ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΙΓΑΙΟΥ

ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ

ΤΜΗΜΑ ΜΗΧΑΝΙΚΩΝ ΟΙΚΟΝΟΜΙΑΣ ΚΑΙ ΔΙΟΙΚΗΣΗΣ

ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ

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(ΠΜΣ-ΜΕ.Δ.Μ.Ο.Δ.Ε.)

«ΔΙΑΧΕΙΡΙΣΗ ΓΝΩΣΗΣ ΚΑΙ ΜΟΝΤΕΛΑ ΑΞΙΟΛΟΓΗΣΗΣ ΩΡΙΜΟΤΗΤΑΣ:

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"KNOWLEDGE MANAGEMENT MATURITY ASSESSMENT FRAMEWORKS:

A HOLISTIC APPROACH AND A PROPOSAL FOR A NOVEL INTEGRATED KMM MODEL"

ΕΙΣΗΓΗΤΗΣ: ΕΙΡΗΝΗ ΜΠΟΥΓΟΥΛΙΑ

ΕΠΙΒΛΕΠΩΝ: ΜΙΧΑΗΛ ΓΛΥΚΑΣ

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OPERATIONAL & HUMAN RESOURCES MANAGEMENT: KNOWLEDGE & CORPORATE RESOURCES MANAGEMENT MATURITY MODELS

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"KNOWLEDGE MANAGEMENT MATURITY ASSESSMENT FRAMEWORKS: A HOLISTIC APPROACH AND A PROPOSAL FOR A NOVEL INTEGRATED KMM MODEL"

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University of the Aegean
Postgraduate Programme in Financial and Management Engineering by Research

Eirini A. Bougoulia
irenempougoulia@hotmail.com

Supervising Professor:
Michael Glykas

Prologue

"Εν οίδα, ότι ουδέν οίδα"

"All I know, is that I know nothing"

The thirst for knowledge has been a trait of the human kind since the beginning of time. It has served as the ignition for every great accomplishment and the motivation behind every human effort towards improvement. There are only a few things that one can never have enough. Knowledge is one of them. It has brought societies together and cultures closer, it has elevated the human spirit for thousands of years. And it will continue to do so. Knowledge is always growing and forever evolving. Its greatest power lies in the fact that it is endless, timeless, and limitless, knows no boundaries and leaves no margin for discriminations. Knowledge is what transforms human errors into constant improvement, failure into success, and disappointment into perseverance.

This study will forever be a privilege.

Έχω διαβάσει και κατανοήσει τους κανόνες για τη λογοκλοπή και τον τρόπο σωστής αναφοράς των πηγών που περιέχονται στον Οδηγό συγγραφής διπλωματικών εργασιών του ΤΜΟΔ. Δηλώνω ότι, από όσα γνωρίζω, το περιεχόμενο της παρούσας διπλωματικής εργασίας είναι προϊόν δικής μου δουλειάς και υπάρχουν αναφορές σε όλες τις πηγές που χρησιμοποίησα.

Acknowledgements

I am – and will continue to be – grateful to every person, researcher and practitioner, who has in any way and extent contributed to the creation and sharing of Knowledge, for making it possible for the next person to come.

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Special thanks to

B. & M. Riga for always being present.

This work is dedicated to

G. Rigas, the greatest supporter of acquiring knowledge

&

K. Rigas, the truest believer in sharing knowledge, a true Professor.

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Thesis Summary

Maturity is the degree to which an object, technology, process or organization evolves over time. Maturity models (MM) in organizations methodically classify procedures and determine phases, which lead the manager's plans. Knowledge, even though intangible, is an asset which like any other asset needs to be managed.

Maturity in Knowledge Management (KM) is the degree to which knowledge assets are effectively managed within organizations. It symbolizes the ongoing phase-by-phase management of knowledge assets until knowledge is deliberately and methodically defined, managed, checked, stored, and shared while also generating useful results for the company. The stages of evolution of KM efforts in an organization are described by KM maturity (KMM) and growth is defined by a knowledge management maturity model (KMMM), which also aids businesses in evaluating the development of KM practices, improving decision-making, and recommending performance improvements.

Knowledge Management (KM) frameworks' aim is to collect the individuals' expertise knowledge and share it in the form of collective knowledge among the organizational entities, producing and establishing what is known as organizational knowledge. The KM framework is dictated by business needs, aiming at performance improvement via collective knowledge. KMMMs provide a road map for KM implementation. The concept behind any such model is based on strategic objectives and the best possible use of corporate resources available.

This study begins with the concept of Operational Management and the presentation of OM practices. The concept of Sustainability and the future of OM is also examined. Human Resources Management is examined through a literature survey to identify key factors and best known practices, as well as the concept and progress of standardization in HRM.

The research aims to provide a systematic overview of the maturity models used in Knowledge Management with the purpose of identifying different perspectives, contributions, shortcomings and implementation gaps. This study can be characterized as a theoretical research based on a systematic literature review. As a result of this analysis, KM key points and KMMMs CSFs are pointed out and recorded. The concept of standardization and its relation to KM, presenting known KM Standards and their core principles will be explored. Based on the most widely spread critical success factors used in Knowledge Management Maturity Assessment presented in the literature survey, the extended

objective of this thesis study is to propose a holistic and integrated Knowledge Management Maturity Assessment framework encompassing the core guidelines of ISO 30401 in order to be used by researchers and practitioners for future reference in the form of a generic maturity assessment web matrix.

The main questions that this study addresses are:

RQ1. What is the relationship between human resources and KM?

RQ2. What is the relationship between strategy and KM?

RQ3. What is the role of leadership in KM?

RQ4. What is the role of performance measurement in KM?

RQ5. What is the relationship between change management – continuous improvement and KM?

RQ6. What is the relationship between process and KM?

RQ7. What is the role of enablers in KM?

RQ8. Which are the required enablers for a successful KM?

RQ9. What is the link between KM Standards and KM Maturity models?

RQ10. Can a KM maturity assessment framework be applied for the assessment of ISO 30401 implementation?

RQ11. Can a generic KM maturity assessment matrix be developed for ISO 30401 implementation?

The methodology that was used to conclude this study, includes an extended literature review in the field of Knowledge Management, KM frameworks, KM Standardization and ISO 30401. Based on the literature reviewed and the conclusions regarding the research questions, a holistic novel KMM Model is proposed with the intention of being tested within an organization and presented in the form of a case study as part of the thesis. Critical Success Factors, the design approach and KPIs are suggested as part of the novel integrated KMMM that is proposed.

