İSTANBUL TİCARET
ÜNİVERSİTESİ

T.C.

İSTANBUL TİCARET UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES

BUSINESS ADMINISTRATION GRADUATE PROGRAM

The Mediating Role of Knowledge Management on the Relationship Between Organizational Learning and Innovation Performance: A Research in Technology Parks

Master Thesis

Beşir Kemal ŞAHİN

20002555

Advisor: Prof. Dr. N. Öykü İYİGÜN

Istanbul, 2023

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Hazırlamış olduğum tez özgün bir çalışma olup YÖK ve İstanbul Ticaret Üniversitesi Lisansüstü Yönetmeliklerine uygun olarak hazırlanmıştır. Ayrıca, bu çalışmayı yaparken bilimsel etik kurallarına tamamıyla uyduğumu; yararlandığım tüm kaynakları gösterdiğimi ve hiçbir kaynaktan yaptığım ayrıntılı alıntı olmadığını beyan ederim. Bu tezin ihtiva ettiği tüm hususlar şahsi görüşüm olup İstanbul Ticaret Üniversitesinin resmi görüşünü yansıtmamaktadır.

Beşir Kemal ŞAHİN

ABSTRACT

This research explores the relationship between knowledge management, organizational learning, and innovation performance, and the mediating role of knowledge management between organizational learning and innovation performance on companies in technology parks operating in Turkiye. The research provides theoretical information about these three fields, which are crucial for organizations.

The complicate interaction between organizational learning, knowledge management, and innovation performance forms a critical base for companies seeking to develop in today's dynamic and competitive business landscape, enabling them to use the power of knowledge, continuously adapt and improve, and drive transformative innovations that propel their success. On the other hand, technology parks were selected due to their significant contribution to the development, innovation, advanced technology, and per capita income of countries worldwide. For these reasons, companies operating in technology parks are expected to show differences in organizational learning, knowledge management and innovation performance when compared to companies in other industries and clusters.

An empirical quantitative study was carried out involving 341 firms across five technology parks in Turkey. Our research results indicate that both organizational learning and knowledge management positively influence innovation outcomes.Our results also suggest that knowledge management plays a mediating role between organizational learning and innovation performance.

Keywords: Organizational Learning, Knowledge Management, Innovation Performance, Innovation, Technology Parks.

ÖZET

Bu araştırma, bilgi yönetimi, örgütsel öğrenme ve yenilik arasındaki ilişkiyi ve bilgi yönetiminin örgütsel öğrenme ile yenilik arasındaki aracı rolünü incelemektedir. Çalışma, Türkiye'de faaliyet gösteren teknoloji parklarındaki şirketlere odaklanmaktadır. Araştırma, örgütler için hayati önem taşıyan bu üç alan hakkında teorik bilgiler sunmaktadır. Ek olarak, bilgi yönetiminin örgütsel öğrenme ile yenilik performansı arasındaki ilişki üzerindeki etkisini analiz etmektedir.

Örgütsel öğrenme, bilgi yönetimi ve inovasyon performansı arasındaki karmaşık etkileşim, bugünün dinamik ve rekabetçi iş ortamında başarılı olmayı hedefleyen şirketler için önemli adımlardır. Bu etkileşim, şirketlere bilginin gücünden yararlanma, sürekli olarak uyum sağlama ve iyileştirme yapma, başarılarını tetikleyen dönüştürücü inovasyonları harekete geçirme konusunda olanak sağlar. Diğer yandan da teknoparklar, ülkelerin gelişimine, inovasyon kabiliyetlerine, ileri teknolojisine ve kişi başına düşen gelirlerine önemli katkıları nedeniyle seçilmiştir. Bu çerçevede, teknoloji parklarında faaliyet gösteren şirketlerin, diğer sektörlerde ve kümelenmelerde yer alan şirketlerle karşılaştırıldığında örgütsel öğrenme, bilgi yönetimi ve inovasyon performansı açısından farklılıklar sergilemesi beklenmektedir.

Türkiye'de beş farklı teknoloji parkında 341 şirket ile ampirik kantitatif anket yapılmıştır. Çalışmamızın bulguları, örgütsel öğrenme ve bilgi yönetiminin inovasyon performansı üzerinde olumlu bir etkiye sahip olduğunu göstermektedir. Sonuçlarımız ayrıca bilgi yönetiminin örgütsel öğrenme ile yenilik performansı arasında aracı bir rol oynadığını göstermektedir.

Anahtar Kelimeler: Örgütsel Öğrenme, Bilgi Yönetimi, İnovasyon Performansı, İnovasyon, Teknoloji Parkları.

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1. INTRODUCTION

In the contemporary context of rapid globalization and continuous technological advancement, effective resource management stands as a paramount determinant for companies to attain success in their strategic pursuits. Conceptual resources, such as data, information, and knowledge, have become increasingly vital due to these developments. Consequently, many scholars have deeply explored the ideas of knowledge management, organizational learning, and innovation since they underpin competitive edge. By leveraging these conceptual resources, companies can gain a competitive edge, stay ahead of the competition, and achieve their strategic objectives (Carneiro, 2000; Therin, 2003; Caroline & Angel, 2011; Martín-de Castro, 2015; Dickel & Moura, 2016).

The concept of knowledge, which is at the center of the concepts of knowledge management, organizational learning, and innovation, has been an area of epistemic interest since the Classical Greek Age. (Alavi & Leidner, 2001; Salter & Alexy, 2014). In today's business landscape, companies involved in the production, integration, and protection of artificial intelligence are leveraging their achievements in knowledge management, organizational learning, and innovation to gain a significant competitive advantage (Birzniece, 2011). This advantage stems from their effective utilization of intellectual assets, continuous learning culture, and capacity for groundbreaking advancements in artificial intelligence (AI) technology. As a result, the connection between knowledge management, organizational learning, and innovation outcomes is increasingly vital in today's changing framework, with knowledge being pivotal in this new age. By utilizing these principles, businesses can boost their results and secure a competitive advantage in the fast-paced world of artificial intelligence and the knowledge-driven economy (Drucker, 1993).

In the modern world, universities are undoubtedly one of the main sources of producing scientific knowledge. Their most valuable assets lie in their abilities to foster organizational learning and facilitate the transfer of knowledge (Genç & İyigün, 2011). Tech parks, serving as centers for advanced and knowledge-driven industries, have been

researched to decipher the ties between knowledge management, organizational learning, and the outcomes of innovation (Martín-de Castro, 2015). By facilitating active collaboration between universities and industries, technology parks provide ideal platforms to investigate the impact of university-industry cooperation on knowledge production and innovation performance. When companies collaborate with universities, they can tap into the universities' abundant resources and knowledge. This helps them boost their own organizational learning and innovation abilities, enabling them to stay ahead of competitors in the dynamic and rapidly evolving business environment (Kör & Maden, 2013).

The aim of this dissertation is to explore the interaction among knowledge management, organizational learning, and innovation outcomes in businesses situated in tech parks. Specifically, this research seeks to understand the intermediary function of knowledge management between organizational learning and innovation outcomes. Concentrating on tech parks, which are epicenters for knowledge-driven change and prime venues for academic-industrial partnerships, the investigation intends to highlight the pivotal contribution of universities in advancing knowledge management, organizational learning, and innovation.

1.1. Problem Statement and Research Questions

In this thesis, it was investigated whether knowledge management plays a mediating role between organizational learning and innovation among technology park companies. The main reason for exploring this issue is that organizational learning, knowledge management, and innovation are crucial concepts for companies to compete and sustain their success. While there are undoubtedly other factors influencing competition, these three concepts are interconnected by their foundation in knowledge utilization and numerous commonalities. The study was conducted on companies in technology parks. In Turkiye, there are 78 active technology parks with a total of 4500-5000 companies (Bilgin & Işık, 2022). The survey was sent to 790 companies and 341 of these companies returned so as to find answers to the questions outlined below.

Within the framework of these questions, the relations between knowledge management, organizational learning and innovation and the mediating role of knowledge management will be tried to be tested with the following hypotheses.

H1: There is a significant and positive relationship between organizational learning and innovation performance.

H2: There is a significant and positive relationship between organizational learning and knowledge management.

H3: There is a significant and positive relationship between knowledge management and innovation performance.

H4: Knowledge management has a mediating effect between organizational learning and innovation performance.

1.2. Organization of the Paper

The research is organized into five sections, detailing the research goals. The initial chapter serves as an introduction. The subsequent chapter delves into theoretical underpinnings, offering a thorough review of pertinent literature. This chapter, through a literature survey, aspires to furnish a detailed grasp of the central notions and their significance to the investigation. The third segment details the research methodology, encompassing aspects like the research model, sample selection, data gathering approach, and research tools. The fourth segment presents the research results, covering demographic analysis, factor evaluation, and sections where hypotheses undergo testing. The fifth and concluding segment engages in discussion, encompassing conclusions, research constraints, and recommendations for future studies.

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

In investigating the intermediary role of knowledge management in the link between organizational learning and innovation performance, a literature review was crafted around the notions of knowledge management, organizational learning, and innovation performance. When the studies that include these concepts are examined, we see the basic concepts of "knowledge", "learning", and "innovation". During the research, it was observed that different theories such as Organizational Theory, Weberian bureaucratic-based organization theory, engineering-based organization theory, the School of Human Relations, the Unifying Paradigm, positivist organization theory, resource-based theory, and knowledge-based theory were mentioned in the sources where these concepts were included (Keskin et al., 2016). It is thought that two main theories are important in this research and constitute the theoretical background of the research. It can be stated that one of them is "Organizational Theory" and the other is "Knowledge Based Theory".

Organizational theory, which focuses on how organizations function, develop, and interact with their environment, examines the structures, processes, and behaviors within the organization. This research can be considered as a study carried out in the field of "Organizational Theory" since it examines the internal and external interaction of organizations, how information is exchanged between units, and how the company models internal processes in order to gain competitive advantage by offering innovative products. On the other side Knowledge Based Theory is the theory that states that knowledge and knowledge-based resources are the main factor for organizations to gain competitive advantage and for long-term success. The ability of an organization to create, accumulate, apply, leverage knowledge efficiently brings sustainable success. In this theory, knowledge is the most basic and unique resource that is difficult to copy and imitate in building this success (Kogut & Zander, 1992; Nonaka & Takeuchi, 1995; Elkjaer & Simpson, 2011). The fact that the concept of knowledge is based on both knowledge management, organizational learning and innovation performance in this

research means that the research can be cited among the studies conducted in the field of "Knowledge Based Theory".

2.1. Organizational Learning

Individuals possess an innate inclination for acquiring knowledge, a trait that has facilitated their survival over centuries through assimilation of insights from the natural world. Similarly, within organizational contexts, survival and productivity hinge on the acquisition and application of acquired knowledge. A lag in learning from the environment inevitably jeopardizes this struggle for dominance. This phenomenon stands as a pivotal driver of competitive advantage (Adams et al., 1998; Bennet & Bennet, 2004; Aggestam, 2006; Liao et al., 2008). In the contemporary landscape, this propensity is not merely a discretionary pursuit, but rather an imperative necessity (Yang, 2007).

While a widely agreed-upon characterization of organizational learning is lacking, an examination of existing research reveals varied epistemological perspectives on the subject of learning within organizations. Clearly defining the notion of learning becomes essential in elucidating the construct of organizational learning. Fundamental to this are the notions of obtaining, disseminating, and harnessing knowledge (Adams et al., 1998; Therin, 2003; Eren et al., 2013).

The concepts of learning outlined in the literature on organizational learning offer a comprehensive outlook on this matter.

Table 1 Organizational Learning Definitions

Birkenholz	1999	Learning refers to the observable changes in a person's behavior as a result of applying new knowledge, skills, or practices
Fiol and Lyles	1985	Learning is a continuous process of enhancing one's actions by acquiring and applying new knowledge.
Stewart	1992	Learning is a fundamental and ongoing process that inevitably leads to changes in an individual's knowledge, skills, attitudes, and values, which ultimately influence their behavior.
Therin	2003	The construct of learning is multifaceted and encompasses various dimensions or sub-constructs. Despite the availability of multiple theoretical definitions, operationalizing them is often challenging. Learning is comprised of three distinct levels: knowledge management, organizational learning, and the learning organization.
Liao	2008	The process of learning often leads to the formation of fresh ideas and understandings. This phenomenon is typically observed when we take productive actions and learn from our own errors through detection and correction.
Grundy	1994	The act of consciously or unconsciously constructing or adjusting one's viewpoints to gain a more comprehensive understanding of the world around them.

(Argote, 2011)

The table 1 illustrates a compilation of definitions pertaining to organizational learning, derived from various scholars spanning over a decade. These definitions collectively underscore the evolution of thought regarding how organizational learning is perceived, emphasizing its multidimensionality and the imperative role it plays in shaping behaviors, enhancing actions, and refining perspectives within an organization.

Various perspectives exist when it comes to comprehending the essence of organizational learning. It encompasses processes such as “acquiring information”, “interpreting data”, “developing knowledge”, and “sustaining learning” which are articulated without reference to distinct definitions (Argote, 2011). In the literature, different conceptual frameworks are evident for organizational learning, including “knowledge acquisition, information distribution, information interpretation, and organizational memory”. For

instance, Addicot et al. (2006) proposes a tripartite model consisting of acquiring, disseminating, and using knowledge, while identifying three obstacles as avoiding ambiguity, compartmental thinking, and inertia. On the other hand, Huber (1992) defines organizational learning stages as acquisition, interpretation, dissemination, and storage. Additionally, Kim (2009) outlines the stages of organizational learning as acquisition, interpretation, and implementation. Another perspective by Addicot et al. (2006) designates these stages as acquisition, sharing, and implementation.

2.1.1. Stages of Organizational Learning

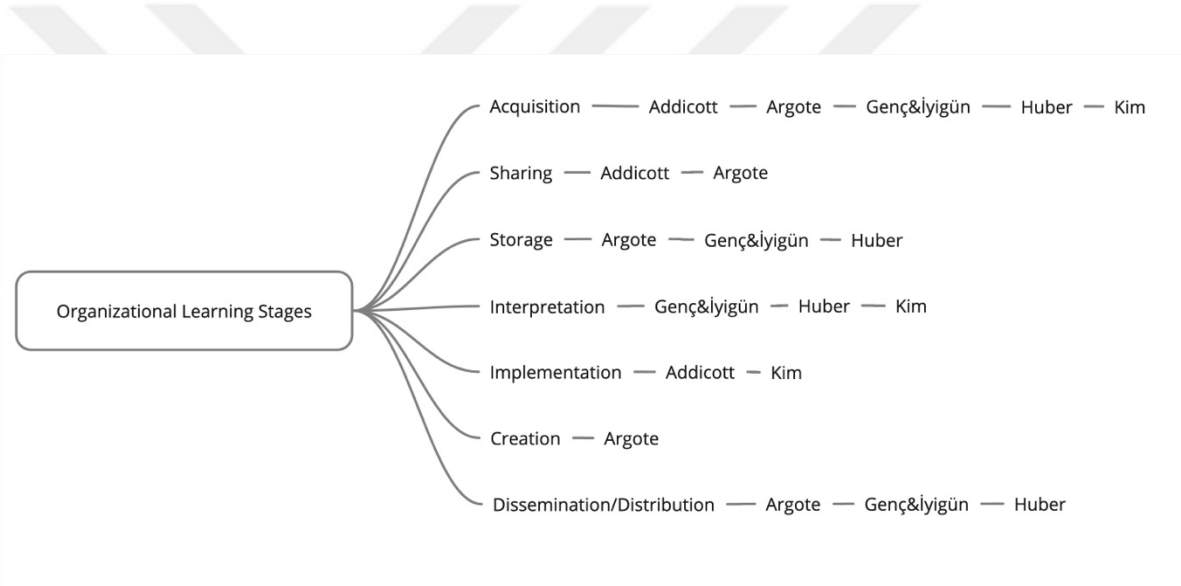

Figure 1 Organizational Learning Stages and Authors

The diagram in figure 1 illustrates the various stages of organizational learning, with references to the key authors who have contributed to each respective stage. From acquisition to dissemination, scholars such as Addicott, Argote, Genç&İyigün, Huber, and Kim have extensively studied and provided insights into the processes involved in organizational learning.

The process of knowledge acquisition within an institution is observable through the changes in the behaviors and perceptions of individuals (Aggestam, 2006). Organizational learning can be categorized into distinct types, such as routine-dependent, history-dependent, and goal-driven learning. Additionally, knowledge can be acquired

through direct personal experiences and observations of others. This classification provides a framework for understanding how organizations can improve their learning capabilities and knowledge acquisition (Genç & İyigün, 2011).

Organizational learning entails the exchange of knowledge within an organization, encompassing the accumulation, transformation, or reduction of its knowledge, experiences, and expertise. This adaptive change in organizational learning is deemed crucial for attaining sustainable competitive advantage, as it can involve the generation of novel knowledge through internal or external factors, or the modification of existing organizational knowledge (Calantone et al., 2002; Yang, 2007; Eren et al., 2013).

Since adaptability to the environment is recognized as a fundamental aspect of organizational learning, companies embracing organizational learning can be characterized as open systems (Eren et al., 2013). Such changes may manifest as alterations in organizational rules, talent management, strategy, or culture, which significantly impact a company's innovation and performance capacity (Calantone et al., 2002; Eren et al., 2013). Moreover, organizational learning contributes to error reduction, facilitates adaptation to environmental shifts, and enhances innovation capabilities. In addition to this perspective, there are also studies that focus on the managerial tools and methods that facilitate organizational change (Eren et al., 2013).

2.1.2. Learning and Organizational Learning

At the core of learning lies human values, which serve as the fundamental elements of organizations. Learning initiates with the individuals within the company, emanating from their efforts to augment their knowledge levels (Carneiro, 2000). However, organizational learning goes beyond individual learning and encompasses collective processes, systems, and culture that facilitate knowledge acquisition and utilization to achieve shared objectives (Bennet & Bennet, 2004). This learning process unfolds within a dynamic and interconnected community (Nonaka & Takeuchi, 1995), commencing with knowledge formation in individuals, eventually extending to organizational learning. It is crucial to differentiate individual learning from organizational learning, as the latter

entails distinct goals and standards (Bennet & Bennet, 2004; Cavaleri, 2004; Aggestam, 2006). Organizational learning is not solely a product of individual knowledge exchange; rather, it emerges through relationships and interactions between individuals (Bennet & Bennet, 2004).

While individual learning emphasizes cognitive and behavioral changes in the individual's relationship with their surrounding ecosystem, organizational learning is grounded in social activities like knowledge sharing and constructing joint models based on information and experience (Bennet & Bennet, 2004). To enable organizational learning, knowledge acquired through individual learning must be transformed into a resource accessible to other employees within the company. Retaining knowledge within individuals holds significance for organizations during the organizational learning process and for short to medium-term preservation (Therin, 2003). A shared consensus, either explicit or implied, is necessary for understanding, interpreting, and disseminating the obtained knowledge (Eren et al., 2013). However, the full realization of learning also entails an ambiguous nature, as organizational learning may occur at various stages, ranging from individual realization within the organization to realization throughout the entire organization (Bennet & Bennet, 2004). When members of the organization can apply their learning to address common problems, it signifies the presence of organizational learning (Liao et al., 2008). Individual learning remains apparent in every aspect where organizational learning takes place.

