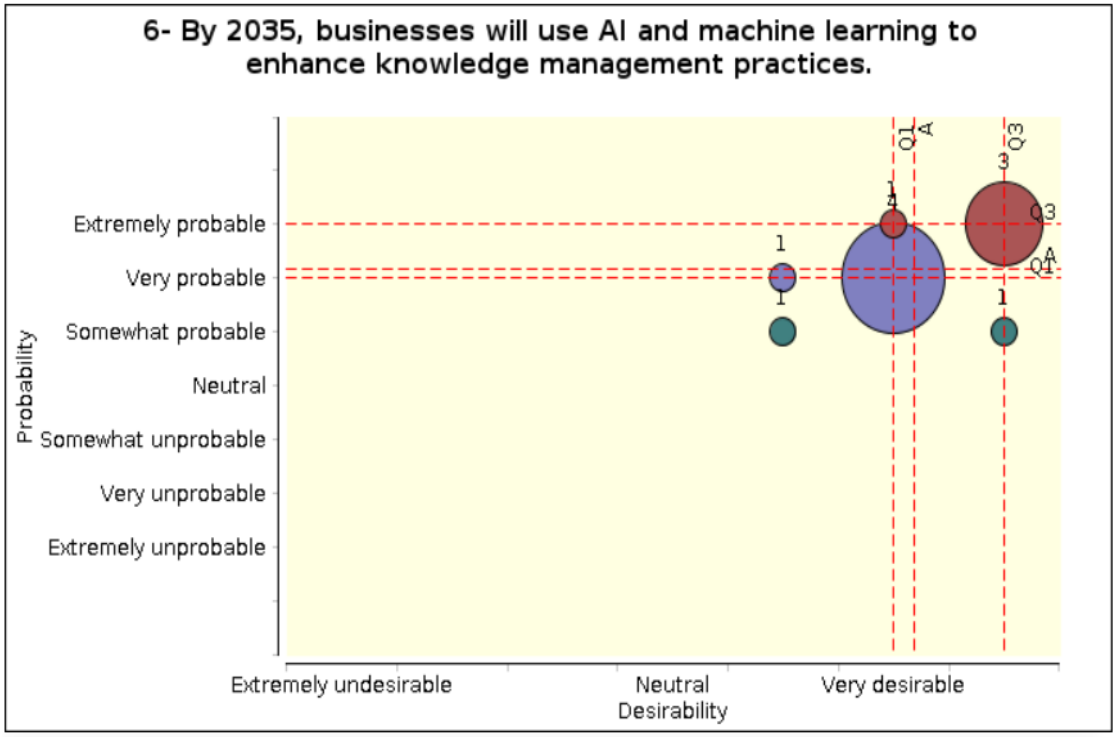


6- By 2035, businesses will use AI and machine learning to enhance knowledge management practices.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

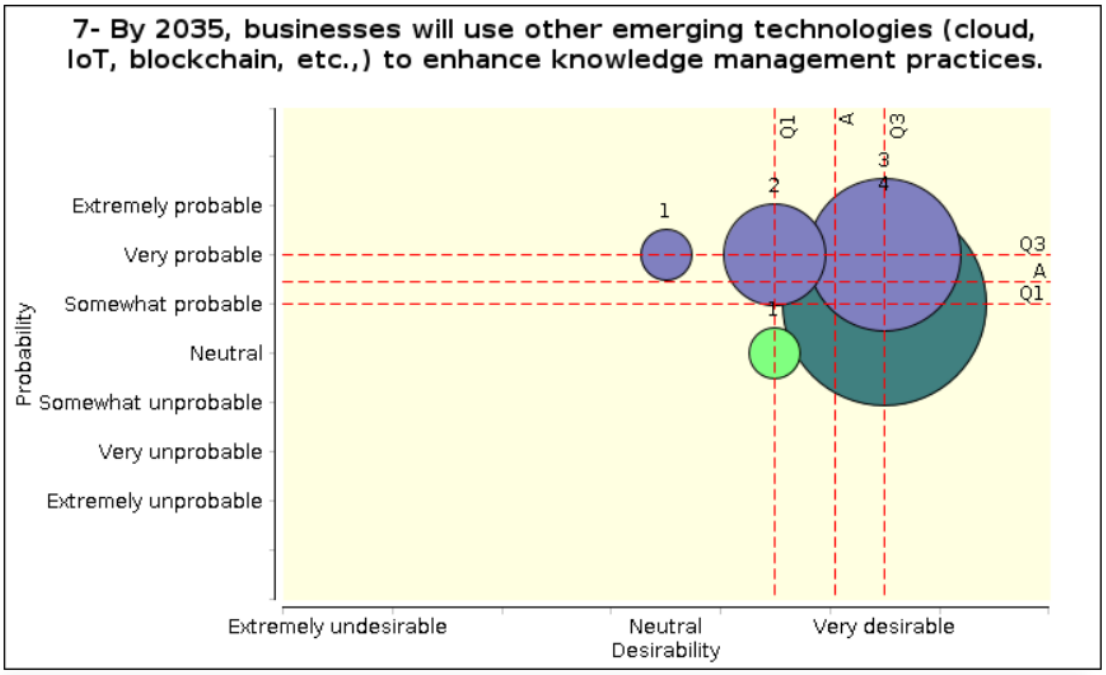


7- By 2035, businesses will use other emerging technologies (cloud, IoT, blockchain, etc.,) to enhance knowledge management practices.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