Keywords: Knowledge Management, Maturity Assessment, Maturity Models, Critical Success Factors, Knowledge Management Frameworks, Glykas Quality Compass, ISO 30401

1. Operations Management

1.1. Operations Management Practices

Operations management (OM) is concerned with the management of organisational activities, as well as people, processes, technology and other corporate resources in order to produce goods and/or deliver services required by its customers. Sprague (2007) covered innovations like scientific management (Taylor's days), factory management (Extension of Taylor's days), industrial management (in the 1930s), and production management in his article on the evolution of operations management from the 16th century to the 21st century (World War II and after). These former studies have recently been revived as the field of study known as operations management. There has been a gradual increase in macro (more complicated) concerns and people-related aspects in OM research, which has traditionally been focused on micro (isolated) difficulties with a technical (equipment) focus (Subramanian, 2012).

Both the core perspective of lean production (Womack et al., 1990) and integrated manufacturing (Dean & Snell, 1991) place emphasis on operational management strategies as sources of competitive advantage. Among them, Integrated Manufacturing, which includes Total Quality Management, Just-In-Time, and Advanced Manufacturing Technology, is the most constrained in its thinking. These operational procedures are each marketed as being efficient both on their own and when used in tandem with one another. Total Quality Management is founded on the idea that, as opposed to being a distinct policy with a correction role, quality control should be an essential component of the production process and, therefore, a key duty of operators. Continuous improvement to cut waste, doing things properly the first time, and quantitative measurement to examine deviations from desired quality standards are key components. The expected performance benefits include increased revenue as well as lower costs, as Total Quality Management should reduce waste and eliminate the labor costs associated with inspection and rectification. High quality may enable the company to charge more for its products and is likely to lead to repeat business (Birdi et al., 2008).

Figure 1. Commonly attributed TQM principles (https://www.smartsheet.com/total-quality-management).

A "pull" rather than a "push" system, just-in-time is designed to produce goods in direct reaction to internal and external client demand rather than building for stock. In order to guarantee just-in-time delivery to the customer, each stage of production is finished just in time for the next to be finished immediately after it. In order for payment to come as quickly as possible following investment, it is important to keep as little money tied up in raw materials, work in progress, and stocks of unsold finished items as feasible. Just-in-time inventory control has the performance benefit of lowering inventory and material costs while perhaps making the company's products more appealing. Additionally, as inventory is reduced and throughput is accelerated, quality is expected to improve since items and materials spend less time in companies' buffer stocks, where they are vulnerable to harm (Birdi et al., 2008).

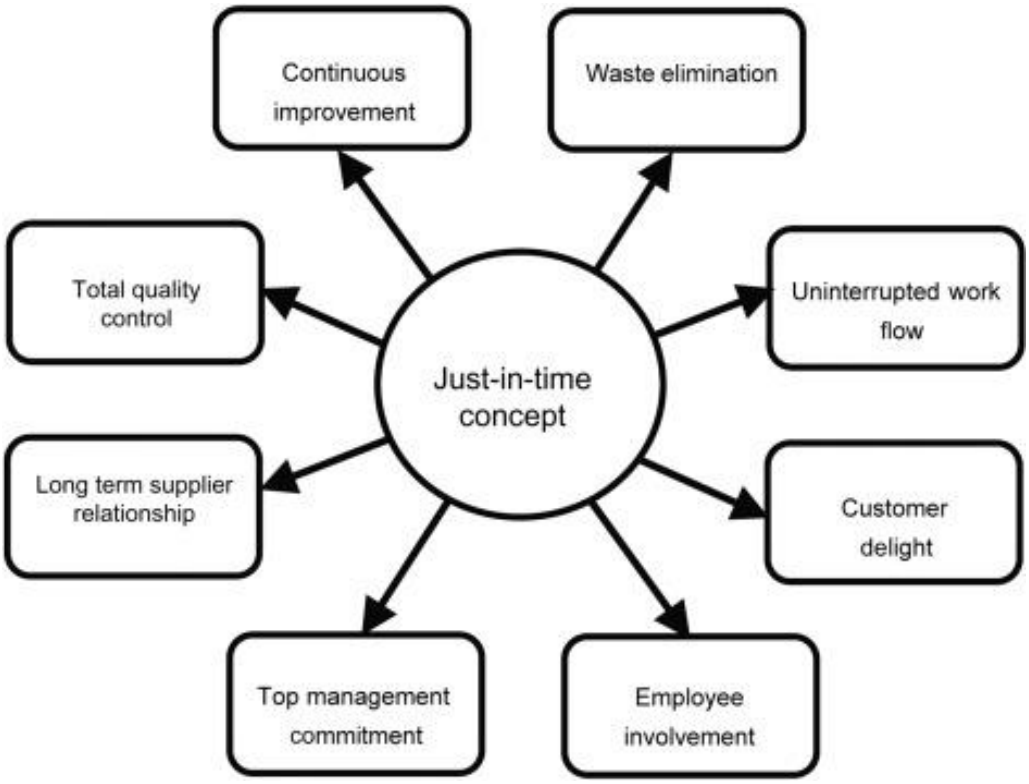

Figure 2. JIT management schematics, by D.R. Kiran (2019).

Robots, computer numerically controlled machines, computer-aided design software, and process planning software are just a few examples of the computer-based equipment that is included in advanced manufacturing technology. In order to develop flexible manufacturing systems, also known as CAD/CAM (computer-aided design and computer-aided manufacturing) systems, such technologies are occasionally linked into even bigger systems through shared computer control and by materials handling and transfer devices. They are frequently referred to as "integrated computer-based technology," which also includes non-manufacturing applications, as a result of this integrated use. Businesses that invest in advanced manufacturing technology should see the automation's performance benefits of lower labor costs, more productivity, and superior quality. However, a distinct advantage over traditional automation is that switching between products may be done more quickly and easily by just loading new software rather than manually resetting machines, which reduces non-productive time and response times and increases production flexibility (Birdi et al., 2008).