Examining organizational learning processes in terms of organizational performance reveals three phases: "perception," "behavior," and "performance." Employees start perceiving knowledge from internal and external sources, leading to changes in their work behavior. Consequently, performance improvement can be observed as a result of these perceptual and behavioral changes (Eren et al., 2013).

2.1.3. Knowledge Perspective of Organizational Learning

The organizational learning process entails the utilization of individual learning endeavors within companies, while concurrently establishing organizational learning systems. Additionally, certain learning processes can emerge through the resolution of company-related problems and experiences. As such, a proactive approach towards training and developing all employees becomes essential for fostering the growth of companies. This can be achieved through two means: firstly, by implementing mechanisms that ensure the organization remains actively and continuously informed about advancements in the ever-evolving world of science. Secondly, by seeking more effective ways to enhance production processes and gain technological advantages while advancing knowledge (Carneiro, 2000).

The ultimate expectation from organizational learning is to enhance company performance and contribute to its continuous improvement. Through the integration of individual learning and organizational learning mechanisms, companies strive to attain improved operational efficiencies and technological competitiveness. The active engagement of employees in the learning process aids in adapting to dynamic environments and seizing opportunities for advancement in a rapidly evolving world. As such, companies should adopt a proactive stance towards knowledge development and dissemination, fostering a culture of learning and innovation to thrive in the competitive landscape (Senge, 1990).

For organizational learning to occur, the company must recognize the value of knowledge and embrace its potential to bring about changes in both the company's behavior and that of its employees. Top management plays a vital role in fostering organizational learning, as they are responsible for decision-making and achieving company goals. Having access to sufficient knowledge from internal and external sources, and ensuring a continuous and updated flow of knowledge, becomes crucial in making informed decisions (Davenport & Prusak, 1998).

Each company develops and implements its own tailored organizational learning approach, taking into account its specific conditions and organizational characteristics.

For a company to transform into a learning organization, it needs fundamental capacities including a dedication to learning, a collective vision, receptiveness, and an internal culture that promotes knowledge exchange (Cavusgil et al., 2003). These qualities facilitate the company's ability to learn, adapt, and progress effectively.

Shared knowledge derived from organizational learning acts as a competitive asset within the company, promoting inventive thinking and innovation (Chawla & Joshi, 2011). Even in the absence of explicit competition, individuals are expected to generate and propose new ideas about the company after engaging in active learning processes (Carneiro, 2000). Moreover, strategic alliances between companies play a crucial role as knowledge transfer mechanisms, with organizational learning at the core (Young, 2005).

The idea of a learning orientation pertains to generating and applying knowledge throughout the organization to secure a competitive edge. It encompasses knowledge about customers, market changes, competitor analysis, and technological advancements, as well as knowledge about products and their features (Calantone et al., 2002). To facilitate knowledge transfer among employees, the knowledge produced within the organization is stored in books, databases, and documents. Each learning activity contributes to the accumulation of this stored data (Aggestam, 2006). However, errors may arise in the organizational learning process, and this is where Knowledge Management processes come into play, aiming to preserve data and address errors resulting from this situation (Carneiro, 2000; Aggestam, 2006).

The concept of organizational learning that supports knowledge management is relatively new compared to the broader notions of individual and organizational learning. When it comes to change, various factors like uncertainty, challenges, cooperation, and cultural differences, both within and outside the organization, can influence its nature. Learning occurs through interactions during times of change and can manifest as harmony, efficiency, and innovation. Change can occur spatially, both within and outside the organization, or over time, based on past experiences. Organizational learning, in essence, involves reinterpreting past experiences (Cavaleri, 2004).

The crux of the matter lies in the acquisition of knowledge, whether it originates from within or outside the institution. Knowledge serves as the foundation of learning, leading to the acquisition of new knowledge (Carneiro, 2000; Bennet & Bennet, 2004; Cavaleri, 2004). While some studies may not explicitly mention the concept of knowledge due to their focus on the organization's learning capacity, it is widely acknowledged that knowledge naturally emerges as a result of organizational learning (Cavaleri, 2004). However, Therin offers a different perspective, likening each component of knowledge to a stock and defining the learning process as a flow. In this view, organizational learning encompasses all organizational activities and involves the integration and internalization of knowledge within the company (Therin, 2003).

In the realm of organizational learning, the human resources department holds a pivotal position, emphasizing the psychological aspect of this process. Figure 2 illustrates the rapid increase in publications related to organizational learning from the late 1960s to the mid-1990s, as studied by Crossan & Guatto (1996). Notably, the literature reveals a growing number of articles addressing this topic in recent years.

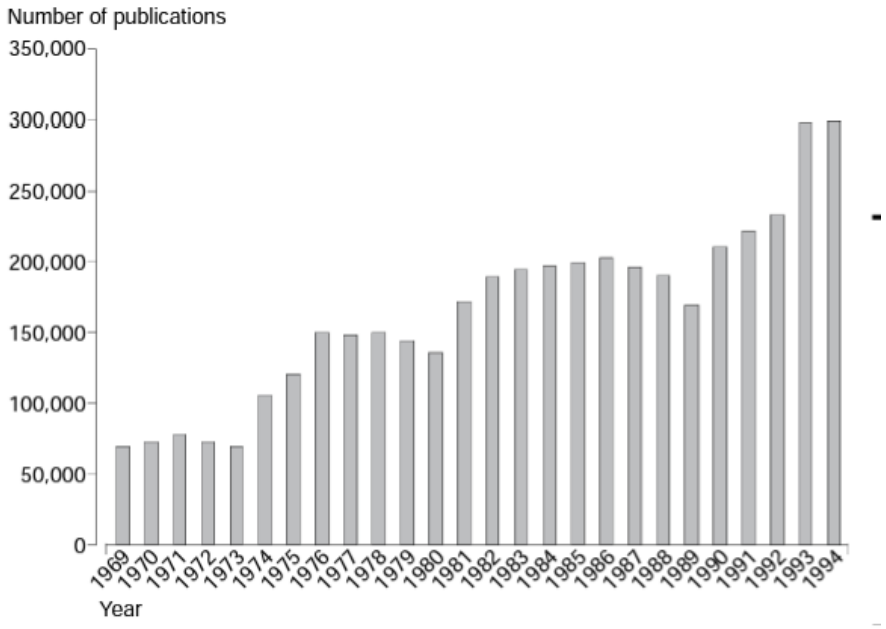

Figure 2 Numbers of Organizational Learning Publications (Crossan & Guatto, 1996)

2.1.4. Structures of Organizational Learning

When considering organizational learning and its associated structures, both internal and external factors have an impact. Moreover, knowledge management and the concept of a learning organization are influenced by these same variables. The relationship between knowledge management, organizational learning, and the learning organization is interconnected, as knowledge management affects organizational learning, which, in turn, contributes to the establishment of a learning organization. These processes collectively influence both innovation performance and financial performance (Therin, 2003).

However, there are distinctions in the level of effort required between organizational learning and learning organizations. While achieving a learning situation may not necessarily demand significant effort in organizational learning, the establishment of a learning organization necessitates deliberate endeavors by the organization (Genç & İyigün, 2011).

Figure 3 presents Therin's (2003) general framework on learning and innovation, emphasizing the interconnectedness of knowledge management, organizational learning, and the concept of a learning organization. This framework suggests a cascading effect where effective knowledge management can lead to better organizational learning, further resulting in enhanced innovation and financial performances.

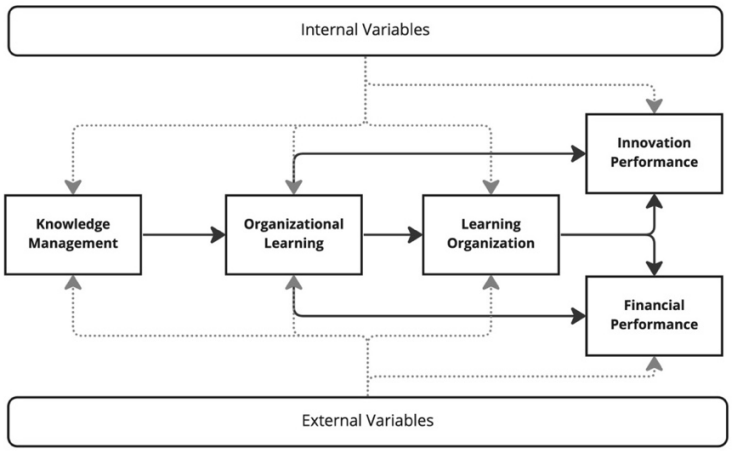

Figure 3 Learning and Innovation General Framework (Therin, 2003)

2.1.5. Organizational Learning Models

Organizational Learning is characterized by five key features: “personal mastery, mental models, team learning, shared vision, and systems' thinking” (Kim, 2009).

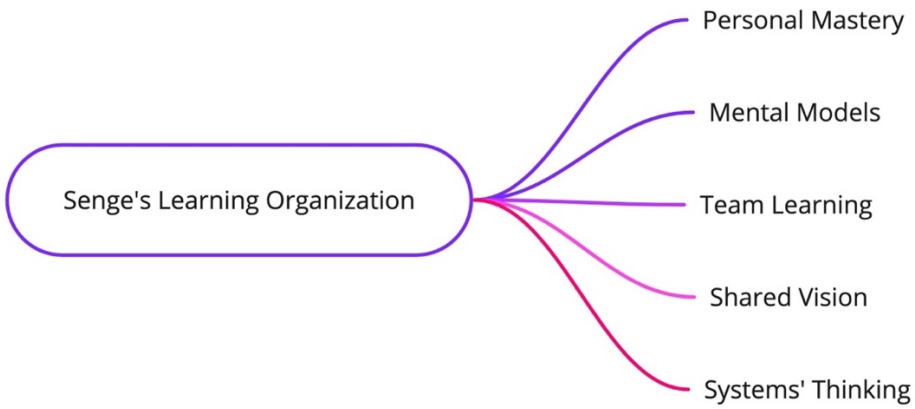

Figure 4 Senge's Learning Organization (Senge, 1990)

Figure 4 visually depicts Senge's (1990) concept of the Learning Organization, emphasizing its five core disciplines: “personal mastery, mental models, team learning, shared vision, and systems thinking”. Kim (2009) further elaborated on these principles, noting that Organizational Learning is defined and shaped by these foundational attributes, which collectively guide the evolution and maturation of learning organizations.

Table 2 Systems Thinking and Linear Thinking Comparison

Linear Thinking	**Systems Thinking**
See individual parts	See whole systems
See linear cause-effect relationships	See inter-linkages circles of causality
See static snapshots	See processes of change over time
Use visible solutions closest to us	See true systematic causes, points of leverage

(Senge, 1990)

As seen is the Table 2 personal mastery involves personal growth and learning, emphasizing the importance of individuals within an organization possessing a strong

desire and ability to learn and perceive reality objectively. It encourages self-awareness and active engagement in one's learning and development, positioning individuals as agents of change (Bennet & Bennet, 2004). Mental models refer to the conceptual frameworks, assumptions, and generalizations existing in an individual's mind. People's behaviors in the organization are influenced by their perspectives, approaches, perceptions, and biases towards events. This aspect highlights the distinction between individuals' mental patterns and the organization's overall vision (Richardson, 1991). Team learning takes precedence over individual learning in the context of global competition and technological advancements. It underscores the significance of collective learning within teams, recognizing that individual biases hinder organizational learning, necessitating effective team learning practices. Shared vision involves the dissemination of the company's future goals, direction, and dreams among all members of the organization. A unified vision among employees contributes to the institution's success, fostering organizational learning (Senge, 1990).

Systems' Thinking goes beyond the traditional understanding of systems thinking solely for the organization, encompassing a broader systems perspective that includes customers and suppliers. It emphasizes the importance of considering the larger system and seeing the big picture when making rational decisions within the organization. This approach involves understanding and perceiving not only the internal aspects of the organization but also how it relates to other systems (Senge, 1990; Richardson, 1991).

System dynamics, often referred to as the technical aspect of systems thinking, holds significant importance. It involves modeling the analytical aspects of systems thinking using computer programs by knowledgeable employees (Senge, 1990). Notably, systems thinking serves as the central discipline in Senge's 5th discipline, built upon four other disciplines as you seen in the figure 6. Its primary focus is to foster dialogue and effective communication within the organization, encouraging problem-solving, shared understanding, and mutual learning, leading to organizational learning (Senge, 1990). Moreover, Systems thinking supports double loop learning, prompting the organization to reevaluate shared visions, current mental models, and underlying assumptions to ascertain their effectiveness for the organization's benefit (Bennet & Bennet, 2004).

However, it's worth noting that Senge's concept of the learning organization has faced criticism in the literature. Some authors argue that the concept is vague and falls under an ambiguous category (Hsu & Lamb, 2020; Bennet & Bennet, 2004; Keskin et al., 2016).

One of the prominent theories in the realm of organizational learning is the theory rooted in behavioral principles. Within this framework, four main concepts are notable: "single loop learning, double loop learning, deutero learning, and strategic learning" (Easterby-Smith et al., 2000; Bennet & Bennet, 2004).

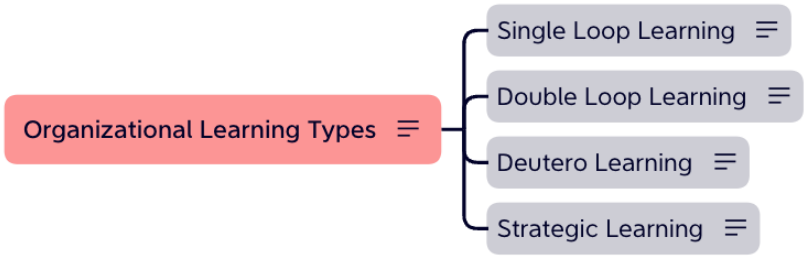

Figure 5 Organizational Learning Types (Bennet & Bennet, 2004)

Figure 5 delineates the different types of organizational learning as identified by Bennet & Bennet (2004), highlighting the progression from single loop learning to more advanced concepts such as strategic learning. These types represent the varying depths and approaches of learning within organizations, each with its unique emphasis and methodology.

The concepts of "*single loop learning, double loop learning, and deutero learning*" emerged in the 1970s, rooted in the theory of behavior. In both single loop and double loop learning, human behavior is driven by executive values and variables, such as achieving predefined goals, winning, suppressing negative emotions, and emphasizing rationality. In the single loop approach, individuals focus on their specific tasks and groups within the organization rather than the organization as a whole (Argyris, 1976).

It is important to note that single loop learning may not significantly contribute to improving innovation performance. Individuals in single loop learning execute their

duties, identify and correct errors, but they may not influence the organization's existing policies and objectives (Bennet & Bennet, 2004).

Single loop learning is not possible where double loop learning exists. Double loop involves a deeper understanding of learning and leaders must be able to develop flexible and organic structures in which they can perform this deep learning rather than mechanical structures. This means a level of maturity and corporate culture that managers can accept their own mistakes (Easterby-Smith et al., 2000).

Deutero learning is a term derived from the word "deuteros," meaning second or next form. It gained prominence in organizational learning studies during the 1970s, although it was first mentioned in 1942 (Visser, 2003). Deutero learning refers to a learning process that goes beyond the initial learning objectives and results in acquiring additional knowledge. It is closely related to the concept of proto learning, where initial learning targets are achieved, and then further learning occurs. To illustrate, if learning to ride a motorcycle is the proto learning target (or single loop learning target) in a company, deutero learning would involve gaining knowledge about the streets, understanding the company's navigation system, and exploring new routes that were not previously known (Lutterer, 2012). In general, both double loop learning and deutero learning, in contrast to single learning, focus on driving change by questioning the fundamental dynamics of the organization and its environment and challenging existing beliefs (Bennet & Bennet, 2004).

In the framework of strategic learning, organizations thoroughly examine all options considering the "external context," "psychological context," and "internal context." This evaluation involves addressing key issues and interpreting conflicts through various concepts such as ambiguity, individual perspectives, teamwork, organizational dynamics, complexity, interconnections, and tensions (Grundy, 1994).

2.2. Knowledge Management

The literature contains numerous definitions of knowledge management (Drucker, 1993; Nonaka & Takeuchi, 1995; Davenport & Prusak, 1998; Alavi & Leidner, 2001; Mardani et al., 2018; Loermans, 2002). Knowledge Management gained global attention in the business world, especially due to its potential for significant cost reductions and enhanced performance for global companies (Bahra, 2001; Cavaleri, 2004; Donate & Guadamillas, 2011; Costa & Monteiro, 2016).

Knowledge is becoming as important as equipment, capital, material, and labor in the management of organizations, even becoming an alternative. It is assumed that in the future, competition wars will be structured according to the advantages gained through knowledge resources and knowledge workers (Drucker, 1993; Jaworski & Kohli, 1993; Gold et al., 2001; Mardani et al., 2018).

In our increasingly interconnected world, the geographical reach of companies necessitates them to constantly seek information beyond their own confines. This underscores the importance of crafting robust knowledge management systems. Several factors underscore this need, such as the growing intricacy of markets, labor mobility, the need for sustained learning, corporate intentions to manage knowledge, protection of intellectual assets, avoidance of redundant efforts, the drive for rapid innovation, intensifying globalization, technological evolution, and the imperative to share best practices (Donate & Guadamillas, 2011; Chawla & Joshi, 2011).

Historically, scholars discussed the notion of information management. Though once perceived as a neutral and standard system, today's discourse recognizes knowledge management as a separate and distinct area. While it possesses a normative framework, its application in the real world can vary and is often influenced by individual interpretations (Gloet & Terziovskli, 2004).

While the literature offers various definitions, the definition provided by the American Productivity and Quality Center (American Productivity & Quality Center, 2023) is widely accepted.

> "*A conscious strategy of getting the right knowledge to the right people at the right time, and helping people share and put information into action in ways that strive to improve organizational performance*",

has been one of the most generally accepted definitions (Cavaleri, 2004; Donate & Guadamillas, 2011; Costa & Monteiro, 2016).

Knowledge Management encompasses a diverse approach to accomplishing organizational goals through optimal utilization of knowledge. It encompasses the methods of generating, recording, disseminating, and efficiently applying organizational knowledge. It emphasizes streamlining the methods where knowledge is produced, distributed, and utilized within organizations. (Davenport & Prusak, 1998).

Knowledge Management involves the tactics and methods used to pinpoint, record, preserve, and apply knowledge to achieve an organization's goals. While it typically employs systems such as databases and networks, it also emphasizes fostering a culture that encourages knowledge dissemination and eliminates barriers (Nonaka & Takeuchi, 1995).