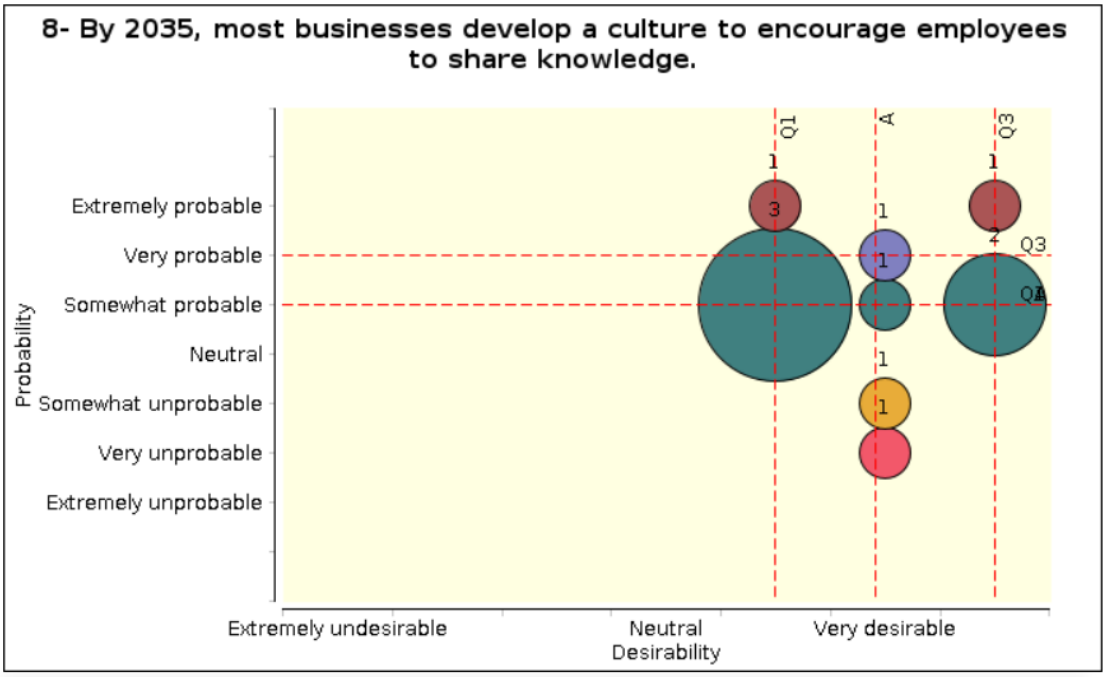


8- By 2035, most businesses develop a culture to encourage employees to share knowledge.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.

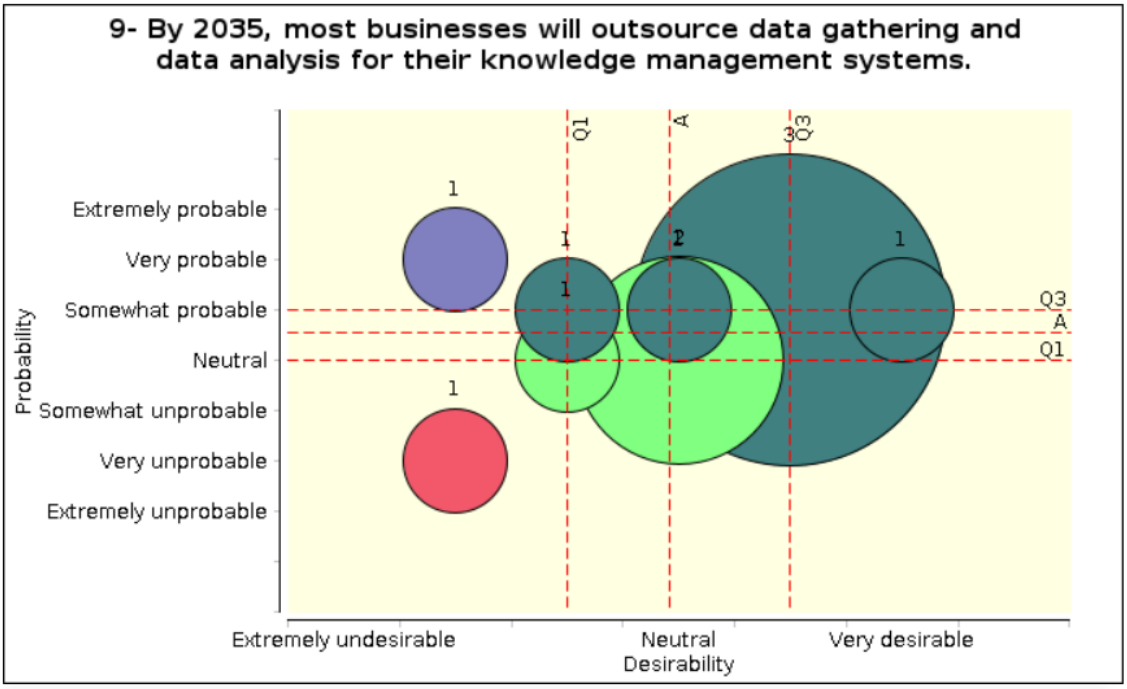


9- By 2035, most businesses will outsource data gathering and data analysis for their knowledge management systems.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.



10- By 2035, knowledge management will significantly facilitate the transformation of tacit knowledge into explicit knowledge.

Please express your opinion on how **desirable and probable** the statement above is.

Kindly provide further explanation for your reasoning in the **comment box** below.

The answers of other respondents are visible and open for your review and feedback.