Lean Production, which includes the extra practice of supply-chain partnering, is fundamentally based on the three elements of Integrated Manufacturing (Womack et al., 1990). In order to ensure that the proper materials and components are given to the needed standard and at the lowest possible

cost, the final stage of these practices entails the establishment of strategic alliances through long-term partnerships with suppliers (and customers). The objective is to maintain the integrity of the materials and components in order to avoid any quality issues, reduce any shortages or supply delays, and ultimately improve performance. When internal expertise is insufficient, it might also be a way to increase quality further by outsourcing the work. The Integrated Manufacturing and Lean Production models presuppose that their core practices will improve business performance (Birdi et al., 2008).

Lean Supply Chain Management is about eliminating waste, and as a result reducing cost. The lean approach is focused on efficient, streamlined operations and eliminating anything in the process that does not add value to the product or service that is delivered to customers.

Six Sigma is a set of techniques and tools for process improvement. It was introduced by American engineer Bill Smith while working at Motorola in 1986.

Generally speaking, process improvement programs—which also include additional methodologies like business process re-engineering (BPR), theory of constraints, and total productive maintenance—include both Lean Production and Six Sigma. Lean and Six Sigma are founded on Taylor's (1911) fundamental ideas and incorporate the influential works of Ohno (1978), Shingo (1981), and Deming (1986) (Shah et al., 2008).

Lean Production, which developed over several decades from the Toyota Production System (TPS), is thought to boost business performance by cutting out waste. Lean Production can be defined as a philosophy, a set of ideas, or a collection of techniques, depending on the level of abstraction used to define it. There are four basic characteristics of lean production, and related practices are typically bundled together even though scholars dispute on the precise practices and their quantity. These are methods used in the management of quality, pull production, preventative maintenance, and human resources (Shah et al., 2008).

Descriptions of Six Sigma also range from a business philosophy for improvement to a collection of statistical tools and metrics. Academics have identified six concepts or constructs related to Six Sigma (Schroeder et al. 2008):

(i) top management leadership
(ii) customer requirements
(iii) focus on financial and non-financial results
(iv) structured method of process improvement
(v) strategic process selection, and
(vi) full-time specialist

Although definitions of Six Sigma vary in scope, Six Sigma places considerable emphasis on reducing unwanted variation (Shah et al., 2008),

Both Lean and Six Sigma have underlying philosophies that can be described in terms of a set of practices, tools/techniques, implementation orientation, unit of analysis, and performance metrics connected to them. Philosophy is put into practice through a variety of procedures, methods, and apparatus. The emphasis on how practices and procedures are applied is on the implementation orientation. The analysis unit is where process improvements happen. Finally, the performance measures highlight areas that may usually be improved (Shah et al., 2008).

There are many striking parallels and significant contrasts between Lean and Six Sigma when their philosophies, methods, and methodologies are compared. The field of quality management exhibits the most overlap. On the other side, Six Sigma practices and techniques assist in locating and removing problem roots, whereas Lean practices and techniques concentrate on simplifying processes. Lean places a strong emphasis on process flow, while Six Sigma focuses on process flaws. Lean production also addresses process issues that are readily apparent, such as inventory, material flow, and safety. Six Sigma is more interested in issues that are less obvious, such as performance variation. The majority of scholars concur that there are more similarities than differences between Lean and Six Sigma tools and processes. However, there are significant differences in the employee participation throughout deployment. Black belts and master black belts are included in the parallel organizational structure used by Six Sigma to implement the techniques. Lean, on the other hand, actively involves the process's participants in order to improve it (Shah et al., 2008).

Lean and Six Sigma both emphasize the importance of management and employee involvement to boost performance, but the types of involvement vary greatly between the two methodologies. Lean is a bottom-up methodology where management supports and facilitates shop-floor employees' formation of cross-functional self-directed work teams and application of Lean tools. When implementing Six Sigma, management takes a more active part, frequently choosing improvement projects based on financial and strategic objectives and supporting and overseeing the improvement initiatives (Shah et al., 2008).

The popular press has been busy reporting on stories of businesses that have forged ahead with the implementation of a combined Lean-Six Sigma approach in the hopes of appropriating higher

performance gains from the combined approach while academics work to resolve the definitional and boundary issues related to Lean production and Six Sigma.

Lean-Six Sigma, on the other hand, might be the most recent operations management trend with dubious potential for performance enhancement. It is not yet clear whether a combined Lean-Six Sigma methodology is the newest management trend or produces meaningful performance improvements that surpass isolated implementation (Shah et al., 2008).