Knowledge management is the practice of managing knowledge and processes to facilitate knowledge sharing among employees (Darroch et al., 2000; Therin, 2003; Loermans, 2002; Aggestam, 2006). Any activities that do not contribute to enhancing knowledge are considered outside the scope of knowledge management (Therin, 2003). Essentially, it involves the systematic management and organization of essential knowledge within a company. This vital knowledge encompasses processes such as knowledge creation, organization, diffusion, utilization, and exploitation (Caroline & Angel, 2011; Mardani et al., 2018).

Knowledge management aims to institutionalize access to experience, knowledge, and expertise, thereby creating new opportunities and achieving a competitive advantage over rivals. It improves innovation capabilities and enhances customer value. The concept also

encompasses knowledge creation, valuation, metrics, mapping, indexing, transportation, storage, distribution, and sharing (Gloet & Terziovskli, 2004; du Plessis, 2007).

A different viewpoint on knowledge management perceives it as a managerial role responsible for generating, finding, overseeing, and disseminating information flow, aiming to utilize knowledge optimally for the sustained advantage of the organization (Darroch & McNaughton, 2002; du Plessis, 2007). Furthermore, knowledge management involves changing existing knowledge and the organization's knowledge processes to produce valuable knowledge outputs. In essence, it not only manages the final product of knowledge but also oversees the entire knowledge production process, akin to managing a factory and its means of production (Firestone & McElroy, 2004).

2.2.1. Features of Knowledge Management

Knowledge management is among the top priorities for organizations such as effectiveness, performance, and sustainability in competition (Donate & Guadamillas, 2011; Kör & Maden, 2013). Knowledge management involves a range of actions that encompass generating, arranging, distributing, and utilizing knowledge, (Therin, 2003) which are demonstrated through the processes of acquiring and communicating knowledge (Aggestam, 2006). Knowledge management can be described as the process of assessing the knowledge possessed by individuals within organizations or the collective knowledge of the organization itself. Its main focus lies in leveraging this accumulated knowledge to enhance the company's overall performance (Bennet & Bennet, 2004; Alegre et al., 2013).

Furthermore, knowledge management involves structuring and organizing knowledge within the organization to deliver services more effectively to customers. While it plays a central role in fostering innovation within companies, it also encompasses harnessing the problem-solving abilities of the organization and fostering the development of new ideas (du Plessis, 2007).

Knowledge can take various forms, including individual knowledge held by individuals themselves and social knowledge that is shared and embedded within the organization (Nonaka & Takeuchi, 1995). When individual learning becomes relevant and valuable to the company, it becomes a part of the organizational knowledge. Individual knowledge encompasses a wide range of personal insights, facts, procedures, concepts, opinions, ideas, observations, and judgments held by individuals. It is influenced by external factors and may have a subjective cognitive structure (Alavi & Leidner, 2001).

On the other hand, knowledge that goes beyond individuals and exists within the organization can be found in different aspects such as organizational culture, routines, policies, systems, and various documents (Alegre et al., 2013).

The rapid advancement of information management in recent times can be attributed to information technologies. However, it is essential to recognize that information management and knowledge management are distinct processes. Knowledge management encompasses the utilization of data and information gathered by companies in software products and business applications, which facilitates the flow of information. Converting information into knowledge is a significant aspect of knowledge management, and it involves various processes such as identification, capture, retrieval, sharing, and evaluation (Cavaleri, 2004). This field is closely connected to organizational learning (Therin, 2003), and it focuses on managing access to knowledge, whether it resides in individuals' minds or within the organization, making it available to those who need it when and where it is required.

Knowledge management is not limited to innovation development; rather, it also involves maintaining and improving the overall knowledge ecosystem, which is crucial for the organization's success (du Plessis, 2007). It operates at the individual, team, and organizational levels, with considerations for people, processes, culture, and technology. The significance of knowledge in companies is widely acknowledged, and they recognize the need to manage knowledge effectively. To achieve this, companies can adopt and adapt knowledge management systems used by their competitors, considering factors such as market conditions, internal structure, and competition. These systems can vary in

their nature, either being implicit or explicit, and may also be influenced by the preferences of company leaders (Dickel & Moura, 2016; Caroline & Angel, 2011).

Different organizations have diverse approaches to acquiring knowledge internally. Some companies may consider outsourcing as a viable option, while others may prefer a more centralized structure. Knowledge management can be IT-driven in some companies, focusing on codification, while in others, it may be HR-focused, emphasizing personalization. Thus, knowledge management can be categorized into two main axes: one that centers on people and the other on technology (Hong & Kuo, 1999).

The primary objective of knowledge management is to utilize both internal and external knowledge to address current challenges within the company, adapt to environmental changes originating from both internal and external sources, and foster innovation to promote company growth (Hong & Kuo, 1999; Inkinen et al., 2015). As you see in the figure 7 the understanding the connection between knowledge and management functions, four key domains play a significant role: people and driving forces, market and strategy, knowledge and systematic thinking, and organization and operation. These domains are interrelated and linked to six essential management capabilities, namely prediction ability, responding ability, production ability, creativity, learning ability, and developmental ability (Hong & Kuo, 1999; Dickel & Moura, 2016).

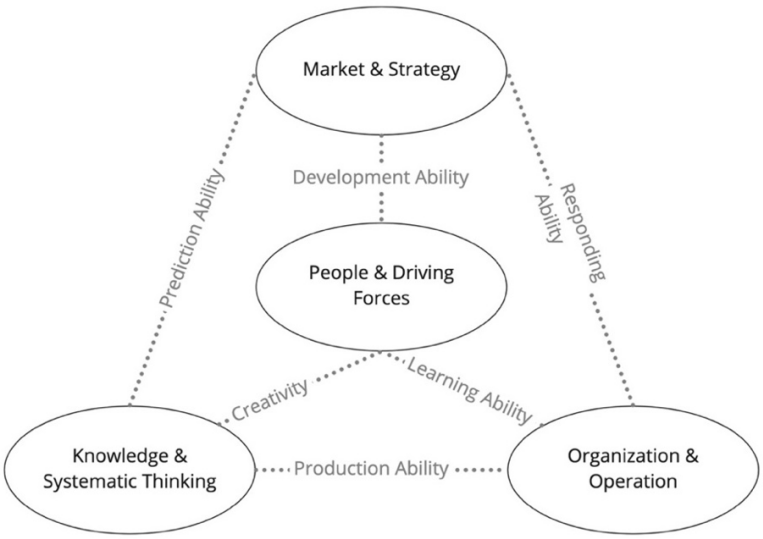

Figure 7 Knowledge and Management Functions

(Hong & Kuo, 1999)

Knowledge management consists of three interrelated processes: "*knowledge acquisition, knowledge conversion and knowledge*" (Liao & Wu, 2010).

2.2.2. Knowledge

The importance of knowledge within management science is consistently on the rise. It holds a pivotal position in the management of value creation, which entails the conversion of knowledge from one type to another (Carneiro, 2000). Knowledge is a fundamental factor influencing competition and production. Unlike traditional assets like capital and technology, manual labor is now given higher importance and priority. Companies that possess abundant knowledge enjoy advantages over their competitors in terms of quality, innovation, and efficiency, providing them with a significant edge in terms of sustainability (Dickel & Moura, 2016). However, from an organizational perspective, having knowledge alone does not guarantee a strategic advantage; it needs to be effectively managed (Caroline & Angel, 2011). When examining knowledge management, it becomes essential to grasp the nature of knowledge, its definition, and its formation process. Knowledge management involves the transformation of information into knowledge in alignment with the company's objectives and long-term viability (Aggestam, 2006). To fully understand knowledge management, it's essential to differentiate between data, information, and knowledge, since each carries its own significance (Cavaleri, 2004; Aggestam, 2006).

Knowledge is reflected in shifts in cognition, habits, and actions and can be perceived as a conviction (Argote, 2011). This belief enhances the organization's capacity for effective action (Alavi & Leidner, 2001). Knowledge can be categorized into three main action groups: the methods used to recognize similar situations and activities, the guiding principles for action, and the expectations regarding the desired outcomes (Cavaleri, 2004). Knowledge, as a result, can be viewed as the proficiency and competence gained from education, firsthand experiences, or both theoretical and hands-on grasp of a topic (McDermott, 1999).

Beyond mere skills and expertise, knowledge can also include comprehension, consciousness, and acquaintance gained through research, exploration, observation, or firsthand experience (Davenport & Prusak, 1998; Chawla & Joshi, 2011). It can be defined as the capacity to take effective action, which means being aware of potential and probable capabilities and acting upon them (Bennet & Bennet, 2004). Knowledge is a two-way process comprising knowledge production and knowledge integration. The creation of knowledge encompasses procedures like gathering information, personal and collective learning, formulating knowledge assertions, and the evolution of these claims. Conversely, knowledge integration entails processes like disseminating knowledge and information, searching, retrieval, distributing knowledge, and instructional methods (Firestone & McElroy, 2004). Knowledge can be defined as information merged with experience, backdrop, assessment, and contemplation (Davenport & Prusak, 1998; Gloet & Terziovskli, 2004).

Figure 8, inspired by the work of Firestone & McElroy (2004), presents a comprehensive model outlining the stages and components of knowledge production and integration within an organization. The model emphasizes the cyclical relationship between knowledge as a core, its production encompassing stages like information acquisition and evaluation, and its subsequent integration which includes activities like searching, sharing, and teaching.

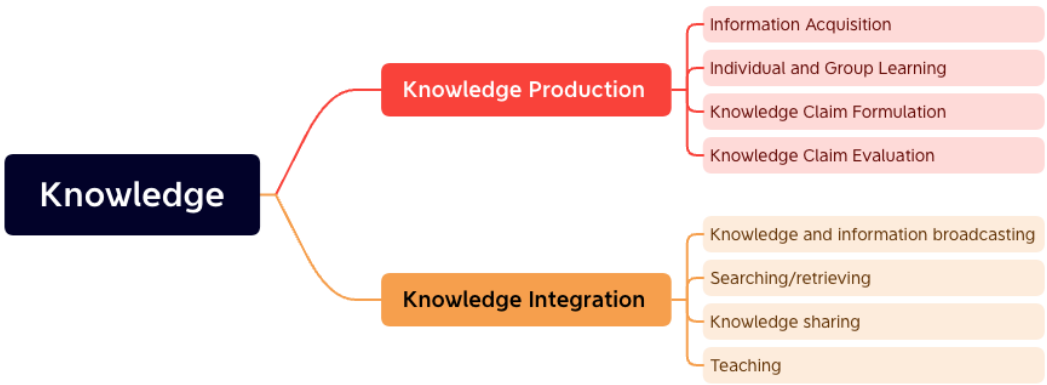

Figure 8 Knowledge Model (Firestone & McElroy, 2004)

Knowledge can be categorized into individual knowledge and social knowledge (Nonaka & Takeuchi, 1995). It exists within individuals and extends beyond the boundaries of the organization (Therin, 2003). Knowledge can also be understood as the process of individual learning becoming meaningful for the company. This includes personal knowledge, such as facts, procedures, concepts, comments, ideas, observations, and judgments that individuals possess in their minds. Knowledge formed through external influences naturally has a subjective cognitive structure (Alavi & Leidner, 2001; Darroch et al., 2000; Darroch & McNaughton, 2002).

In addition to individual knowledge, there is knowledge that resides outside of individuals within the organization. This knowledge becomes embedded in various aspects of the organizational culture, including routines, policies, systems, and documents (Firestone & McElroy, 2004; Alegre et al., 2013).

Knowledge is built upon two fundamental sources: "data" and "information". Data consists of raw facts that provide a snapshot of the current situation but lack interpretation and assessment, making them insufficient for decision-making (Davenport & Prusak, 1998). Conversely, information is data that has been given significance and intention, rendering it valuable and pertinent for those making decisions (Drucker, 1993; Eren et al., 2013). It serves as valuable input for managerial decision-making.

Knowledge, in turn, is information that has been validated, contextualized, and enriched to provide insights into a specific subject matter. It goes beyond mere facts and records, incorporating an understanding of context, methodology, and significance. Knowledge is the result of synthesizing information with experience, values, contextual information, and expertise. This process involves acquiring, interpreting, and integrating knowledge from various sources, such as market intelligence from consumers, rivals, and vendors. Through this transformative process, knowledge creates new interpretations and perspectives that were not previously apparent (Darroch & McNaughton, 2002; Alavi & Leidner, 2001; Therin, 2003; Bennet & Bennet, 2004; Nonaka & Takeuchi, 1995).

The transformation of information into knowledge involves several stages, including context, usefulness, interpretability, and selectivity, as information is refined and processed to become valuable knowledge (Alavi & Leidner, 2001).

Knowledge can be preserved in various reservoirs. These can be transactive memory systems, as well as tools, routines, or communications between individuals (Argote, 2011). Knowledge can be stored, manipulated, and shared over fixed and soft networks (Davenport & Prusak, 1998). Knowledge can be viewed as a message. It can be called a message between both the receiver and the emitter (Bennet & Bennet, 2004).

Knowledge management is a field that develops in the same field as organizational learning, as it is based on knowledge acquisition and communication (Therin, 2003). Tacit knowledge can provide an advantage in terms of business, as it is a singular, non-imitable, very difficult to substitute, personal knowledge type (Caroline & Angel, 2011).

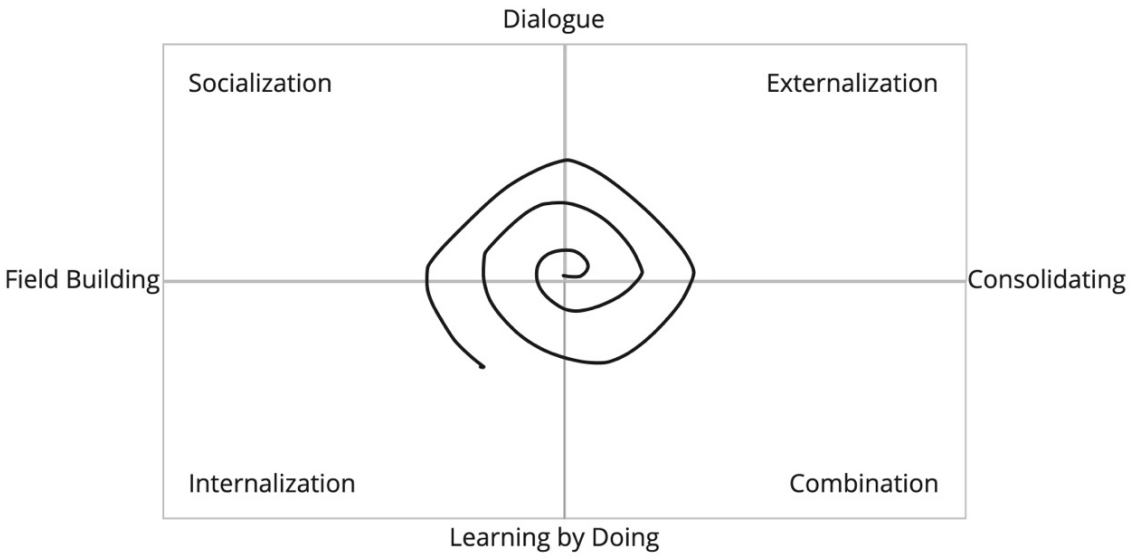

Figure 9 The Nonaka and Takeuchi Knowledge Spiral (Nonaka & Takeuchi, 1995)

Figure 9 illustrates knowledge spiral, a foundational model that captures the iterative processes of knowledge creation and transformation in organizations (Nonaka & Takeuchi, 1995). The spiral symbolizes the dynamic interaction between four essential knowledge aspects - socialization, externalization, combination, and internalization.

This emphasizes the ongoing growth of knowledge through dialogue, field development, experiential learning, and consolidation.

Table 3 Knowledge Taxonomies and Examples

Knowledge Taxonomies and Examples		
Knowledge Types	**Definitions**	**Examples**
Tacit	Knowledge is rooted in actions, experience, and involvement in specific context	Best means of dealing with specific customer
Cognitive tacit	Mental models	Individual's belief on cause effect relationships
Technical tacit	Know-how applicable to specific work	Surgery skills
Explicit	Articulated, generalized knowledge	Knowledge of major customers in a region
Individual	Created by and inherent in the individual	Insights gained from completed Project
Social	Created by and inherent in collective actions of a group	Norms for inter-group communication
Declarative	Know-about	What drug is appropriate for an illness
Procedural	Know-how	How to administer a particular drug
Causal	Know-why	Understanding why the drug works
Conditional	Know-when	Understanding when to prescribe the drug
Relational	Know-with	Understanding how the drug interacts with other drugs
Pragmatic	Useful knowledge for an organization	Best practices, business, frameworks, Project experiences, engineering drawings, market report
Cognitive-Possession Individual	Based on cognitive psychology	Representation of the World. Reality is objective. Knowledge is universal, abstract, specific to one task or directed towards the solution of a problem
Cognitive-Possession Connectionist	Based on cognitive psychology	The same as cognitive with the exception that the representational process of this reality is different, in that it considers knowledge as arising from networks and not individuals. Knowledge is found in connections
Social process	Act of construction and creation	Reality is socially constructed. Knowledge is neither universal nor abstract (it depends on context). It is based on social interaction

(Chiva & Alegre, 2005)

Table 3 provides a comprehensive overview of the various knowledge taxonomies, accompanied by succinct definitions and real-world examples, as posited by Chiva & Alegre (2005). Ranging from tacit knowledge rooted in experience to explicit pragmatic knowledge useful for organizations, this taxonomy effectively categorizes the diverse essence of knowledge in its many forms and contexts. A crucial consideration in understanding knowledge and its management encompasses the ideas of the knowledge spiral, implicit-tacit knowledge, and overt knowledge.

In this model put forward by Nonaka and Takeuchi (1995), the transition from implicit to explicit knowledge and their definitions are elaborated upon. Tacit knowledge is the type of knowledge that exists in people, emerges in practice, but has not yet been decoded and is not suitable for transfer, formalization, and transmission. Conversely, explicit knowledge is the kind of understanding that can be readily shared, interpreted, and applied transparently by other organizational members. Knowledge occurs in individuals as tacit knowledge. It becomes explicit with social interaction. This framework comprises four stages: socialization (from tacit to tacit), externalization (from tacit to explicit), combination (from explicit to explicit), and internalization (from explicit to tacit). At the socialization step, knowledge transfer takes place through one-to-one communication, knowledge exchange based on experience, observation and behavioral change based on observation. During the externalization phase, individuals have the ability to convey and impart expertise. Essentially, during this phase, knowledge can be archived, disseminated, and relayed. In the Combination stage, explicit understanding merges within individuals, and diverse knowledge sources converge. In the internalization step, the shared knowledge is internalized to form new mental models in individuals (Nonaka & Takeuchi, 1995; Genç & İyigün, 2011; Polanyi, 1997).

Figure 9, derived from Nonaka & Takeuchi's 1995 work, depicts the rotational transformation between tacit and explicit knowledge, underscoring the persistent dynamics through methods like “socialization, externalization, combination, and internalization”. This framework highlights the fluidity of generating and disseminating knowledge, mirroring the traditional methods Japanese firms have employed in navigating innovation dynamics.