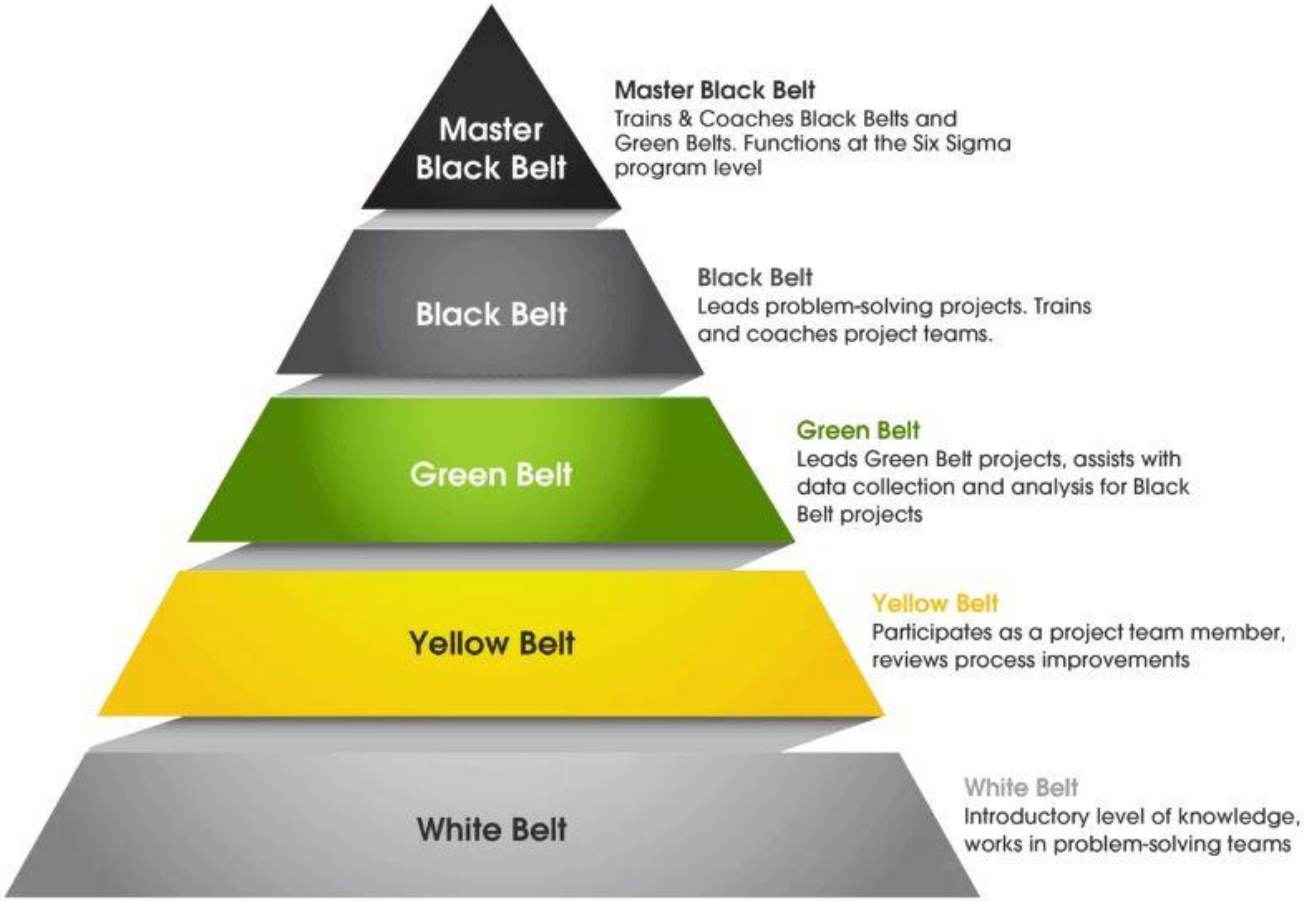

Figure 3. Six sigma belts – levels (https://certificationacademy.com/six-sigma-belt-levels-explained/).

The notion of overall quality management includes processes (TQM). The importance of taking into account business processes lies at the core of both the Malcolm Baldrige National Quality Award and the European Quality Award, which is based on the EFQM model. These methods call for process identification, management of those processes through assessment, application of focused innovation

and creativity, and management of process change. BPR, which encourages the radical modification of business processes, is a second path that urges firms to think about their business processes. Some have shown how BPR and TQM work together, while others have shown how they clash. Regardless, it is a reality that firms analyze their business processes using TQM, BPR, or even both approaches (Armistead, 1997).

The process paradigm and the ideas and methods for creating, directing, and enhancing operational processes have moved from operations management into business process re-engineering (BPR). For the purposes of using BPR, operations management undoubtedly teaches us a lot (Armistead, 1997).

Business processes can be viewed as a collection of connected tasks that cross functional lines with their inputs and outputs. Why are firms trying to adopt strategies to explicitly manage business processes and why are they important? The process view (Armistead, 1997) addresses a number of issues, including:

- increasing organizational flexibility to respond to shifting external demands;
- addressing the speed of new product and service launches and customer responsiveness;
- facilitating cost reduction;
- facilitating increased delivery reliability; and
- helping address product and service quality in terms of consistency and capability.

In the literature, various categorizations of processes have been put forth. For instance, the CIM-OSA Standards classify tasks into manage, operate, and support categories. Armistead (1997) discovered that grouping processes into operational, support, direction-setting, and managerial processes was helpful for defining processes. Two factors motivate the separation of direction-setting and managerial processes: (1) on a practical level, models adopted by organizations, like the EFQM model, distinguish leadership from policy and strategy formulation; and (2) the strategy literature views the development of strategy as a process in and of itself. The methods used within an organization to create goods and services are known as operational processes. These are the procedures that have received the most of the attention in TQM and BPR so far. They span throughout the entire company and are connected to outcomes like product development or order fulfilment. They are acknowledged in the concepts of integrated logistics and supply chains, concurrent engineering, and just-in-time (JIT) methodologies. The BPR methods spread the same concepts for streamlining processes and cutting cycle times to service firms. The operational processes' supporting

processes are what make them possible. They are focused on managing staff and human resources, providing support technology or systems, and managing accounting. Setting strategy for the organization, its markets, the placement of resources, and managing change within the organization are all aspects of direction-setting procedures. The steps that are specified in a formal planning process are mixed with less well-defined frameworks in direction-setting processes. Managerial processes, which include decision-making and communication activities, are somewhat subordinate to the other categories. Examples of managerial processes include the entrepreneurial, competence-building, and rejuvenation processes put out by Ghoshal and Bartlett in 1995. Some businesses have made an effort to standardize these procedures and have implemented a systematic method of decision-making and communication, for instance. As with any classification, not all organizations will necessarily agree with this one (for example, some organizations would position the direction setting processes as part of their operational processes) (Armistead, 1997).

Figure 4. Categorization of business processes (Armistead, 1997).

1.2. Sustainability in OM

Integrating sustainability concerns with their conventional areas of focus presents new difficulties for operations management researchers and practitioners. Over the past 30 years, there has been increasing demand on companies to consider the effects of their processes and offerings on the environment and their use of resources. The trend toward triple bottom line reporting (3BL), which considers the relationship between profit, people, and the environment, is one sign of this pressure.

The difficulties that come from this integration include closed-loop supply chains, lean and green operations, and green product design (Kleindorfer, 2009).

The advantages of total quality management (TQM), time-based competitiveness, and just-in-time operations (JIT), which were transferred to Europe and North America from Japan, were already highlighted in the 1980s. These theories had been developed in the 1960s and 1970s, and they were eventually accepted in Japan as the cornerstone of the country's postwar economic recovery. The management systems needed to integrate them with business strategy were made available by TQM, JIT, and time-based competition. These tools and management systems' methodology and locus of control were closely related to operations. Operations started to change from being a mistreated stepsister needed to support marketing and finance to a beloved handmaiden of value creation as the effects of these innovations on customers and profit became increasingly apparent. It was starting to take on strategic priority for businesses all around the world. Building on these initial advances, business process reengineering (BPR), a wave of change that greatly benefited non-manufacturing processes by implementing the time-based and waste-minimization efforts that TQM and JIT had applied to manufacturing, began in the 1990s. This entire progression eventually gained the name "process management," which underlined the critical role that processes play in value creation and management. The core-competency movement, which emphasized the need for businesses to build technological and organizational competencies that their rivals could not easily copy, gave process management further impetus. The unbundling of value chains, outsourcing, and innovations in contracting and supply chains are just a few of the changes that have occurred over the past ten years as a result of the convergence of the core-competency and process management movements. People now understand the value of coordinating strategy and operations, a Skinner-promoted idea (1969, 1996) (Kleindorfer, 2009).

The tools and principles of TQM and JIT were applied to generating new product development and managing supply chains, and they often involved several businesses. Companies established their core competencies and included them in their business processes. Typically, they implemented JIT first between suppliers and production units, then they transitioned to optimized logistics (including efficient consumer response, or ECR), then they implemented customer relationship management, and finally they implemented global fulfillment architecture and risk management. Similar corporate trends were influenced by these supply-chain-focused developments as businesses transitioned from lean operations to lean enterprises and then to lean consumption (Womack and Jones 2005). The

advent of TQM and JIT in manufacturing in the 1980s led to the realization that organizations set up in accordance with process-management concepts would also improve, and that the excellence principles applied to manufacturing operations could. The foundations and methods for managing today's outsourcing, contract manufacturing, and global supply chains have been made possible by the convergence of these process management concepts, information and communication technology, and globalization (Kleindorfer, 2009).

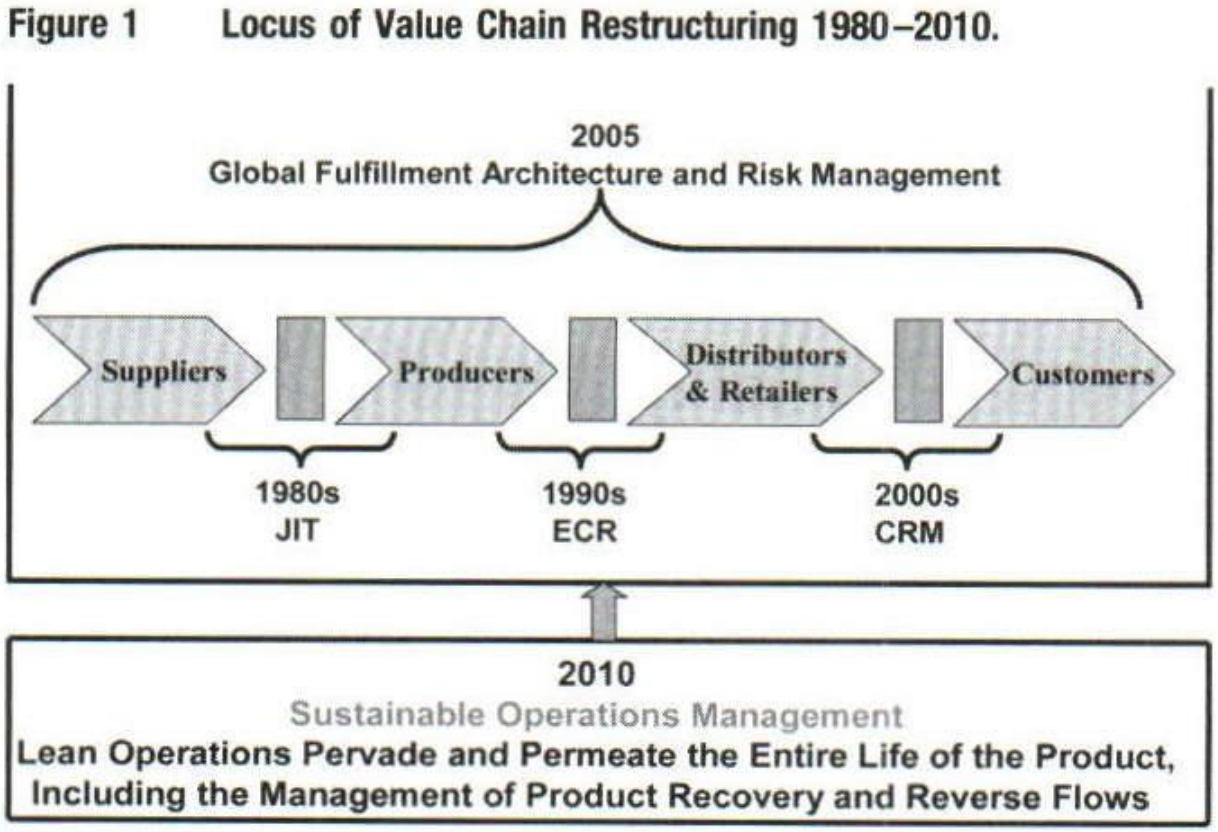

Figure 5. Locus of Value Chain Restructuring 1980 – 2010 (Kleindorfer, 2009).

People realized that earnings and profitability were only one factor in the long-term viability of businesses and economies as the new economic order took shape. The future of people, both inside and outside of businesses, and the future of Earth are also significant. The triple bottom line (3BL), the three Ps of people, profit, and planet, and the objective of maintaining viable social franchises (the trust of employees, customers, and communities) as well as viable economic franchises all take into account these new legitimacy concerns (the ability to pay from the cash flows it generates for capital and other inputs it uses to produce its outputs). OM is becoming more and more linked to

sustainability, and it now addresses both the operational factors that affect profitability and how they affect both people and the environment. Researchers in OM have significant potential to make an impact thanks to the developing synthesis (Kleindorfer, 2009).

Figure 6. 3BL management, by Taylor (2020).

Business enterprises are under intense pressure to quantify their environmental impacts and to participate in 3BL reporting to account for the energy and other resources they consume and the resulting carbon footprint they leave behind as a result of these growing concerns. Producing and shipping current products, recycling, remanufacturing, and reusing existing products, as well as designing new products, are the main activities that have an impact on the environment. Naturally, OM has helped determine and lessen this imprint (Kleindorfer, 2009).

Regarding the "people" component of 3BL, workers must feel proud of their work and that their organizations act responsibly and with concern for their health and safety. Aligning sustainability objectives with employee and market motivations in terms of the environment can be challenging. However, businesses may be compelled to enhance their environmental performance by external demands from the community and the risk of lawsuit. It is obvious that businesses are most likely to increase their environmental performance when tough laws are enacted as a result of public pressure. If a company has created an environmentally friendly technology and feels that having legislation require it will offer them a competitive advantage, they may campaign for regulations themselves (Kleindorfer, 2009).