Figure 9 Tacit - Explicit Knowledge (Nonaka & Takeuchi, 1995)

2.2.3. Knowledge Base Theory

To understand the concept of knowledge management, it's crucial to understand why knowledge holds great importance for companies. Knowledge-based theory, a part of economic and management research focusing on knowledge creation, integration, utilization, and deployment processes, sheds light on this matter. It is rooted in Resource-based theory, also known as the resource-based view (RBV), which suggests that companies must identify strategic resources for sustainable competition (Donate & Guadamillas, 2011).

In the Resource-Based View (RBV), resources vary in their contribution to competitive edge. The significance of resources varies depending on the nature of the industry and the company's operations. Managers assess potential key resources of the company based on their valuable, rare, imperfectly imitable, and non-sustainable qualities (Barney, 1991).

The inception of knowledge-based theory can be traced back to Edith Penrose's research in 1959. This theory examines how organizational performance varies based on the organization's main resources and technical knowledge or know-how. Knowledge is

acknowledged as a vital non-tangible asset that enhances organizational value (Nonaka & Takeuchi, 1995; Miller, 2002). From the perspective of knowledge management, knowledge becomes the most significant factor in terms of competition and sustainability. To be advantageous, knowledge must be valuable, scarce, and difficult to imitate. Consequently, knowledge is considered a key strategic resource, imparting socio-economic, intellectual, and cultural value to the company (Donate & Guadamillas, 2011). In essence, knowledge is not only essential for an organization but also a crucial attribute for gaining a competitive edge.

2.3. Innovation

Throughout history, innovation has played a significant role in shaping societies and economies. An intriguing example of this can be found in the story of Samuel Johnson and Sir William Scott, who were involved in the invention of the guillotine in France (Salter & Alexy, 2014). At the time, Johnson expressed his concern about the world's obsession with innovation, even in matters of life and death, as new methods for executions were emerging.

> *"The age is running mad after innovation; and all the business of the world is to be done in an new way; men are to be hanged in a new way; Tyburn itself is not safe from the fury of innovation"*

The French Revolution brought about a remarkable innovation—the guillotine. It replaced older execution methods like the "breaking wheel," "hanging," and "beheading by the sword." The guillotine was considered a more humane, faster, and efficient alternative.

In a different context, former US President Barack Obama emphasized the importance of innovation in a speech. He highlighted that innovation has been a driving force behind the United States' economic leadership in the 20th century

> *"Now, history should be our guide. The United States led the world's economies in the 20th Century because we led the world in innovation. Today, the competition is keener; the challenge is tougher; and that's why innovation is more*

important than ever. That's the key good, new jobs in the 21st century. That's how we will ensure a high quality of life for this generation and future generations."

This means that innovation is an important element both historically and geographically (Salter & Alexy, 2014).

2.3.1. Definition

Schumpeter's theory proposes that innovation is born from combining and reshaping existing information and materials into new and original forms (Dickel & Moura, 2016; Mardani et al., 2018). Similarly, Peter Drucker (1995) defines innovation as a means of creating new resources that generate wealth or increasing the wealth-generating potential of existing resources. Although these definitions don't fully encompass the complexity of innovation, they provide a useful starting point for understanding its essence.

In practical terms, innovation can be seen as incorporating new production methods into existing systems and developing new products and technologies based on customer demands in research and development organizations. From a business perspective, innovation is a process that focuses on effectively managing knowledge to create viable and marketable solutions (du Plessis, 2007). For companies, innovation is essential to attain sustainable competitive advantage and generate value in a fast-paced and competitive environment (Huang & Li, 2009). It plays a crucial role in their success and growth.

Innovation is the development of new products, systems, and methods, covering both breakthroughs and novel creations. From a value-based perspective, innovation is the process of generating value for the company or its customers. This value can take various forms, such as patents, newly developed products, or improved human resources management systems (Gloet & Terziovskli, 2004). In essence, innovation involves introducing something new and valuable to enhance the company's offerings or operations.

Innovation can be generally described as the process of generating, accepting, and applying new ideas and information derived from novel knowledge in various aspects of planning, technology, or materials related to products, processes, systems, structures, administrative systems, or organizational members. It involves incorporating fresh insights and concepts to improve or create new products, services, or organizational practices (Calantone et al., 2002; Gloet & Terziovskli, 2004; Huang & Li, 2009; Liao & Wu, 2010; Caroline & Angel, 2011; Eren et al., 2013; Kör & Maden, 2013; Mardani et al., 2018).

On the other side, it's vital to show that innovation is not just about having ideas. The selection and effective implementation of these ideas play a crucial character in the innovation process. In other words, turning promising concepts into practical solutions is equally significant in achieving successful innovation.

2.3.2. Innovation and Knowledge

Innovation is closely connected to knowledge. Without knowledge, particularly tacit knowledge, both people in an organization and the organization itself cannot comprehend the current state and fail to identify where it can evolve with new insights. Essentially, innovation involves the exploration of knowledge, whereby products, services, and systems are reimagined through the application of knowledge. In other words, it entails rethinking and reshaping an organization's existing know-how. To achieve innovation, companies must therefore revamp their existing knowledge resources, update their knowledge management systems, and reformulate their approach to knowledge. This highlights the importance of effective knowledge management, as it directly influences a company's capability to develop its innovation performance (Nonaka & Takeuchi, 1995; Gloet & Terziovskli, 2004; Alegre et al., 2013; Eren et al., 2013; Mardani et al., 2018).

Innovation relies heavily on tacit knowledge. Therefore, organizations need talented and creative persons who are inspired to disseminate their knowledge in order to drive innovation. Without a structured and institutional memory, it becomes challenging for organizations to be innovative (Brand, 1998).

The connection between knowledge management and innovation is closely tied to the organization's learning culture and its ability to acquire and effectively use knowledge (Calantone et al., 2002). A culture that fosters openness to innovation provides a competitive advantage. The willingness of employees to engage in innovative activities is influenced by the organization's cultural openness. Innovativeness encompasses various aspects, such as employees' intent to be innovative, having the right infrastructure, access to markets, and an environment conducive to implementing innovation (Kör & Maden, 2013).

In today's complex world, innovation, driven by knowledge management, has become a challenging endeavor. Those responsible for boosting a company's innovation performance face an overwhelming influx of knowledge from both within and outside the organization. Even with cutting-edge knowledge management systems, competitors may possess more extensive and higher-quality knowledge, enabling them to innovate faster. This complexity adds to the intricacy of the innovation process (Cavusgil et al., 2003; Chapman & Magnusson, 2006; du Plessis, 2007).

Innovation is seen as a process that contains getting, sharing, and assimilating knowledge to create new insights. This conscious approach of knowledge management serves as the foundation of innovation. Knowledge, as opposed to mere data or information, is personal, difficult to replicate, and relies on the individual's interpretation, making it central to the learning process (Nonaka & Takeuchi, 1995; Gloet & Terziovskli, 2004).

The Knowledge-Based View, viewed through the Resourced-Based theory, emphasizes that a company's innovation capacity is closely tied to its intellectual assets and knowledge. The ability to effectively utilize this knowledge in the innovation process becomes a crucial factor. In this context, knowledge plays a central role in driving innovation (Nonaka & Takeuchi, 1995; Martín-de Castro, 2015).

2.3.3. The Importance of Innovation

Innovation holds great significance for companies, contributing to various aspects of their growth and success. Key benefits of innovation include gaining a competitive edge, expanding market share, entering new markets, achieving financial gains, enhancing organizational performance, problem-solving, and adding value to products or services. As a major growth strategy, innovation plays an important role in the overall progress of firms (Gloet & Terziovskli, 2004; Liao & Wu, 2010; Kör & Maden, 2013; Eren et al., 2013).

Specifically, an organization's ability to innovate plays a crucial role in enhancing its performance (Calantone et al., 2002). Companies with strong innovation ability not only introduce more products to the market but also witness higher product adoption rates by customers. This fosters a culture of confidence in companies with robust innovation skills. Alongside culture, technological infrastructure is another crucial element for successful innovation. Interactive communication networks play a key role in facilitating active collaboration among individuals both inside and outside the company, ensuring swift sharing of innovation outcomes and valuable feedback (Huang & Li, 2009).

Innovation is all about putting ideas into action. When individuals develop new products, services, or technologies, it's not the final endpoint, but rather a starting point for further improvements and advancements. Innovation capacity and capability drive the motivation to continuously seek new solutions for the betterment of society. Throughout history, groundbreaking inventions like electricity, steam engines, transistors, and computers have emerged due to this drive for innovation.

In the current corporate environment, managing innovation is essential rather than just a distinguishing factor among businesses. Continual innovation is now a widely accepted principle in contemporary management. Companies must quickly learn and develop innovative processes and products that integrate with both internal and external ecosystems. Staying afloat in the industry requires swift and regular adaptation due to rapid technological changes, reduced product lifespan, and increased frequency of new product launches. The key differentiator lies in the speed at which innovation takes place

(Chapman & Magnusson, 2006; du Plessis, 2007; Liao & Wu, 2010; Caroline & Angel, 2011; Dickel & Moura, 2016).

Innovation can be likened to an exploration, much like the age of great discoveries. Those who possess fast and powerful "ships" in the form of innovation capabilities are more likely to achieve success. Innovation also has a unique nature, as it involves both tacit and sticky elements. This implies that close interactions and teamwork among people are vital in promoting innovation. For example, the BMW company initiated an R&D program where engineers are required to work within a close distance of 25 meters to enhance their collaborative efforts and innovation performance (Gloet & Terziovskli, 2004; Salter & Alexy, 2014).

2.3.4. Types of Innovation

2.3.4.1. Behavioral – Willingness to Change

When we examine innovation in companies, we can identify two main types based on their characteristics. The first type is what we call "innovation rate" which is more tangible and outcome-driven, focusing on concrete changes and results. The second type is the "willingness to change" which is more abstract and relates to the motivation and openness of the company to embrace change and new ideas (Calantone et al., 2002).

2.3.4.2. Incremental - Radical

Incremental innovation refers to the continuous improvement and development of existing products or services within a company. It is usually driven by market demands and aligns with the company's established practices. This type of innovation is readily accepted and integrated within the organization, as it builds upon the company's existing know-how and expertise (du Plessis, 2007; Salter & Alexy, 2014; Al-Hakim & Hassan, 2016; Mardani et al., 2018).

Radical innovation is a transformative process that disrupts the existing competition and introduces entirely new products or services to the market. It creates novelty that has not been seen before and can cause confusion among customers, employees, and competitors. This type of innovation may render the company's current know-how and skills obsolete, leading to internal resistance. While radical innovation presents great opportunities for companies, it also comes with commercial uncertainties and risks. Even with obstacles, groundbreaking innovation is vital for an organization's sustained prosperity. It can mark the beginning of new technologies, reshape existing market structures, or respond to changing customer behaviors, especially among new generations. In any case, radical innovation should be viewed as a pathway to new markets and the initiation of new dynamics (Darroch & McNaughton, 2002; du Plessis, 2007; Salter & Alexy, 2014; Mardani et al., 2018). Figure 10, drawn from Dodgson, David, & Nelson (2013), provides a concise representation of a Simple Innovation Portfolio, mapping the relationship between market familiarity and the nature of innovation ranging from incremental to radical. The matrix underscores the strategic approaches organizations can adopt, whether targeting operational efficiencies in existing markets, expanding capabilities into adjacent markets, or exploring unknown markets with disruptive innovations.

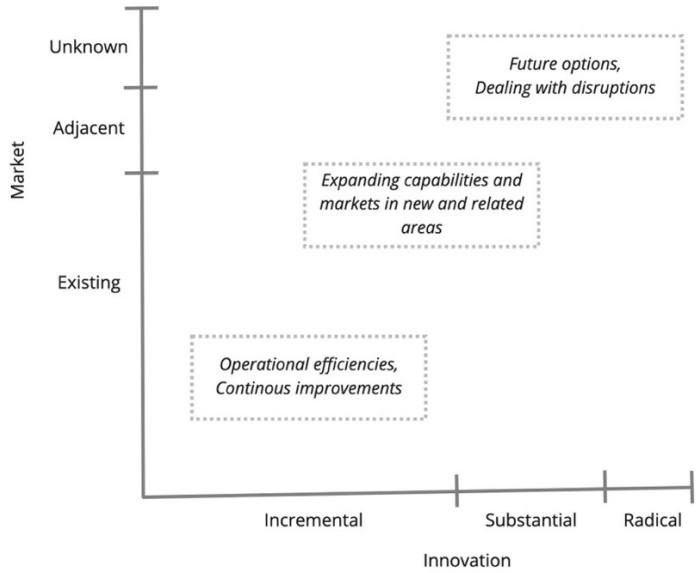

Figure 10 Simple Innovation Portfolio (Dodgson et al., 2013)

2.3.4.3. Product – Process Innovation

Product innovation involves the commercial activities related to the creation of new products. This can include technical design, research and development, production, management, and marketing efforts aimed at introducing novel products to the market (Alegre & Chiva, 2008; Liao & Wu, 2010; Eren et al., 2013; Salter & Alexy, 2014).

Process innovation pertains to the development of new technologies and methods in the product development and management processes. It represents changes in the production methods of products or services within the company. Process innovation can be further categorized into organization and technology innovation, which focus on improving the company's internal processes and adapting to technological advancements (Alegre & Chiva, 2008; Liao & Wu, 2010; Eren et al., 2013; Salter & Alexy, 2014; Martín-de Castro, 2015).

2.3.4.4.Architectural – Modular

Architectural innovation involves making changes to the information and components of a product. It does not focus on creating a completely new product or process from scratch, but rather on using existing components to develop a new product. While the components themselves may be the same as those used in the old product, the way they are combined results in a completely different product with unique functionalities.

On the other hand, modular innovation refers to a process where a significant innovative change is made to one of the components, rather than altering the relationship between the components. In this type of innovation, the product remains the same, but a particular feature of the product becomes more advanced compared to competing products. In summary, architectural innovation involves creating novel products by reconfiguring existing components, whereas modular innovation focuses on enhancing specific features of a product by improving one of its components (Salter & Alexy, 2014).

2.3.4.5.Open Innovation – Closed Innovation

Open innovation is the approach of incorporating external innovation sources when developing new products and services within an organization. In other words, companies can tap into external knowledge and expertise to enhance their innovation activities. This method differs from the conventional closed innovation paradigm, in which organizations depend exclusively on their in-house research and development (R&D) teams to drive innovation.

In open innovation, companies have several options for integrating external sources of innovation. They can collaborate with external partners, such as research institutions, universities, or other companies, to jointly develop new products. Alternatively, they can create systems and platforms to attract ideas and innovations from outside contributors, including customers, suppliers, and the wider public. Open innovation is particularly relevant in high-tech and knowledge-based industries, where the rapid pace of advancements makes it challenging for a single company to have all the necessary resources and expertise internally. By embracing open innovation, companies can access a broader pool of knowledge and capabilities, leading to effective and efficient innovation processes.

On the other hand, the closed innovation model follows a more traditional path, with companies conducting internal R&D activities to develop new products. Intellectual property rights for these innovations are closely guarded by the company. In general, open innovation provides a more cooperative and comprehensive method of innovating, enabling businesses to tap into outside knowledge and resources for their advancement and prosperity (Chesbrough, 2003; Martín-de Castro, 2015). Figure 11, adapted from Martin-de Castro (2015), illustrates the 'Virtuous Circle' concept, demonstrating the cyclic relationship between technological advancements, R&D investments, product innovation, and resultant business profits. This framework emphasizes the interconnectedness and interdependence of technological breakthroughs, product development, and organizational growth, underscoring the need for sustained R&D efforts to maintain business vitality.

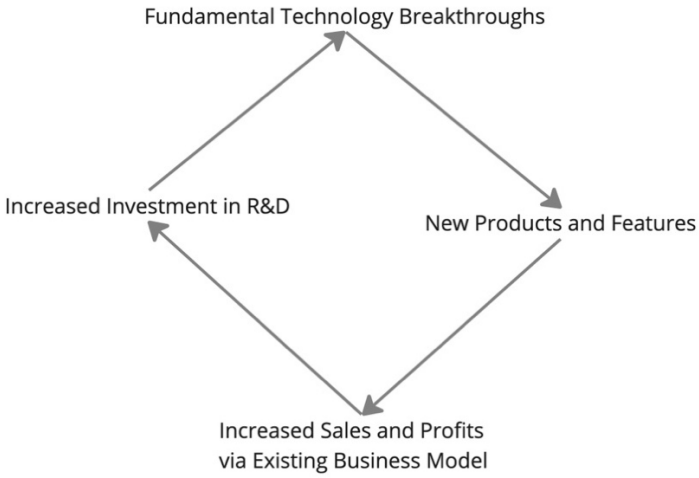

Figure 11 The Virtous Circle (Martín-de Castro, 2015)

Figure 12, based on Chesbrough (2003), illustrates the 'Closed Model for Overseeing Industrial R&D', highlighting a sequential journey from research initiatives, moving to the developmental stage, and finally reaching the market within the confines of the company. This model highlights the insular nature of traditional R&D processes, where innovation is internally driven and only projects fitting the firm's immediate goals and capabilities reach the market.

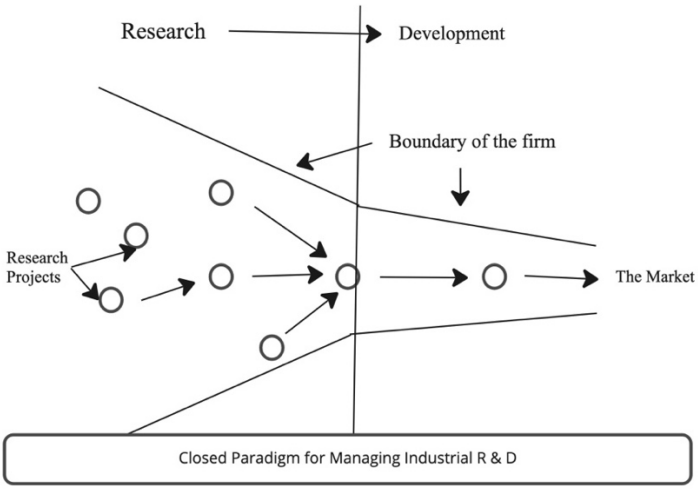

Figure 12 Closed Paradigm for Managing Industrial R&D (Chesbrough, 2003)

Research and Development areas are related to each other as much as possible. Projects enter from the left side, and after their observation and evaluation, they are brought together with the customer from the left. Many important projects, which are started with enthusiasm, disappear in the internal processes before meeting the customer. A significant issue with closed-loop innovation in the modern era is the increasing movement of highly qualified individuals. Additionally, the availability of private venture capital (VC) plays a role. Rapidly developing technology, increasing competitors, increasing expectations of customers make it impossible to implement the closed-loop innovation management model anymore. In the new situation, it has changed as can be seen in the graphic below. Figure 13, adapted from Martin-de Castro (2015), delineates the disrupted flow of the virtuous circle, illustrating the chain reaction initiated by technological breakthroughs and leading to potential organizational outcomes such as IPOs, acquisitions, or even the dissolution of the company. The model underscores the inherent risks and rewards in innovation, emphasizing pivotal moments such as the venture capital intervention and the strategic exit of key engineers to pursue new ventures.

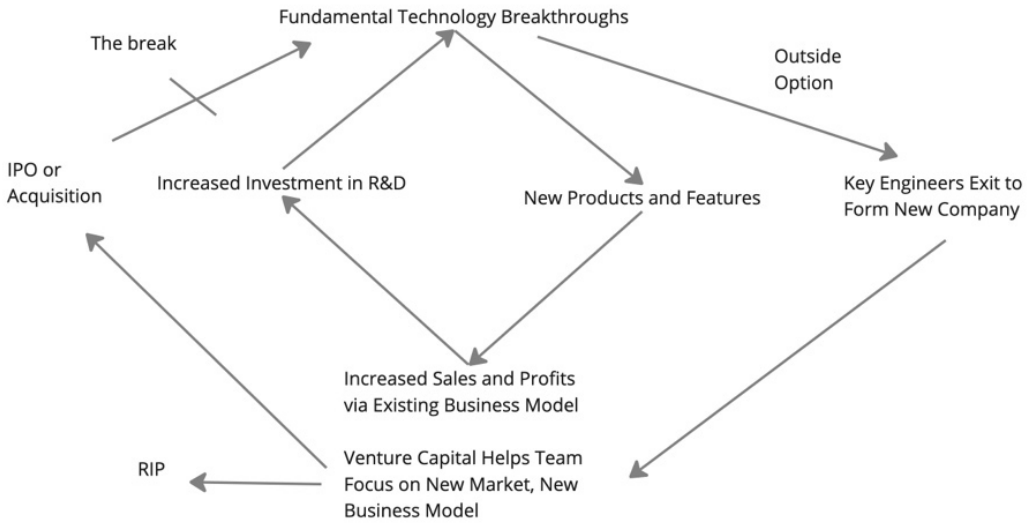

Figure 13 Virtous Circle Broken (Martín-de Castro, 2015)

The following table explains what the open innovation paradigm is integrated with the closed system. At this point, Chesbrough (2003) defined open innovation as:

"Open innovation is a paradigm that assumes that companies can and should use external ideas as well as internal ideas, and internal and external paths to market, as the companies look to advance their technology."

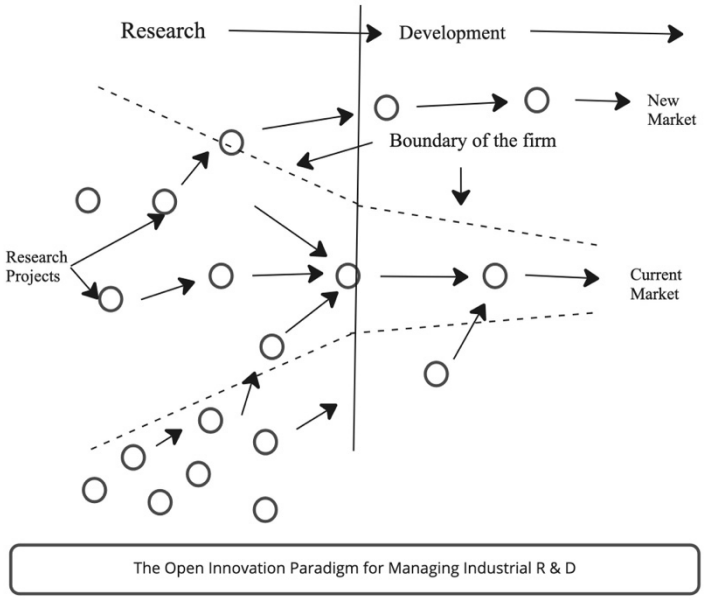

Figure 14 The Open Innovation Paradigm for Managing Industrial R&D (Chesbrough, 2003)

When comparing the principles of closed and open innovation in the given table, it's clear that open innovation plays a pivotal role in securing a company's sustained growth and longevity. Figure 14 that is shown below, adapted from Hong & Kuo (1999), delineates the intricate facets of innovation management, emphasizing the interconnectedness between key components such as specifying R&D and shaping culture and performance management. The diagram underscores the balance between visionary and practical approaches in innovation, suggesting the importance of both conceptual and actionable strategies in driving organizational success.

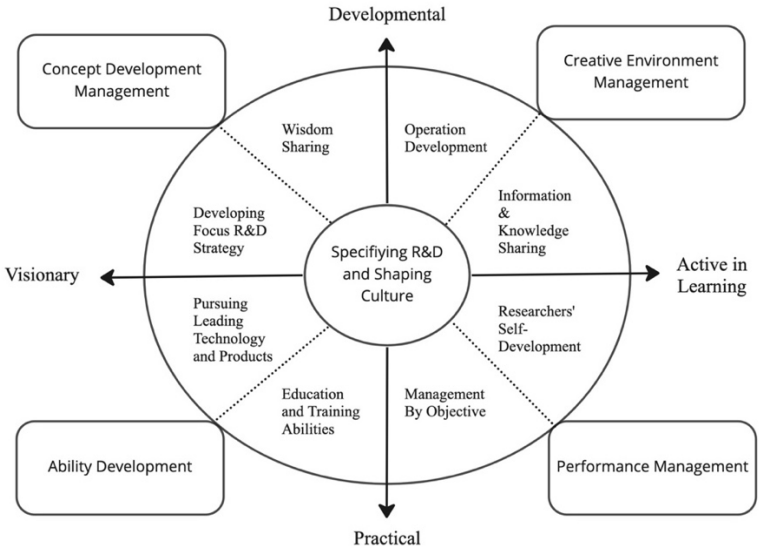

Figure 15 Innovation Management (Hong & Kuo, 1999)

Table 4 Contrasting Principles of Closed and Open Innovation

Contrasting Principles of Closed and Open Innovation	
Closed Innovation Principles	**Open Innovation Principles**
The smart people in our field work for us.	Not all the smart people work for us. We need to work with smart people inside and outside our company.
To profit from R&D, we must discover it, develop it, and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to market first will win.	Building a better business model is better than getting to market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our IP, so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

(Chesbrough, 2003)

Table 4, inspired by Chesbrough's 2003 study, highlights the core distinctions between Closed and Open Innovation concepts, showing the progression in thinking regarding

how companies handle R&D and innovation. While closed innovation emphasizes self-reliance and internal capabilities, open innovation encourages collaboration and leveraging both internal and external expertise to create and capture value.

2.3.5. Innovation Performance

To accurately grasp the innovation outcomes within an organization, it's vital to thoroughly understand the notions of both innovation and performance and synchronize them correctly. While the focus has been on defining innovation, it is now necessary to turn our attention to the concept of performance. In organizational theory, performance can be described as the accomplishments of a group of employees or the entire company within specific time frames. To clarify the notion of success further, it can be seen as achieving the set goals within the established parameters, either on time or even earlier, and with greater efficiency than anticipated. This approach encompasses both qualitative and quantitative aspects of performance (Frazier & Howell, 1983).

Innovation performance is primarily evaluated based on the axis of innovation. Researchers often explore this topic through the lenses of product and process innovation, total quality management (TQM), and research and development efforts (Prajogo & Ahmed, 2006).

Innovation is important in terms of maintaining the continuity of companies and providing superiority in the competition in the market and is a must for companies. Innovation performance also provides benefits for businesses to continue their lives, increase their profitability, increase their market shares and increase their competitive power (Eren et al., 2013; Sofiyabadi et al., 2020).

Innovation is intrinsically tied to generating new insights by learning and tailoring them to an organization's needs. It involves measuring and evaluating all stages, starting from knowledge development, management, and transformation into products or processes, to their introduction into the market. Additionally, the number of innovations implemented by a company and the willingness of its human resources to innovate are important factors

in assessing innovation performance. Additionally, in contemporary times, a company's ability for open innovation has emerged as a critical metric to assess innovation outcomes (Greco et al., 2015).

In the strategic innovation process, the capabilities of leaders play a crucial role in driving innovation performance. Their skills in developing new business models, fostering a culture of open innovation, and demonstrating effective leadership qualities are key factors that influence the success of innovation initiatives (Sofiyabadi et al., 2020; Therin, 2003).

2.4. Relation Between Organizational Learning, Knowledge Management, and Innovation

The interaction between organizational learning, knowledge administration, and innovation has garnered considerable academic attention. This connection emphasizes the intricate ways through which the acts of learning, acquiring, distributing, and applying knowledge within entities drive innovation. Organizational learning aids in the procurement and formulation of knowledge, while systems of knowledge administration are crucial in confirming the successful application and distribution of this knowledge. This cooperative relationship forms the bedrock for innovation by facilitating the conversion of knowledge into ideas, strategies, and methodologies, thereby boosting the organization's adaptability and competitive advantage in a swiftly changing landscape.

2.4.1. Organizational Learning and Innovation

Learning within an organization and its innovation capabilities are vital in improving business outcomes, securing a competitive advantage, and boosting profit margins for companies (Eren et al., 2013). Much of the scholarly literature suggests that learning within an organization has a beneficial effect on its innovation capabilities (Jerez-Gomez et al., 2005; Gunsel et al., 2011; Eren et al., 2013; Al-Hakim & Hassan, 2016; Hsu & Lamb, 2020).

Research indicates a strong and positive link between learning within an organization and its innovation outcomes (Jerez-Gomez et al., 2005; Gunsel et al., 2011; Eren et al., 2013; Al-Hakim & Hassan, 2016; Sahin, 2022). The link is rooted in the understanding that knowledge underpins both learning and innovation within an organization. As organizational learning cultivates knowledge, innovation emerges from the continuous cycle of knowledge the system demands. This effect not only enhances innovation performance but also ensures the competitive advantage and survival of companies. Innovation plays a crucial role in adapting to changing environments and staying ahead in the market.

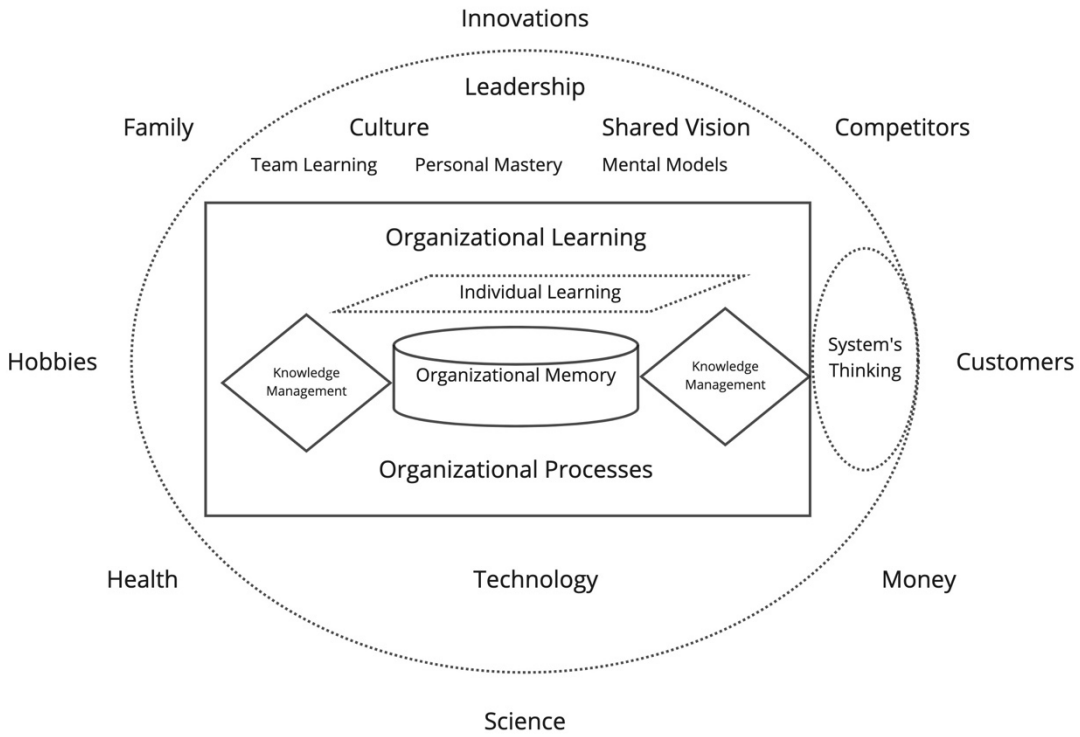

Figure 16 A Conceptual Model of Learning Organization and Knowledge Management (Aggestam, 2006)

Figure 16, based on Aggestam's 2006 research, showcases an intricate conceptual framework that merges the concepts of learning organizations and knowledge management, highlighting the interaction between personal and organizational learning. The framework underscores the significance of organizational memory and procedures, enveloped by outside influences like culture, leadership, and systemic thinking, suggesting a comprehensive perspective on knowledge and organizational development.

Organizational learning not only leads to increased success and performance for businesses but also serves as a catalyst for fostering innovation capacity (Eren et al., 2013). This procedure entails the development of fresh knowledge, closely associated with enhancements in innovative performance (Calantone et al., 2002). By transforming the knowledge acquired through organizational learning into innovation, companies can achieve sustainable competitive advantage (Costa & Monteiro, 2016). Managers acknowledge that human capital is one of a company's most precious resources. It has been seen the vital role of promoting personal learning, which subsequently elevates organizational knowledge and augments the firm's competitive edge due to its beneficial effect on innovative outcomes (Carneiro, 2000; Costa & Monteiro, 2016).

In modern companies that prioritize and emphasize learning capacity, the term "Knowledge Workers" has emerged to describe employees who actively generate knowledge. These individuals play a vital role as catalysts for innovation performance, particularly in technology-oriented industries like software, pharmaceuticals, healthcare, financial services, communications, and consulting, where knowledge is of paramount importance for global competitiveness. Due to the process of organizational knowledge acquisition, intellectual capital is poised to become the primary driver of innovation and creativity in the near future (Carneiro, 2000).

The contribution of organizational knowledge, stemming from organizational learning to the process of innovation is substantial. Yet, current scholarly works examining the impact of this knowledge on innovation outcomes are still sparse (Therin, 2003; Caroline & Angel, 2011). In companies that thrive on competition, strong productivity and innovation outcomes go hand in hand. Both organizational learning and effective knowledge management play pivotal roles in elevating such results (Cavaleri, 2004).

Historically, knowledge management and organizational learning were perceived as separate domains. However, the current perspective acknowledges their interrelatedness and potential synergy with innovation. Knowledge management focuses on practical aspects and actions, while organizational learning involves theories, values, and mental models. Even with this linkage, there's a noticeable gap in extensive studies examining the ties between organizational learning, knowledge management, and innovation (McElroy, 2000; Cavaleri, 2004).

Within the framework of knowledge management, organizational learning, and innovation, a key notion includes the application of reasoning, which also integrates the use of artificial intelligence in enterprises (Cavaleri, 2004).

Figure 17, inspired by Carneiro's research from 2000, illustrates the integral relationship between knowledge management and its influence on both innovation and competitiveness within an organization. The diagram underscores the significance of personal characteristics and development, emphasizing their role in shaping knowledge

development strategic decisions, which subsequently impacts market understanding and the ability to effectively compete.

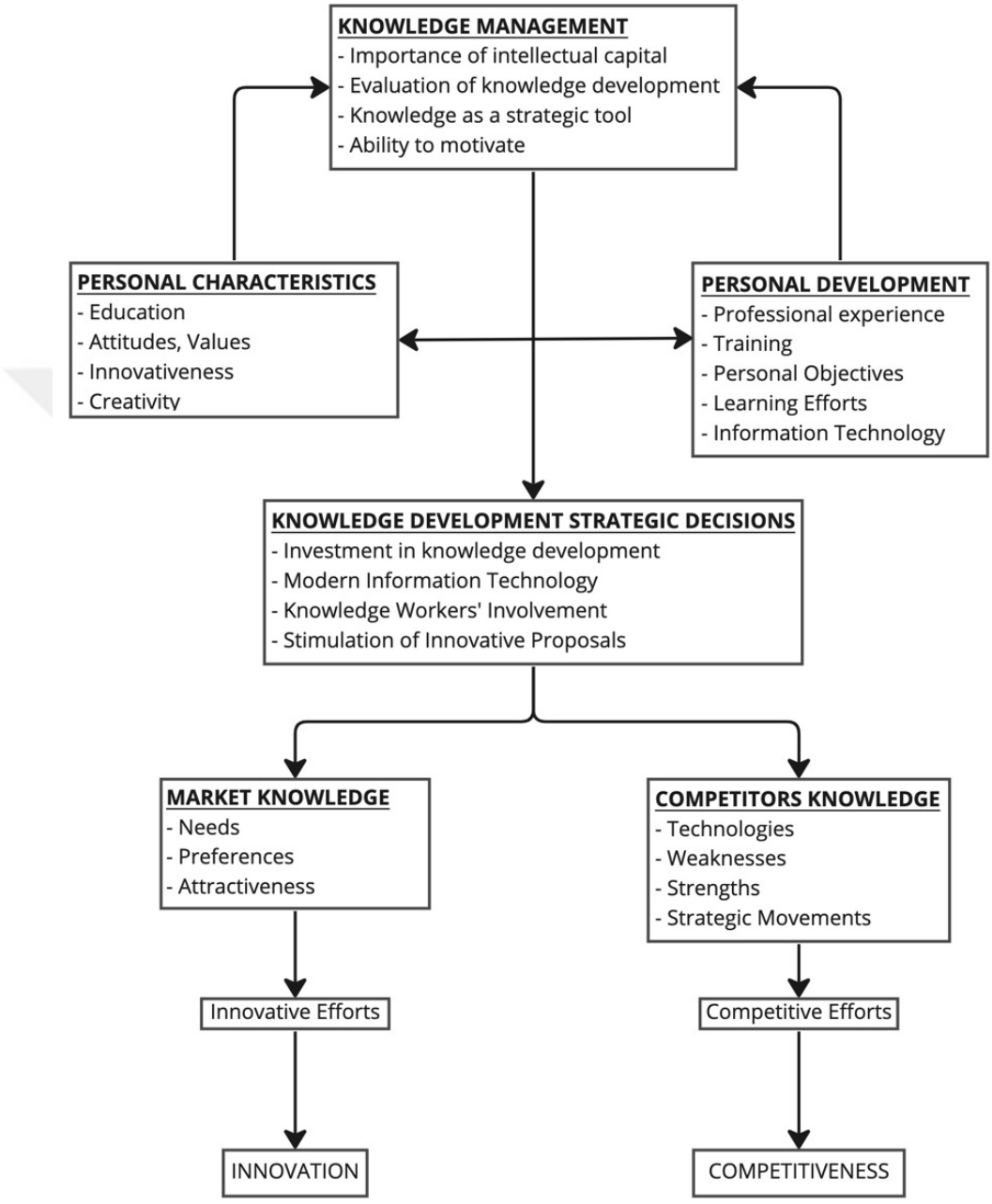

Figure 17 Influence of Knowledge Management on Innovation and Competitiveness (Carneiro, 2000)