Companies will be expected to take into account people and the environment, thus researchers must broaden their perspective in OM. The following considerations suggest that there will be an increase in chances to invest in sustainable operations, supply networks, and technology (Kleindorfer, 2009):

1. As the global economy grows and rapidly industrializing nations like China and India place increasing demands on these resources, the cost of materials and energy will also continue to rise.

2. There will likely be continued significant public pressure for improved environmental, health, and safety performance, which will result in stronger property rights, more regulations, international agreements to manage harmful externalities and protect resources, and cuts to subsidies.

3. Raising consumer demand for goods produced by businesses adhering to 3BL principles may be a result of greater understanding of 3BL issues.

4. There is significant non-government group activity about corporations' sustainability performance as a result of people's growing opposition to globalization.

How will companies and operations managers respond to the drive for sustainability? Hayes and Wheelwright's (1985) paradigm for the four stages of acceptance of the operations function, which captures its contribution to creating value and strategic success, has been used by several scholars to answer this topic. The four phases move from "internally neutral" (catch-up or reactive mode) through "externally neutral" (matching but not exceeding industry practice and standards) to "internally supportive" (defining suitable priorities to support the company strategy) (providing externally recognized superior operational capabilities for competitive advantage) (Kleindorfer, 2009).

Two synergies with OM principles have been found in relation to new management systems that promote excellence in employee health and safety and sustainable industrial practices. The first is lean

production, which is the process of identifying and removing waste. Originally focusing on time, quality issues, and excess inventory, lean production is now successfully utilized to identify environmental wastes. The relationship between quality and environmental management systems, namely the Environmental Management System as defined by the international standard ISO 14000 and the associated Eco-Management and Audit Scheme of the European Union, is the second area of synergy. After the successful implementation of ISO 9000 standards, ISO 14000's development started in 1991, and ISO 9000's success served as the inspiration for ISO 14000's goals (Kleindorfer, 2009).

Businesses must learn how to be flexible, adaptable, and aligned in balancing the needs of the public and the environment with their financial interests. The human factor has mostly been ignored in OM research up to this point, but the recent emphasis on behavioral OM may change that. The combination of process management systems such as ISO 9000, ISO 14000, and others with management systems for safety and environmental goals demonstrates the growing importance of all three Ps in fostering sustainable operations. OM creates links. First of all, as OM is crucial to carrying out a company's goal, it serves as the hub for all other disciplines. Second, OM builds connections with various disciplines like psychology, marketing, finance, game theory, and economics. Building new connections with other sectors, such as industrial ecology, will be necessary for sustainable operations. OM must strengthen its prior ties to engineering in order to accomplish sustainable operations, which cover design, life cycle analysis, and other related topics. These bridge activities will require novel solutions to the current problems. For instance, as suggested by Corbett (2005), it might be time to look "beyond trade-offs" to find solutions that mitigate or prevent conventional trade-offs and, as a result, provide better and stronger results for the business as well as the discipline. Companies can rely on OM to put sustainability into practice and integrate it into the fabric of the business and its workforce once they have accepted and embraced it. Last but not least, the modelers (the OR-based OM population) must reexamine the traditional models to address issues pertaining to people and the environment (Kleindorfer, 2009).

1.3. Operations management within the information economy

There have always been "operations" to be managed as long as there has been organized commercial activity of any type. However, the scientific management and work-study methods of Taylor (1911) and Gilbreth (1911, 1912), the lot-sizing models of Harris (1913) and Camp (1922), and

the shop floor models of Gantt can all be considered the forerunners of the present academic discipline of operations management (OM) (1916). The queuing studies created in telephony by Erlang (1909) and Palm (1957) have proven to be fundamental in modeling numerous service settings in the service industry. The underlying idea of a production function has, of course, been applied in the field of economics for many years, beginning with the production of simple items and agriculture. Fuchs provides an early study of the unique qualities of the manufacturing function in service sectors (1968). According to casual observation, OM research and teaching have historically been biased in favor of the manufacturing industry. The importance of services to the economy is widely recognized, research in this area is expanding, and service operations management is taught in the majority of management curriculum. It is safe to say that the transition to services in industrialized economies has already proceeded significantly and cannot be furthered. The economy's recent considerable shift toward the technology industry needs to be addressed (Karmarkar, 2007).

The terms "data," "information," and "knowledge" have multiple definitions. Everything that can be turned into a symbolic (and thus digital) representation and that can be perceived by humans, namely hearing and seeing, is one operational definition of data. It has been said that information is a subset of data that is timely, accurate, relevant, and concise. It has the quality of depending on both the sender and the receiver. Additionally, information is typically produced as a result of humans or machines processing data. The idea that we currently live in an information economy is one that few would contest. The information economy can be defined in a variety of ways and at various levels of detail. Regarding the latter, we may start by taking a look at the main economic sectors at the industry level. A more thorough analysis might focus on businesses. A closer analysis would focus on employment. The level of operations or tasks would be a still more granular perspective. These many points of view offer varying viewpoints on the issue. In reality, it is beneficial to examine the information economy at various resolutions in order to achieve a variety of goals (Karmarkar, 2007).

Machlup (1962) explored the "knowledge industry" in his groundbreaking work. He listed the elements of the knowledge economy and calculated its contribution to the GDP (GNP). According to Machlup, the knowledge sector produced 29% of the US GNP in 1958 (Karmarkar, 2007).

In the past, traditional manufacturing and service industries have experienced relatively moderate technological transformation. Many adjustments (feeds and speeds) were parametric rather than revolutionary. The velocity of change has accelerated more lately, frequently as a result of information technologies (like MRP, CAM, CAD, CAPP, EDI). It has been necessary to pay attention to both the

relevant technology and the altered use and implementation economics while evaluating these developments. Currently, we are in a stage of technological development that will mostly effect the service industry, while supply chains will also be impacted. When a change is this quick and widespread, it might not be possible to embrace it gradually or to be a "late adopter." Instead, there are good reasons to link emerging technology to process economics and subsequently to management practice in a proactive and even predictive manner. Consider the corresponding claim about traditional MIS (management information systems) practice from a slightly different angle: it is no longer possible to study corporate information systems without having a basic understanding of managerial functions. MIS cannot continue to be a solitary office task. Information management has now a major role in many businesses, especially those in the information sector, and the firm's information and communication system may serve as both its factory and its façade. To follow this line of reasoning to its logical conclusion, it is not a coincidence that the OM and MIS divisions have merged in many forward-thinking and top business schools (Karmarkar, 2007).