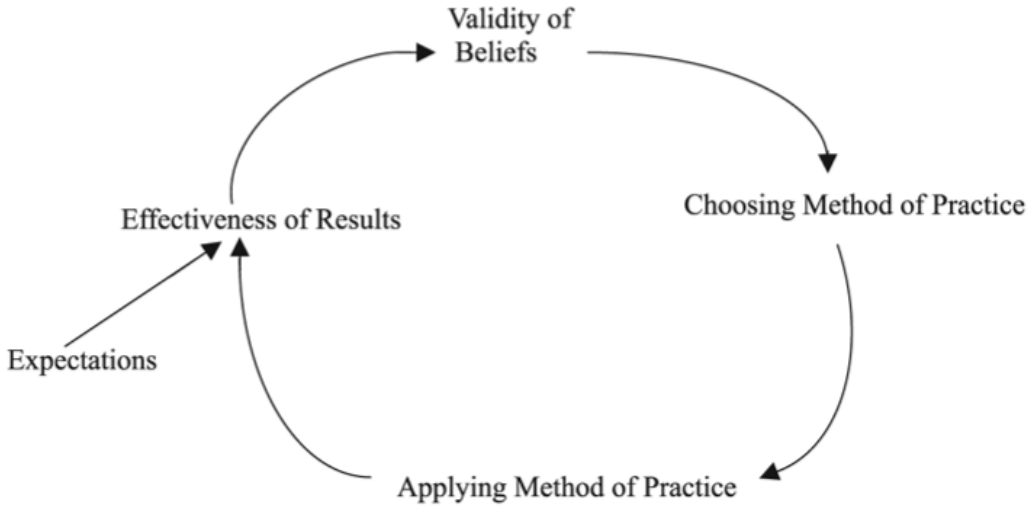

Figure 18 Learning Cycles (Cavaleri, 2004)

The core of pragmatist philosophy lies in logic, where learning, knowledge, and action are intricately interconnected. When companies emphasize improving innovation performance, the significance of organizational learning and its associated elements becomes evident through their ideas and outcomes. Latest research has delved into understanding the interactions between knowledge management, organizational learning, and innovation. This includes examining ideas like action learning cycles, assertions of knowledge, impactful actions, and cognitive frameworks and belief structures (Cavaleri, 2004; Onağ et al., 2014; Noruzy et al., 2013). These investigations shed light on the practical aspects of these areas and their role in driving effective action and promoting innovation within organizations. Figure 18, adapted from Cavaleri's 2004 work, delineates the cyclical nature of learning, emphasizing the interconnectedness of beliefs, practice methods, and the ensuing results. This model underscores the continuous feedback loop between expectations and the effectiveness of results, suggesting that learning is a dynamic process rooted in both our convictions and the outcomes of our applied methods.

Companies allocate resources to research and development not only to create innovative processes or products but also to assimilate and apply knowledge from external or internal sources. The dual functions of R&D bolster firms' willingness to allocate resources to

these initiatives, given the elements that impact the quality and simplicity of learning (Cohen & Levinthal, 1989). This is crucial in understanding the connection between organizational learning and innovation when considering the R&D aspect (Liao et al., 2008). By examining the R&D dimension, we can better evaluate how organizational learning contributes to innovation within companies.

Within the realm of organizational learning, systems for knowledge management are vital in enhancing learning and resource potential. Cultivating learning skills is vital to forge a connection between knowledge management and innovation (du Plessis, 2007). While knowledge originates from individuals, limiting it to individuals would hinder company progress, leading to minimal innovation, particularly during employee turnover. Therefore, transferring individual knowledge to the organization, in the form of organizational learning, becomes highly important and indispensable for innovation production (Therin, 2003).

In the realm of innovation, architectural innovation can occur through the integration of existing information within the company, whereas radical and incremental innovation results from the discovery of new information, essentially learning it (McKee, 1992; Therin, 2003; Liao et al., 2008). The type and quality of learning also play a significant role in determining the nature of innovation. Companies that effectively transform and internalize external information demonstrate a higher potential for successful innovation. Consequently, organizations proficient in organizational learning processes have the capacity to develop radical innovations (Therin, 2003).

In order to develop innovation, it is not sufficient for an institution to solely rely on external knowledge. Instead, it is crucial to develop a dynamic capacity to internalize and assimilate the external knowledge effectively. By possessing this capability, the organization can swiftly recognize, absorb, and apply external knowledge to its corporate knowledge base, ultimately leading to improved innovation performance (Martín-de Castro, 2015).

Moreover, there's a mutual connection between knowledge management and organizational learning. Knowledge management boosts organizational learning, and

concurrently, organizational learning enhances organizational innovation (Liao & Wu, 2010). This mutual interaction plays a vital role in enhancing the innovative capabilities of the organization.

Organizational learning is closely connected to the processing of organizational knowledge. The idea of a learning organization is frequently viewed as the pinnacle of organizational learning, resulting in parallels between organizational learning and the management of knowledge (Al-Hakim & Hassan, 2016). Additionally, double-loop learning, a type of organizational learning, is deemed especially apt for creating a knowledge management framework that underpins a lasting innovation system (Firestone & McElroy, 2004; Liao et al., 2008).

The process of organizational learning, which involves both individual and collective learning, significantly enhances the innovation capacity of the organization (Argyris, 1976; Liao et al., 2008). Among various learning capabilities, market-focused learning plays a crucial role in driving innovation. Additionally, the concept of knowledge inertia acts as a complete mediator, influencing organizational innovation through its impact on organizational learning (Liao et al., 2008).

2.4.2. Knowledge Management and Innovation

To encourage innovation within a company, employees must have access to knowledge, and this knowledge needs to be shared and exchanged within the organization (Eren et al., 2013, Omotayo, 2015). However, simply exchanging knowledge, whether obtained internally or externally, is not enough to drive innovation (Alegre et al., 2013). Before knowledge can be effectively utilized, it must be organized and structured into coherent patterns to make sense of it and classify it appropriately. Successful innovators are those who possess a deep understanding of product concepts and business potential, making knowledge a fundamental and crucial element in all forms of innovation, as recognized in modern and sustainable innovation management practices (Chapman & Magnusson, 2006; Darroch & McNaughton, 2002; Carneiro, 2000; Nonaka & Takeuchi, 1995; Argote, 2011; Kör & Maden, 2013; Huang & Li, 2009; Obeidat et al., 2016; Lin et al., 2012).

Knowledge management is pivotal in boosting innovation and flexibility in organizations. A vital element of knowledge management within organizational frameworks is the efficient dissemination and exchange of knowledge to pertinent sectors (Alavi & Leidner, 2001; Bennet & Bennet, 2004). However, a major challenge lies in organizations' ability to identify their existing knowledge and develop strategies to address this issue. This is also a central concern for achieving innovation performance (Alavi & Leidner, 2001).

Each organization has a unique mission and vision, leading to distinct learning purposes and methods. The act of learning encompasses collecting and overseeing knowledge from both inside and outside origins. This is vital for creating fresh insights, fundamental to an organization's capacity to evolve and innovate. Organizational learning is chiefly concerned with the journey of learning, whereas knowledge management zeroes in on the end products of that journey. Conversely, innovation underscores the significance derived from these outcomes (Aggestam, 2006).

The innovation performance of organizations is directly linked to the managers' ability to effectively utilize knowledge resources. Moreover, the processes of creating new knowledge significantly influence innovation (Alegre et al., 2013). While designing knowledge management practices with a sound configuration can enhance innovation performance, it does not always guarantee sustained improvement in innovation performance (Alegre et al., 2013, Lin et al., 2012).

Innovative companies greatly benefit from knowledge management systems, particularly those operating on a global scale. Effectively distributing and managing dispersed knowledge among teams contributes to a significant increase in innovation performance. Numerous studies have highlighted that knowledge sharing behaviors play a crucial role in generating organizational capabilities, including innovation (Alavi & Leidner, 2001; Mardani et al., 2018; Noruzy et al., 2013). Without knowledge, it becomes challenging to develop creative ideas and foster innovation. Hence, fostering innovation is perceived as a primary result of knowledge management.

Gaining a competitive edge through knowledge directly correlates with innovation and the use and discovery of knowledge. While the tie between knowledge management and innovation is clear, there's a lack of detailed research in current literature that probes the relationship among knowledge management, innovation, and performance. It's thought that knowledge management systems enhance innovation performance by facilitating quicker knowledge retrieval and keeping pace with emerging knowledge patterns (Mardani et al., 2018; Darroch & McNaughton, 2002; Nonaka & Takeuchi, 1995).

The combination of marketing and production competencies, along with effective knowledge acquisition and dissemination, and knowledge integration, positively influences new product performance. Utilizing knowledge management tools like "use of innovative knowledge," "efficient knowledge collection," and "shared tacit knowledge" appears to enhance innovation (Mardani et al., 2018). In the modern intensely competitive business environment, innovation is vital for companies to sustain and excel, rendering both knowledge management and institutional learning as critical elements (Bennet & Bennet, 2004).

Innovation heavily relies on knowledge, especially tacit knowledge (Gloet & Terziovskli, 2004). The creation of new products and services, termed as innovation, arises when broad knowledge is converted into specialized knowledge (Nonaka & Takeuchi, 1995). Knowledge is essential in sparking creativity and nurturing innovation. Managing this knowledge is crucial for hastening this progression, facilitating swift access to precise and fresh insights, and realizing company goals through the introduction of new products and services. Consequently, innovation garners notable attention within the realm of knowledge management research (Darroch et al., 2000; Caroline & Angel, 2011).

A study conducted by Caroline and Angel in 2011 indicates that strategic management of knowledge boosts both organizational innovation and performance. Their research solidly links knowledge management with innovation and organizational success.

While companies can innovate without implementing knowledge management systems or fully recognizing the importance of managing knowledge, this approach may not be sufficient to keep up with the demands of a dynamic environment. Therefore, knowledge

management becomes essential for sustaining innovation. The process of fostering innovation through knowledge management involves developing collaborations within the organization, transforming tacit knowledge into explicit knowledge, identifying knowledge needs, and addressing those needs to make knowledge accessible throughout the organization (du Plessis, 2007; Cavaleri, 2004; Nonaka & Takeuchi, 2007).

In the economy centered on knowledge, understanding is pivotal for fueling innovation. Interestingly, some claim that innovations arise from unconventional questions posed by individuals with limited knowledge. Both knowledge management and innovation are considered intangible assets for companies, and how to assess and evaluate these aspects in company valuations is a separate topic for discussion (Darroch, Shaw, & McNaughton, 2000).

The table below provides a detailed breakdown of the organizational performance's hierarchical arrangement concerning knowledge management and innovation management. In the context of the table presented, Dickel (2016) identified a significant connection between knowledge management and innovation, contributing to the academic discourse.

Knowledge management goes beyond merely focusing on innovation; it creates the necessary ecosystem for innovation to thrive. As innovation heavily relies on knowledge management, it is crucial to address issues related to knowledge abundance and knowledge access problems (Darroch & McNaughton, 2002; du Plessis, 2007). In the context of open innovation, companies with effective knowledge management processes can successfully internalize innovation (Cavusgil et al., 2003; du Plessis, 2007; (Cavusgil, Calantone, & Zhao, 2003; du Plessis, 2007; Martín-de Castro, 2015).

Figure 19, based on the research of Dickel & Moura (2016), showcases a structured framework that highlights the relationship among knowledge management, organizational alignment, and innovation in influencing organizational outcomes. The structure emphasizes the multifaceted nature of development evaluation, highlighting key factors such as human resources, organizational processes, innovation strategies, and the role of external partnerships.

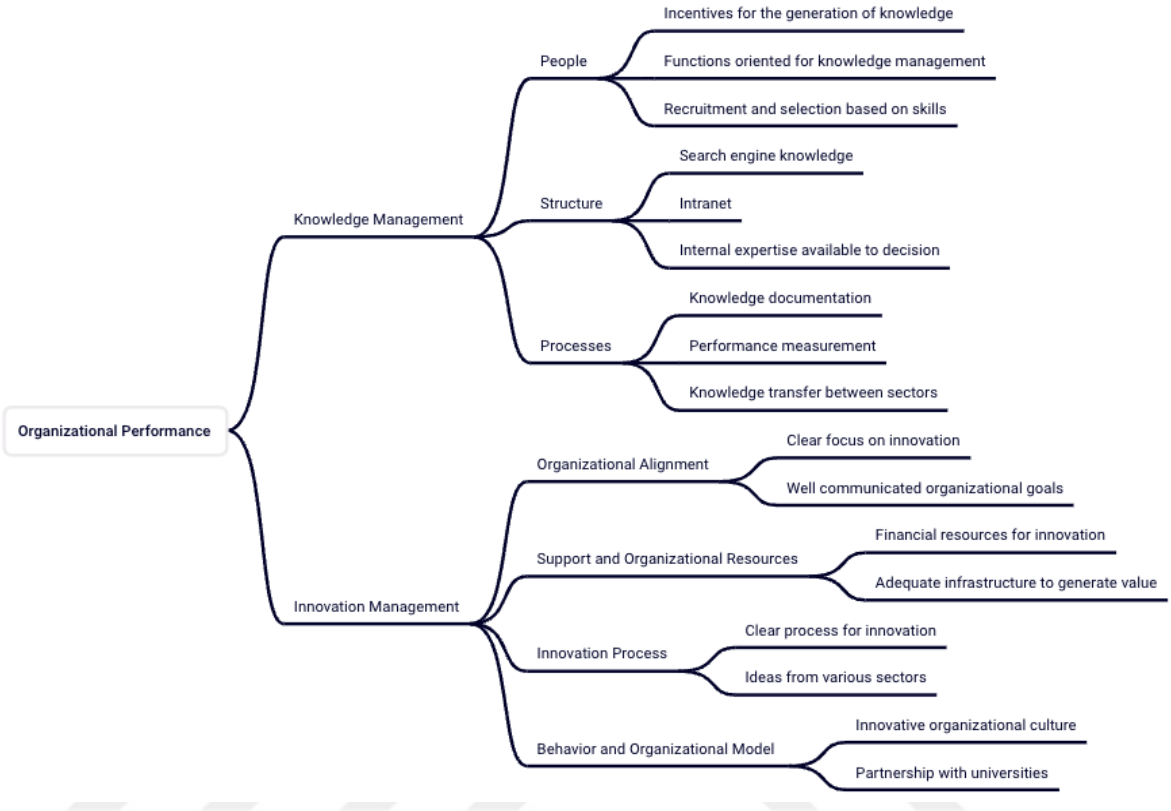

Figure 19 Hierarchical Structure for Evaluation of Development (Dickel & Moura, 2016)

Moreover, knowledge management plays a vital role in managing the complexity of knowledge during the innovation process and incorporating existing knowledge within the organization into innovation efforts. Businesses that can rapidly and effectively produce and employ such information have a higher likelihood of excelling in innovation than those that cannot (Cavusgil et al., 2003). Another crucial facet of the link between knowledge management and innovation is ensuring both internal and external knowledge are reachable via knowledge management. This aids in merging and understanding knowledge, allowing those participating in the innovation process to gain deeper perspectives and reflect thoroughly (du Plessis, 2007).

Knowledge management plays an important role in 5 main points in the innovation process (du Plessis, 2007).

1. Sharing and Codification of Tacit Knowledge

2. Explicit Knowledge
3. Enabling of Collaboration
4. Management of Knowledge Management Lifecycle (creation, gathering, sharing, leveraging of knowledge)
5. Creation of a Culture Conducive for Knowledge Creation and Sharing

For organizations, fostering a corporate culture that enhances their knowledge management is crucial to boost their innovation capabilities (Gloet & Terziovskli, 2004).

Knowledge and human capital are vital components in today's businesses, and managers and strategies that recognize knowledge management and human resources management as drivers of innovation will thrive. Knowledge management practices, centered around information technology (IT) and human resources management (HRM), serve as suitable tools to measure the relationship between innovation performance. Significantly, there's a positive linkage between IT and HRM-driven knowledge management techniques and innovation, highlighting a robust connection between knowledge management and innovative practices (Gloet & Terziovskli, 2004).

Through the lens of the knowledge-centric viewpoint, differences in performance among organizations stem from their unique capabilities in harnessing and cultivating knowledge. Employing effective knowledge management practices enhances the likelihood of achieving remarkable success in terms of innovation and overall business performance (Huang & Li, 2009; Inkinen et al., 2015). Procedures like obtaining, formulating, disseminating, employing, preserving, and possessing knowledge-driven assets are tightly linked with innovation outcomes and yield positive effects (Lee et al., 2005; Inkinen et al., 2015).

The role of knowledge management is pivotal in linking social interaction with innovation outcomes. Implementing an effective knowledge management system is crucial for harnessing the knowledge embedded in networks among employees (Huang & Li, 2009).

Through knowledge management, knowledge becomes accessible throughout the entire organization, enabling individuals and groups to access, share, and utilize knowledge, fostering a culture of learning. This process contributes to expanding the company's knowledge repository. The exchange of new knowledge and insights enhances problem-solving abilities and, more importantly, boosts innovation performance by inspiring employees to address challenges encountered in the competitive landscape (Nonaka & Takeuchi, 1995; Gold et al., 2001; Huang & Li, 2009; Argote, 2011).

Studies examining the influence of organizational learning elements and knowledge management procedures on the effective adoption of technological advancements show a positive relationship between knowledge gathering and its use. Furthermore, knowledge management serves as an enabler for thriving technological innovation. Through converting unspoken insights into product and procedural enhancements, knowledge management enhances overall innovation efficacy. (Lee et al., 2005; Huang & Li, 2009; Liao & Wu, 2010; Al-Hakim & Hassan, 2016).

3. METHODOLOGY

The objective of this research is to explore the connection between organizational learning, knowledge management, and innovative outcomes. Additionally, the study seeks to determine the intermediary function of knowledge management between organizational learning and innovative efficiency.

This section outlines the methods used for gathering data, the intended audience, the number of participants, and the sampling method utilized to meet the goals of this research. Additionally, it outlines the survey procedure carried out to facilitate the analyses conducted in this research. The research part of the study was carried out within the framework of a quantitative research design.

3.1. Research Design

The study investigates if knowledge management acts as an intermediary between organizational learning and innovative outcomes. In that point, the research design to be used to test the following hypotheses is presented in the graphic below.

H1: There is a significant and positive relationship between Organizational Learning and Innovation Performance.

H2: There is a significant and positive relationship between Organizational Learning and Knowledge Management.

H3: There is a significant and positive relationship between Knowledge Management and Innovation Performance.

H4: Knowledge Management has a mediating effect between Organizational Learning and Innovation Performance.