For the time being, our fundamental tenet is that operations management is primarily concerned with the economics of processing and distribution, as well as the configuration, design, and management of goods, services, processes, and chains, whether in the physical or digital world. There will be a need for expert understanding and analysis of these challenges as our ideas about business models and the management of enterprises in the information sector change. After barely finishing the prospecting phase of a gold rush, systematic mining, processing, and delivery carried out by qualified experts are now required (Karmarkar, 2007).

The study of processes is often seen as the foundation of operations management. Others choose a slightly broader perspective that incorporates industry (competitive) economics, product and process technology, product and service design, value chain analysis, and these subjects are becoming more important for managers and competitive success. Historically, manufacturing and production procedures were studied in order to develop process analysis. The creation of "systems analysis," "systems dynamics," and project management (network) models considerably expanded the range of applications for these techniques. They are now often used in service operations, and "business process reengineering" has made their use in internal management processes more well-known. However, there is still a propensity to view information processes as slightly distinct—as more the purview of MIS and IS/IT (Information Services/Information Technology), as manifested in data flow analyses or perhaps even programming flow charts (Karmarkar, 2007).

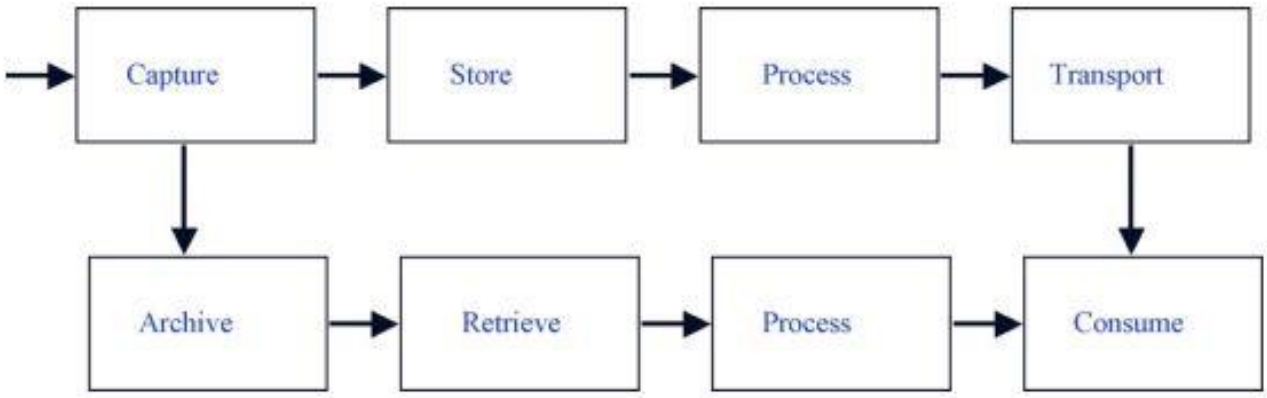

Figure 7. Schematic representation of an information production process (Karmarkar, 2007).

The shop floor was the main area of operations research two decades ago, with an emphasis on process operations, scheduling, batching and buffering, flows, bottlenecks, queues, and routing. Information processing is covered by many of the tools created to address these issues. For instance, information processing at the transactional level shares many traits with material processing. However, other elements of information processes, such as those pertaining to quantification, are essentially different. How one might think about productivity, cost, and quality is directly impacted by these problems. Information value is a very nonlinear function of information amount. Information's worth occasionally even declines as the amount of information increases. (For instance, an online search that returns 1,000 sites may be less useful than one that returns only 10 sites that are pertinent.) Due to the difficulty of quantification, non-linearity of value, and complexity of information creation processes, it is very challenging to estimate the cost of producing information. Modularization and assembly line methods frequently fail. A single person might be more effective than a whole team. Costs associated with information inventory might be extremely low, but access and recovery are becoming more of a challenge than cost-effective storage. There are several forms of information that are difficult to index for searches (meta data is a somewhat unsatisfactory solution). Obsolescence and the need to update and replace information pose a significant financial challenge. In addition to the numerous problems (and opportunities) at the level of specific operations, it is important to consider the necessity of shifting the focus to bigger challenges. Research and analysis typically go into greater detail in a stable world. The information industry, however, is everything from steady. Significant shifts in entire industry sectors and perhaps entire economies are being driven by technological

advancements. There is a need to investigate the industry at the level of information chains and sectors, much as emphasis has tended to shift in manufacturing from the shop floor to supply chains. In this area, there is a severe dearth of tools that can be used to analyze chains in order to comprehend their evolution and the effectiveness of various business models, chain structures, and competitive strategies (Karmarkar, 2007).

1.4. Future of operations management

With the changing demands of the market, managing operations in both manufacturing and service firms has advanced significantly over time. Because of the globalization of the market, business operations must adapt. The landscape of operations management (OM) strategies, methodologies, and technologies has considerably changed by the use of information technology/information systems (IT/IS) and outsourcing in managing operations. Companies are compelled to analyze their OM strategy and manufacturing from a variety of angles by their awareness of the environment and safety. The portfolio of corporate activities and, consequently, the approach to OM, have recently changed due to the cost of energy and security against terrorism. It is now time to review the OM concepts, curriculum, and training at the higher education institution and businesses. Additionally, project management is a notable example of considerable service OM in manufacturing, which has evolved into more of a service activity. Due to the emergence of globalization, outsourcing, and IT, as well as the rapid economic growth of emerging nations like Brazil, Russia, India, and China, the profile of the service sectors has also evolved (BRIC). In actuality, services make up about 80% of the US gross domestic product (GDP); this percentage is also rising for the GDPs of other nations across the world. Again, in light of the aforementioned paradigm shifts, service OM needs to be reviewed (Gunasekaran, 2011).