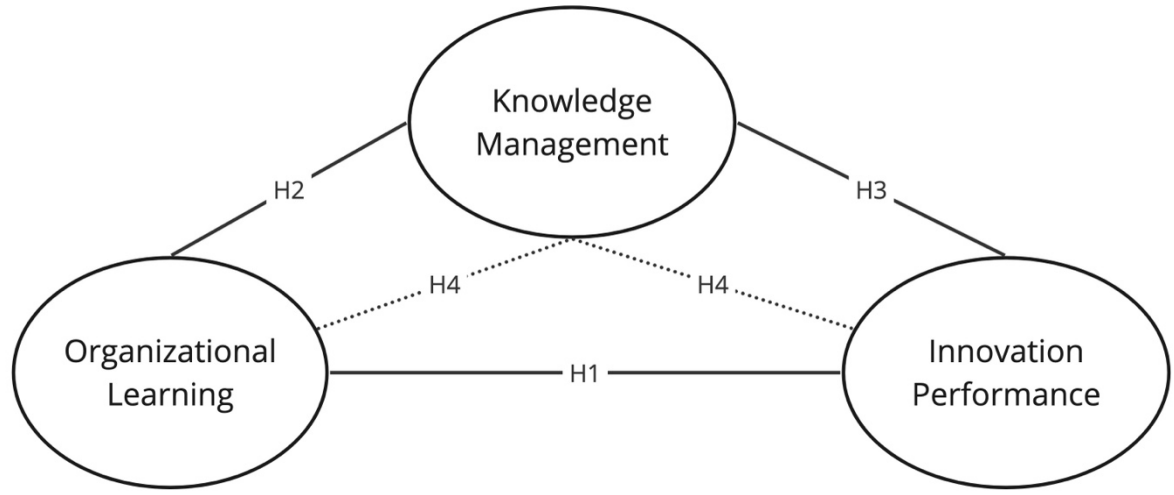

Figure 20 Hypothesis Diagram

3.2. Data Collection and Sample

Sample selection with the ability to represent the universe is very important, as it will allow correct ideas about the large group by examining a small group. This research has been applied to companies operating in technology parks in Turkiye. There are 92 technology parks in Turkiye, of which 78 are active and 14 are under construction. There are approximately 4500-5000 companies in these technology parks (Bilgin & Işık, 2022).

The number of companies is dynamic as some of the companies are closing periodically and some are being newly established. The survey was sent to 790 companies and the survey results from 341 companies were included in the research. The survey application started in January 2022 and was completed in February 2023.

In deciding the sample count, if the population specified in the table below is between 2500 and 5000, 333 to 357 participants in the sample were thought to be appropriate, depending on the p statistical significance value being accepted as 0.05 (Yazıcıoğlu & Erdoğan, 2004).

Table 5 P Statistical Significiance Table

Table of Sample Sizes for a=0.05									
Universe Size	+-0.03 sampling error (d)			+-0.05 sampling error (d)			+-0.10 sampling error (d)		
	p=0.5 q=0.5	p=0.8 q=0.2	p=0.3 q=0.7	p=0.5 q=0.5	p=0.8 q=0.2	p=0.3 q=0.7	p=0.5 q=0.5	p=0.8 q=0.2	p=0.3 q=0.7
100	92	87	90	80	71	77	49	38	45
500	341	289	321	217	165	196	81	55	70
750	441	358	409	254	185	226	85	57	73
1000	516	406	473	278	198	244	88	58	75
2500	748	537	660	333	224	286	93	60	78
5000	880	601	760	357	234	303	94	61	79
10000	964	639	823	370	240	313	95	61	80
25000	1023	665	865	378	244	319	96	61	80
50000	1045	674	881	381	245	321	96	61	81
100000	1056	678	888	383	245	322	96	61	81
1000000	1066	682	896	384	246	323	96	61	81
100 million	1067	683	896	384	245	323	96	61	81

(Yazıcıoğlu & Erdoğan, 2004)

During the data-gathering phase, a survey method was utilized. The research survey is divided into 4 sections.

The initial segment aims to collect personal details from the respondents, including their gender, age, educational background, and tenure at the organization.

The second segment utilizes the organizational learning scale formulated by Calantone, Cavusgil, & Zhao (2002) to assess the extent of organizational learning. This scale comprises four facets and 17 items (Calantone, Cavusgil, & Zhao, 2002). The Turkish rendition of the survey was adapted from Bıçkes' (2011) PhD dissertation, "The Linkages Between Organizational Learning, Innovation, and Firm Outcomes: An Examination of Innovation's Mediating Role in Large Enterprises," and Karabetyan's (2019) PhD work, "The Influence of Organizational Learning, Knowledge Management, and Innovation on Organizational Outcomes: A Study in Service Industries."

The questionnaire's third segment focuses on the knowledge management scale, conceived by Lee et al. (2005), drawing inspiration from Churchill (1979). This scale evaluates using 17 statements (Lee, Lee, & Kang, 2005; Churchill JR, 1979). The Turkish rendition of the survey was taken from Sozbilir and Yesil's (2016) piece titled "Influence of Knowledge Management on Competitive Edge: An On-ground Study in Turkiye" and Fettahlıoğlu and Hirlak's (2017) piece "The Role of Knowledge Management in Business on Organizational Ethos".

The fourth segment utilizes the innovation scale devised by Vila and Kuster to gauge innovation endeavors in firms. This scale encompasses 25 items (Vila & Pages, 2008). The Turkish adaptation of the survey was derived from Bıçkes' (2011) PhD dissertation, "The Relationships Between Organizational Learning, Innovation and Firm Performance: A Research on the Mediation Effect of Innovation in Large-Scale Enterprises"

The language construct validity and reliability of all scales were ensured. For the 3 scales in the questionnaire, the participants' level of agreement with each statement was designed as a 5-point Likert scale (1= Strongly Disagree, 2= Disagree, 3= Neither Agree nor Disagree, 4= Agree, 5= Strongly Agree).

3.3. Data Analysis Method

IBM SPSS 24 software tools were utilized for analyzing the collected data. For evaluating supplementary statistics of the participants, validating and verifying the scales' reliability, conducting Exploratory Factor Analysis (EFA) on the scales' structures, determining normal distribution, and carrying out both descriptive and regression analyses, SPSS was employed. Preliminary evaluations were made to determine the dataset's central tendencies, variations, and distribution patterns, offering insights into the broader data trends. The scales' internal consistency in this research was gauged through Cronbach's alpha coefficient, ensuring consistent and reliable outcomes for subsequent evaluations. To verify the scales' construct validity, an Exploratory Factor Analysis (EFA) was used, helping to pinpoint underlying factor structures and making sure each item had significant

loading on its specific factor. The dataset's normal distribution was confirmed, validating the use of parametric tests for future analyses. Regression analyses were carried out to grasp the relationships and impacts between dependent and independent variables, revealing the relationships' magnitude and orientation.

3.4. Reliability and Validity

Reliability in the study was evaluated through the calculation of Cronbach's alpha reliability coefficients. Detailed results concerning the validity and reliability of the survey are presented within the findings section.

The Cronbach's alpha coefficient derived during the reliability analysis indicates the scale's level of reliability. This coefficient ranges from 0 to 1, and if it exceeds 0.700, it signifies that the scale is considered reliable. Considering the calculated Alpha (α) coefficient, the reliability level of the scale can be interpreted as follows (Nunnally, 1967, 248).

I. not reliable if $.00 \leq \alpha < .40$,
II. If $.40 \leq \alpha < .60$, its reliability is low,
III. It is quite reliable if $.60 \leq \alpha < .80$,
IV. It is highly reliable if $.80 \leq \alpha < 1.00$.

4. FINDINGS

4.1. Demographic Information and Basic Statistics

Of the companies participating in the research, 39.9% are located in Yıldız Technical University, 35.2% in METU, 17.0% in ITU, 4.1% in Hacettepe and 3.8% in İzmir Technology Park.

Table 6 Distribution of companies by Technology Parks

University Technology Parks	Number	Percentage (%)
METU - Middle East Technical University Technology Park	120	35,2
İTÜ - Istanbul Technical University Technology Park	58	17
YTÜ - Yıldız Technical University Technology Park	136	39,9
Hacettepe University Technology Park	14	4,1
İzmir Technology Park	13	3,8
Total	341	100

While 51.9% of the companies participating in the research are not startup companies, 48.1% are startup companies.

Table 7 Company Profiles

Company Profiles	Number	Percentage (%)
Startup	164	48,1
Not Startup	177	51,9
Total	341	100

66.3% of the employees participating in the research are male and 33.7% are female.

Table 8 Gender

Gender	Number	Percentage (%)
Male	226	66,3
Female	115	33,7
Total	341	100

Among the company employees who took part in the study, 47.5% fall within the 26-35 age bracket, 30.8% are in the 36-45 age range, 11.1% belong to the 46-55 age group, 7.3% are 25 years old or younger, and 3.2% are 56 years old or older.

Table 9 Age

Age	Number	Percentage (%)
Age 25 and Under	25	7,3
26–35	162	47,5
36-45	105	30,8
46-55	38	11,1
Age 56 and above	11	3,2
Total	341	100

Among the company managers who took part in the study, 95.3% possess at least an undergraduate degree, 2.6% are high school graduates, and 2.1% have completed an associate degree program.

Table 10 Education

Education	Number	Percentage (%)
High School	9	2,6
Associate Degree	7	2,1
Undergraduate and Above	325	95,3
Total	341	100

In terms of the industry experience of the business managers who participated in the study, the breakdown is as follows: 33.4% have 5 years or less of experience, 27.0% have

between 6-10 years, 16.1% have between 11-15 years, 15.0% have 21 years or more, and 8% have 16-20 years of experience.

Table 11 Experience in the Industry

Experience in the Industry	Number	Percentage (%)
5 Years and Less	114	33,4
Between 6-10 Years	92	27
Between 11-15 Years	55	16,1
Between 16-20 Years	29	8,5
21 Years and Above	51	15
Total	341	100

Of the business participants participating in the research, 29.3% are department managers, 27.6% are owners/founders, 22.3% are specialists, 8.2% are owners and managers, 7.0% are general managers. , 4.7% are in other positions.

Table 12 Position in the Company

Position in the Company	Number	Percentage (%)
Owner/Founder	94	27,6
Owner and Manager	28	8,2
Chairman of the Board	3	0,9
Genelral Manager	24	7
Department Manager	100	29,3
Specialist	76	22,3
Other	16	4,7
Total	341	100

4.2. Factor Analysis

The research scale comprises three distinct sections. In the first phase, each scale included in the questionnaire was analyzed separately, and the sub-dimensions within each scale were identified through factor analyses. To minimize correlation between dimensions, items with equal factor loading on multiple sub-dimensions were excluded from the analyses.

4.2.1. Factor Analysis for Organizational Learning

The organizational learning scale consists of a total of 17 items. The reliability of the scale, assuming it to be unidimensional, was measured by calculating the Cronbach's Alpha value. The initial value obtained was 0.886. By eliminating item “Q17- We make little effort to share our experiences”, this value increased to 0.888; by eliminating item “Q15- Our business has special systems that allow us to share experiences gained from business activities”, it further increased to 0.890; by excluding item “Q16- As senior management in our business, we constantly emphasize the importance of sharing information”, it rose to 0.892; and by excluding item “Q14- As an company, we analyze our unsuccessful activities and share our experiences with the company as a whole”, it was possible to achieve a value of 0.895. Given that the difference between 0.886 and 0.895 is not significant, all variables were retained for further analysis. Considering the established threshold for acceptable reliability is 0.70, and the calculated Cronbach's Alpha value exceeds this, the data forming these variables is deemed reliable.

Table 13 Organizational learning factor analysis

QUESTIONS	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q01 Learning is seen as the main factor for our business to gain competitive advantage.	70,67	53,614	0,626	0,877
Q02 Learning is seen as a key factor in the development of our business	70,65	54,011	0,606	0,877
Q03 The expenditures made for the training of the employees in our company are not seen as an expense but as an investment.	70,71	54,782	0,443	0,883
Q04 In our business, learning is seen as the main tool that guarantees the continuity of our company.	70,74	52,451	0,693	0,874
Q05 There is a common unity of purpose shared by our employees.	70,79	53,196	0,644	0,876
Q06 The vision and values of our business have been adopted by all departments and employees.	70,98	52,353	0,636	0,875
Q07 All employees strive to achieve the objectives of the company.	70,79	53,757	0,563	0,878
Q8 Our employees see themselves as participants in determining the future of the enterprise	70,91	52,143	0,705	0,873
Q09 We reflect our predictions about customer expectations into our decisions and actions.	70,69	54,322	0,576	0,878
Q10 As a business, we constantly question our own decisions and actions.Q10 As a business, we constantly question our own decisions and actions.	70,93	54,198	0,469	0,882
Q11 Our employees constantly question the market and market conditions.	71,08	53,232	0,499	0,881
Q12 As a business, we constantly inquire about information about customers and the market.	70,75	54,057	0,606	0,877
Q13 There is a good dialogue between the managers and employees of our company that allow us to keep our experience alive	70,61	55,309	0,54	0,88
Q14 As an company, we analyze our unsuccessful activities and share our experiences with the company as a whole.	70,9	55,061	0,435	0,883
Q15 Our business has special systems that allow us to share experiences gained from business activities.	71,39	51,869	0,442	0,887
Q16 As senior management in our business, we constantly emphasize the importance of sharing information.	70,83	55,542	0,372	0,885
Q17 -We make little effort to share our experiences	70,6	54,812	0,344	0,888

α: Cronbach Alpha coefficient.

4.2.2. Factor Analysis for Knowledge Management

The knowledge management scale consists of a total of 17 items. The reliability of the scale, assuming it to be unidimensional, was measured by calculating the Cronbach's

Alpha value. The initial value obtained was 0.927, which was identified as the highest achievable value for this scale. Considering the established threshold for acceptable reliability is 0.70, and the calculated Cronbach's Alpha value greatly exceeds this, the data forming these variables is deemed reliable.

Table 14 Knowledge management factor analysis

QUESTIONS	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q18 Our business has a research and training program.	71,44	78,1	0,587	0,926
Q19 Teamwork is encouraged by using knowledge and information in our business.	71,03	82,823	0,646	0,923
Q20 Intensive use of electronic data exchange to make things easier.	71	81,591	0,658	0,922
Q21 There are incentives and fringe benefits for new ideas and suggestions in our business.	71,7	81,723	0,406	0,931
Q22 Our business has a culture that encourages knowledge sharing.	71,06	81,911	0,683	0,922
Q23 In our company, work flow charts are used while performing tasks.	71,12	79,321	0,685	0,921
Q24 In our business, we consult the company database before starting work.	71,17	77,446	0,7	0,921
Q25 We try to specialize in new job design and development.	70,83	83,726	0,625	0,924
Q26 In our business, we try to follow the legal rules and policies related to the business.	70,77	85,196	0,541	0,925
Q27 In order to obtain the knowledge required for the business in our business, extensive research is carried out in customer and business-related databases.	71,05	78,227	0,81	0,918
Q28 Required information for jobs is archived in our company.	70,86	82,472	0,701	0,922
Q29 The achievements of the training (given) in our company are summarized and stored.	71,21	77,967	0,666	0,922
Q30 In our business, the necessary knowledge for the business can be managed systematically and stored for later use	70,97	81,514	0,735	0,921
Q31 In our business, the necessary information and knowledge for the jobs are shared.	70,88	83,308	0,73	0,922
Q32 In our business, efficiency is increased by sharing information and knowledge.	70,95	83,548	0,652	0,923
Q33 Knowledge systems such as intra-company internet network and electronic bulletin boards have been developed to share information and knowledge in our company.	71,2	77,348	0,667	0,923
Q34 Sharing of information and knowledge with other teams is supported in our company.	70,98	82,917	0,648	0,923

4.2.3. Factor Analysis for the Innovation

The innovation performance scale comprises a total of 24 items. The reliability of the scale, considering it as unidimensional, was assessed by calculating the Cronbach's Alpha value. The initial value derived was 0.946. The highest achievable value was determined

to be 0.948 upon the removal of item Q35- Our products are superior to competing products. However, given the minimal difference, all variables were included in the analysis. Evaluating the calculated Cronbach's Alpha value and noting that it significantly surpasses the acceptable threshold of 0.70, the data forming these variables is recognized as reliable.

Table 15 Innovation performance factor analysis

QUESTIONS	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q35 Our products are superior to competing products.	103,01	136,72	0,279	0,948
Q36 Our products meet the needs of customers very well.	102,72	133,707	0,642	0,945
Q37 The level of consistency between the prices and benefits of our products is very good.	102,75	133,729	0,535	0,945
Q38 The level of technological sophistication of our products perceived by customers is quite good.	102,77	131,567	0,686	0,944
Q39 The perceived innovation of our products is quite good.	102,77	131,967	0,691	0,944
Q40 Our company's market capabilities in successfully creating a new product are quite good.	103,02	128,011	0,789	0,942
Q41 In successfully creating a new product, the level of fit between our company's market capabilities and the factors that reveal these capabilities is quite good.	103,11	127,689	0,729	0,943
Q42 Our business is very timely to bring a product to market.	103,21	125,883	0,756	0,943
Q43 The commitment of the Human Resources department to new product development in our company is quite good	103,98	128,347	0,424	0,951
Q44 The determination of the R&D department in our company to develop new products quite good	102,81	133,3	0,455	0,947
Q45 The level of use of formal procedures to develop new products in our business is quite good	102,74	132,399	0,558	0,945
Q46 The level of competence/ability of our company in performing pre-production activities is quite good	102,87	130,487	0,706	0,943
Q47 The level of proficiency/ability of our business in achieving marketing actions is quite good.	103,13	126,016	0,71	0,943
Q48 Our company's proficiency/ability to use new technologies to develop new products is quite good	102,7	132,089	0,708	0,944
Q49 Our company's proficiency/ability to bring products to market is quite good.	103,02	127,388	0,736	0,943
Q50 The efficiency of the time period between the transformation of a new idea into a product and its presentation to the market is quite good compared to its competitors	103,14	129,092	0,608	0,945
Q51 Our company's level of adaptation to the internal and competitive environment is quite good.	102,8	130,044	0,749	0,943
Q52 The level of consideration of customer expectations in the new product development process in our company is quite good.	102,75	130,898	0,694	0,944
Q53 The level of participation of all departments in the new product development process in our company is quite good.	102,77	130,333	0,678	0,944
Q54 Interdepartmental communication level is quite good during the new product development process in our company.	102,75	130,519	0,717	0,943
Q55 The level of support of the new product development process by the top management is quite good.	102,62	134,329	0,605	0,945
Q56 The effectiveness of our company's competitive response against new product entries is quite good	102,96	128,639	0,729	0,943
Q57 The possibility/level of our company's competitiveness against new product entries is quite good	102,85	129,067	0,793	0,942
Q58 Our company's ability to predict the change in customer expectations was quite good	102,79	131,428	0,702	0,944

4.3. Testing Hypothesis

Linear regression techniques were utilized to assess the hypotheses established to meet the research goals. In summary, the Goodness of Fit Indexes is displayed in the table provided below.

4.3.1. Organizational Learning and Innovation Performance

For the hypothesis ;

- H1: There is a significant and positive relationship between Organizational Learning and Innovation Performance

A regression analysis was conducted with Organizational Learning as the independent variable and Innovation as the dependent variable.

Table 16 Organizational learning and innovation performance mean and standart deviation

	Mean	Std. Deviation	N
Innovation	4,4747	0,49623	341
Organziational Learning	4,4266	0,45683	341

Based on the analysis, a strong positive relationship between organizational learning and innovation has been identified. It has been determined that a one-unit increase in organizational learning behavior results in a 0.704 (70%) unit increase in innovation.

Table 17 Organizational learning and innovation performance regression

	R	Adjusted R Square	Beta	Std. Error	F/t	Sig.
	,704[a]	0,493			332,178	,000[b]
(Constant)			1,092	0,187	5,852	0
Organizational Learning			0,704	0,042	18,226	0

4.3.2. Organizational Learning and Knowledge Management

To test the hypothesis

- H2: There is a significant and positive relationship between Organizational Learning and Knowledge Management,

a regression analysis was conducted with Organizational Learning as the independent variable and Knowledge Management as the dependent variable.

Table 18 Knowledge management and organizational learning mean and standart deviation

	Mean	Std. Deviation	N
Knowledge Management	4,442	0,56166	341
Organizational Learning	4,4266	0,45683	341

Based on the analysis, a strong positive relationship between organizational learning and knowledge management has been identified. An increase of one unit in organizational learning behavior leads to a high increase of 0.659 units in knowledge management.

Table 19 Knowledge management and innovation performance regression

	R	Adjusted R Square	Beta	Std. Error	F/t	Sig.
	,659[a]	0,433			260,639	,000[b]
(Constant)			0,854	0,223	3,822	0
Organizational Learning			0,659	0,05	16,144	0

4.3.3. Knowledge Management and Innovation Performance

The hypothesis

- H3: There is a significant and positive relationship between Knowledge Management and Innovation Performance

was tested using a regression analysis, with Knowledge Management as the independent variable and Innovation as the dependent variable.

Table 20 Knowledge management and innovation performance mean and standart deviation

	Mean	Std. Deviation	N
Innovation	4,4747	0,49623	341
Knowledge Management	4,442	0,56166	341

Based on the analysis, a strong positive relationship between Knowledge Management and Innovation has been identified. A one-unit increase in Knowledge Management leads to a significant 0.781 unit increase in Innovation.

Table 21 Mediatign effect of knowledge management between organizational learning and innovation performance

	R	Adjusted R Square	Beta	Std. Error	F/t	Sig.
	,781[a]	0,609			530,342	,000[b]
(Constant)			1,409	0,134	10,505	0
Knowledge Management			0,781	0,03	23,029	0

4.3.4. Mediating Effect of Knowledge Management Between Organizational Learning and Innovation Performance

The hypothesis "H4: Knowledge Management mediates the relationship between Organizational Learning and Innovation Performance" was tested using a regression analysis, with Organizational Learning and Knowledge Management as independent variables, and Innovation as the dependent variable.

The analysis results revealed that both Knowledge Management and Organizational Learning positively influence Innovation. When Knowledge Management was added to the model between Organizational Learning and Innovation, the effect of Organizational Learning decreased from 0.704 to 0.334. This reduction indicates that Knowledge Management has a mediating role in the relationship between Organizational Learning and Innovation.

When determining the relationship between two phenomena, if no other factor is included in the analyses, the relationship between these two variables is termed a direct effect. However, if a third variable is included in the analyses to explain the effect between these two variables and the relationship level between the first two variables decreases, it can be inferred that the last added variable has a mediating effect on the relationship between the initial two variables. In this model, where three variables are present, the final state of the relationship between the first two variables is referred to as the direct effect, while the level at which the first variable affects the second variable through the third variable is called the indirect or mediated effect.

Thus, the hypothesis “H4: There is a mediating effect of Knowledge Management between Organizational Learning and Innovation Performance” is accepted.

Initial analyses were conducted to compute central tendencies, dispersions, and the shape of the dataset's distribution. This provided an understanding of the general trends and patterns in the data. The internal consistency of the scales used in this study was determined using Cronbach's alpha coefficient. This ensured that the scales provided consistent results and were reliable for further analysis. To assess the construct validity of the scales, an Exploratory Factor Analysis (EFA) was employed. This method helped in identifying the underlying factor structures and ensured that each item loaded significantly on its respective factor. The normal distribution of the dataset was verified, which is a prerequisite for many statistical techniques. This confirmed the appropriateness of employing parametric tests in subsequent analyses. Regression Analysis is to understand the relationships and influences between independent and dependent variables, regression analyses were conducted. This allowed for the determination of the strength and direction of the relationships.

Each of these steps was critical in ensuring that the research findings were grounded in robust statistical evidence. Proper diagnostic tests were also performed to check for potential issues like multicollinearity, outliers, and homoscedasticity, ensuring the validity and reliability of the regression analyses.

5. DISCUSSION & CONCLUSION

This study explores the connections between knowledge management, organizational learning, and innovation performance. These concepts are closely intertwined, as they all originate from the resource-based theory and knowledge-based theory (Bennet & Bennet, 2004; Gloet & Terziovskli, 2004; Nonaka & Takeuchi, 1995; Chapman & Magnusson, 2006). Our research outcomes indicate a positive association between knowledge management, organizational learning, and innovation performance within technology parks in Turkiye.

This research encompassed managers representing 341 companies situated in prominent technology parks throughout Turkey, with 48.1% of these being startup companies. Science and technology parks have their origins in the industrial advancements that followed the Industrial Revolution in England, as emphasized in prior studies (Vila & Pages, 2008). These technology parks hold substantial significance within regional development strategies and serve as pivotal centers for advancing innovation policies, as highlighted in earlier research (Vila & Pages, 2008; Goldstein & Luger, 1990; Urriago et al., 2020).

In recent times, the importance of commercialization has grown significantly, as it plays an active role in promoting knowledge transfer, driving economic growth, generating employment opportunities, and fostering entrepreneurship. The role of university incubators and technology parks in promoting commercialization has also been firmly established. Science and technology parks act as catalysts by creating a favorable setting for the exchange of knowledge and the promotion of innovation (Jamil et al., 2015).

The International Association of Science Parks (IASP) provides a definition of a science park, characterizing it as an organization overseen by dedicated experts whose primary goal is to foster an environment of innovation culture and competitiveness among the knowledge-based institutions and businesses associated with it, ultimately contributing to the well-being of the community. Past studies conducted within Science and Technology

Parks in Turkey underscore the significance of investigating this domain, rendering it a captivating and imperative undertaking (Ar & Baki, 2011).

The empirical study's participant companies were chosen from a roster of companies associated with technology-oriented universities, including Middle East Technical University, Istanbul Technical University, Yıldız Technical University, Hacettepe University, and Technopark Izmir. In the period spanning from January 2022 to February 2023, a total of 790 questionnaires were distributed, yielding 341 valid and fully completed responses for subsequent quantitative analysis.

When considering the categories of organizational learning, knowledge management, and innovation, it is essential to examine the constituent sub-components within each category. In the context of the association between organizational learning and innovation performance, the regression coefficient demonstrates a satisfactory value of 0.704, indicating a significant and positive relationship between these variables. Similarly, in the examination of the relationship between organizational learning and knowledge management, the regression coefficient attains a favorable level of 0.659, signifying a significant and positive connection between these two constructs. Furthermore, when scrutinizing the linkage between knowledge management and innovation performance, the regression coefficient reaches an acceptable level of 0.781, highlighting a significant and positive correlation between knowledge management and innovation performance.

Regarding the role of knowledge management as a mediator in the relationship between organizational learning and innovation performance, the initial regression coefficient stands at 0.704 prior to the inclusion of knowledge management as a variable. However, this coefficient decreases to 0.334 upon the incorporation of knowledge management into the analysis.

Our exploration began by examining how knowledge management practices are employed in Turkiye's technology parks. We've uncovered factors that significantly impact organizational learning and subsequent innovation performance. This knowledge management framework was then linked to the process of organizational learning, which

demonstrated its crucial role in cultivating a culture of continuous learning and knowledge transfer. This, in turn, contributes to enhanced innovation outcomes.

The implications of this study reach both academic and practical domains, offering insights into knowledge management, organizational behavior, and innovation. By emphasizing the importance of well-structured knowledge management initiatives, our research provides guidance on their customization for technology parks. This, in turn, supports their growth and competitive advantage.

For professionals in the field, our results underscore the advantages of dedicating resources to efficient knowledge management strategies. By nurturing a culture of learning and encouraging the dissemination of knowledge, organizations within technology parks can markedly enhance their innovation capacity and overall performance.

This research enhances our comprehension of knowledge management, organizational learning, and innovation, making valuable contributions to both theoretical and practical domains. By reinforcing the connection between knowledge management and innovation, technology parks can augment their position as centers of innovation, thereby contributing to the advancement of the nation.

5.1.Recommendations for Further Research

While this study enhances the understanding of the relationships between knowledge management, organizational learning, and innovation, there are opportunities for further exploration. Future research could investigate the underlying mechanisms that connect knowledge management to innovation outcomes. Comparative studies involving technology parks in various regions could reveal contextual factors influencing these relationships.

Organizational learning, knowledge management, and innovation converge at the intersection of knowledge and practicality, emphasizing the importance of future

research. There is still much work to be done in terms of exploring the relationship between knowledge management, organizational learning, and innovation within the context of resource-based theory. Examining these relationships through similar studies conducted in clusters could be a critical area of study in the context of global competition. Additionally, the literature on business management and artificial intelligence is rapidly evolving, presenting an opportunity to conduct knowledge-based theory-based studies in this field (Paschen et al., 2020). Investigating the role of emerging technologies, like artificial intelligence and machine learning, in optimizing knowledge management and innovation processes presents an intriguing research opportunity.

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Bu anket formu İstanbul Ticaret Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı'nda hazırlanmakta olan "Örgütsel Öğrenme ve Bilgi Yönetiminin Yenilikçilik (İnovasyon) Üzerindeki Etkisi: Teknopark Şirketlerinde Bir Uygulama" isimli Yüksek Lisans tezi ile ilgilidir. Bu araştırma tamamen akademik bir amaca yönelik olarak hazırlanmış olup göstereceğiniz ilgiden dolayı teşekkür ederiz. Saygılarımızla

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ÖRGÜTSEL ÖĞRENMEYE İLE İLGİLİ İFADELER

DEĞERLENDİRME: 1: Kesinlikle Katılmıyorum **2:** Katılmıyorum **3:** Kararsızım **4:** Katılıyorum **5:** Kesinlikle Katılıyorum

	Lütfen aşağıdaki soruları firmanızın öğrenme yönelim düzeyi hakkında düşündüklerinizi göz önüne alarak cevaplayınız. Örgütsel Öğrenmeye ilişkin aşağıdaki ifadelere katılıp katılmadığınızı (X) işaretleyerek belirtiniz.	**1**	**2**	**3**	**4**	**5**
1	Yöneticiler temel olarak firmamızın öğrenme yeteneğinin, rekabet avantajımızın kaynağı olduğu konusunda hemfikirdir					
2	Bu firmanın temel değerleri, gelişim için öğrenmenin bir anahtar olduğunu içerir.					
3	Firmamızdaki genel kanı, çalışanların öğrenmesinin bir gider kalemi değil, bir yatırım olduğudur.					
4	Şirketimizde öğrenme, şirketin devamlılığını sağlamak için gereken ana bir özellik olarak görülür					
5	Şirketimde bir amaç birlikteliği vardır.					
6	Şirketimizin tüm birimlerinde organizasyonun vizyonu üzerinde bir görüş birliği vardır					
7	Tüm çalışanlar bu şirketin hedeflerine bağlılık gösterirler.					
8	Çalışanlar kendilerini şirketin geleceğinin belirlenmesinde pay sahibi olarak görürler.					
9	Müşterilerimiz hakkında oluşturduğumuz kabullerimizi (değerlerimizi) kritik etmekten çekinmeyiz					
10	Bu kurumda çalışanlar pazarı algıladıkları yolu sürekli olarak sorgulamaları gerektiğinin bilincindedir.					
11	Müşteri bilgilerini yorumlama şeklimizi nadiren kollektif olarak sorgularız.					
12	Kararlarımızı ve zaman içinde yapılan faaliyetlerin kalitesini sürekli olarak sorgularız.					
13	Geçmişten öğrenilen dersleri canlı tutan örgütsel bir iletişim mekanizması vardır					
14	Başarısız örgütsel girişimleri daima analiz eder ve çıkarılan dersleri etraflıca tartışırız.					
15	Birimden birime, takımdan takıma veya bölümden bölüme, örgütsel uygulamalardan öğrenilen dersleri paylaşmak için belirli mekanizmalarımız vardır.					

16	Üst yönetim sürekli olarak şirketimizde bilgi paylaşımının önemini vurgular.					
17	Deneyim ve dersleri paylaşmak için az çaba sarf ediyoruz.					
BİLGİ YÖNETİMİ İLE İLGİLİ İFADELER						
DEĞERLENDİRME: A: Kesinlikle Katılmıyorum B: Katılmıyorum C: Kararsızım D: Katılıyorum E: Kesinlikle Katılıyorum						
Lütfen aşağıdaki soruları firmanızın bilgi yönetimi düzeyi hakkında düşündüklerinizi göz önüne alarak cevaplayınız. Bilgi yönetimi ilişkin aşağıdaki ifadelere katılıp katılmadığınızı (X) işaretleyerek belirtiniz.		**A**	**B**	**C**	**D**	**E**
1	Firmamızın araştırma ve eğitim programı vardır.					
2	Organizasyon çapında bilgi ve enformasyon kullanılarak takım çalışması teşvik edilir.					
3	İşlerimizin yapılmasını kolaylaştırmak için elektronik veri değişimi yoğun bir şekilde kullanılır.					
4	Firmamızda, yeni fikir önerileri için teşvik ve yan haklar vardır.					
5	Firmamızda, bilgi paylaşımını teşvik eden bir kültür vardır.					
6	Firmamızda, görevler yerine getirilirken iş akış şemaları vardır ve kullanılır.					
7	Firmamızda, işe başlamadan önce şirket veri tabanına başvururuz.					
8	Biz yeni iş tasarım ve geliştirme üzerine uzmanlaşmaya çalışırız.					
9	Firmamızda iş ile ilgili yasal kurallar ve politikalar izlenmeye çalışılır.					
10	Firmamızda iş için gereken bilgiyi elde etmek için müşteri ve iş ile ilgili veri tabanlarında kapsamlı bir şekilde araştırma yapılır.					
11	Firmamızda işler için gerekli bilgileri belgelenir (arşivlenir).					
12	Firmamızda (verilen) eğitimin kazanımları özetlenip saklanır.					
13	Firmamızda sistematik bir şekilde iş için gerekli bilgi yönetebilir ve daha sonra kullanımı için saklanabilir.					
14	Firmamızda, işler için gerekli enformasyon ve bilgi paylaşılır.					
15	Firmamızda, enformasyon ve bilgi paylaşılarak işlerde etkinlik artırılır.					
16	Firmamızda enformasyon ve bilgi paylaşmak için, intranet (firma içi internet ağı) ve elektronik bülten panoları gibi, bilgi sistemleri geliştirildi.					
17	Firmamızda enformasyon ve bilgilerin diğer ekiplerle paylaşılması desteklenir.					
YENİLİKÇİLİK (İNOVASYON) İLE İLGİLİ İFADELER						
DEĞERLENDİRME: A: Kesinlikle Katılmıyorum B: Katılmıyorum C: Kararsızım D: Katılıyorum E: Kesinlikle Katılıyorum						
Lütfen aşağıdaki soruları firmanızın yenilikçilik düzeyi hakkında düşündüklerinizi göz önüne alarak cevaplayınız. Yenilikçiliğe ilişkin aşağıdaki ifadelere katılıp katılmadığınızı (X) işaretleyerek belirtiniz.						
1	Ürünlerimiz rakip ürünlere nazaran üstündür.					
2	Ürünlerimizin tüketicilerin ihtiyaçlarını karşılama düzeyi oldukça iyidir.					
3	Ürünlerimizin fiyatları ve sağladıkları faydalar arasındaki tutarlılık düzeyi oldukça iyidir.					
4	Ürünlerimizin müşteriler tarafından algılanan teknolojik gelişmişlik düzeyi oldukça iyidir.					
5	Firmamızın bir ürünü pazara sunmadaki zamanlaması oldukça iyidir.					
6	Ürünlerimizin algılanan yenilik derecesi oldukça iyidir.					
7	Yeni bir ürünü başarılı bir şekilde oluşturmada firmamızın Pazar yetenekleri oldukça iyidir.					
8	Yeni ürün girişlerine karşı firmamızın rekabet edebilme olasılığı/düzeyi oldukça iyidir.					

9	Firmamızda İnsan Kaynakları departmanının yeni ürün geliştirmeye olan bağlılığı oldukça iyidir.					
10	Firmamızda Ar-Ge departmanının yeni ürün geliştirme konusundaki kararlılığı oldukça iyidir.					
11	Firmamızda yeni ürün geliştirmek için resmi prosedürlerin kullanım düzeyi oldukça iyidir.					
12	Firmamızın üretim öncesi faaliyetleri (fikir geliştirme, pazar araştırması, finansal analiz vb.) gerçekleştirmedeki yeterlilik düzeyi/yeteneği oldukça iyidir					
13	Firmamızın pazarlama eylemlerini başarmadaki yeterlilik düzeyi/yeteneği oldukça iyidir.					
14	Firmamızın yeni ürünler geliştirmek için yeni teknolojilerden yararlanmadaki yeterliliği/yeteneği oldukça iyidir.					
15	Firmamızın ürünleri piyasaya sunmadaki yeterliliği/yeteneği oldukça iyidir.					
16	Firmamızda yeni bir fikrin ürüne dönüştürülmesi ve pazara sunumu arasında geçen zaman diliminin rakiplere nazaran etkinliği oldukça iyidir.					
17	Firmamızın içsel çevreye, rekabetçi çevreye uyum düzeyi oldukça iyidir					
18	Firmamızda yeni ürün geliştirme sürecine bütün departmanların katılım düzeyi oldukça iyidir.					
19	Yeni ürün geliştirme sürecinin üst yönetim tarafından desteklenme düzeyi oldukça iyidir					
20	Yeni ürün girişlerine karşı firmamızın oluşturduğu rekabetçi tepkinin etkinliği oldukça iyidir.					
21	Firmamızın müşteri beklentilerindeki değişimi öngörebilme yeteneği oldukça iyidir					

Sayın katılımcı, araştırmamızın sonuçlarını sizinle paylaşmamızı istiyorsanız lütfen e-posta adresinizi

(……..@.....)