Globalization of markets, decentralized operations, and heightened awareness of environmental issues combined with information technology (IT) advancements have forced industries to reevaluate their productivity and quality strategies and techniques, including the overall operations management (OM) approach. This phenomenon necessitates the appropriate reform of the training and educational curricula. Early on, the Japanese economy's productivity and quality competitiveness compelled businesses in other nations to take seriously their own productivity and quality issues. A further development of OM is the shift from mass production to mass customization. To compete in the global market during this paradigm change, businesses have employed a variety of innovative operational

strategies, techniques, and technology. These techniques include lean production (LP), business process reengineering (BPR), quick response manufacturing (QRM), flexible manufacturing systems (FMS), computer-integrated manufacturing (CIM), agile manufacturing (AM), just-in-time (JIT) strategy, and supply chain management (SCM). The Internet has changed how businesses run in the last 25 years, especially in terms of collecting resources and satisfying client expectations. The current debate centers on whether conventional OM principles and practices, such as strategic planning, scheduling, inventory and quality control, and human resource management, are applicable to contemporary business settings, including SCM, ERP, the Internet, RFID, CRM, outsourcing and third-party logistics (3PL), and knowledge management. Taylor and Taylor (2008) draw attention to the demand for fresh ideas in OM research in the automobile industry. When distinctions across production systems appear to vanish, this becomes very crucial. Recent empirical evidence reveals that lean management heavily relies on consultants, which is counter to employee involvement and depth of expertise. This seems to be the case, particularly when lean management is practiced with the goal of enhancing operational and strategic performance, two things that are essential for any firm. Bayraktar et al. (2007) assess the growth of OM and prospective changes in the pertinent OM domains. Virtual businesses arise in response to market demand and vanish in the lack of a market. It is important to create appropriate OM models that handle the following issues: (a) synthesis and architecture for turning data into knowledge; (b) unified communication techniques and protocols for information exchange; and (c) adaptive and reconfigurable manufacturing systems and processes. To continue playing a significant part in enhancing organizational competitiveness in the global markets of the twenty-first century, virtual enterprises and organizational perspectives must exist. This suggests that OM techniques and principles should be altered to decide whether to create or buy the following: Formation of partnerships; Organizational design that is both manageable and meets changing market demands; Information systems and their adaptability based on the dynamics of virtual firms or organizations; Successful management structures and paradigms for virtual businesses or organizations (Gunasekaran, 2011).

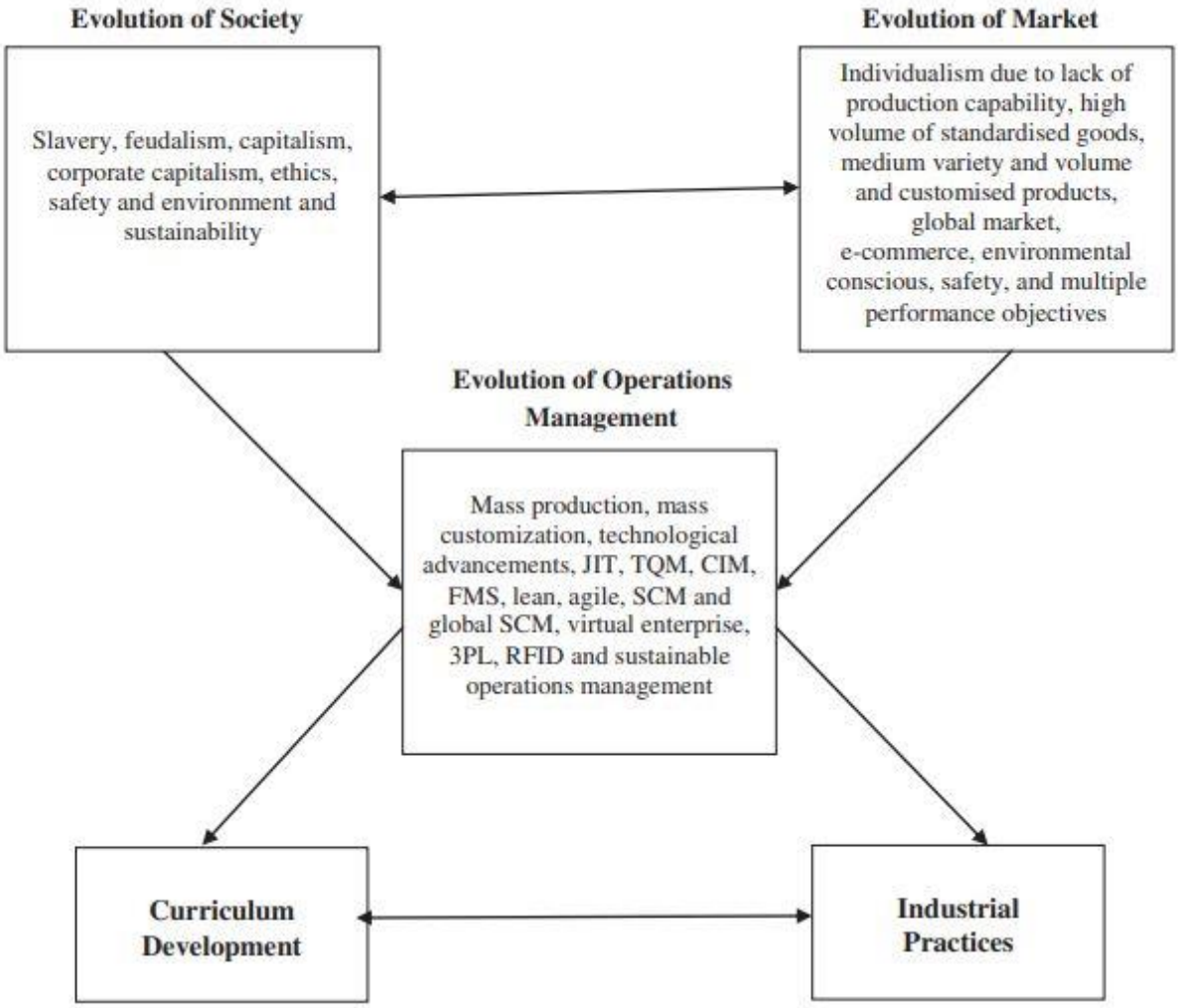

Figure 8. Evolution of OM paradigms (Gunasekaran, 2011).

Mass customization has replaced mass manufacture at OM. At the beginning of its evolution, talented artisans created products based on the demands of specific customers. But this needed more time, more adaptability, and less reactivity. After World War II, there was a huge increase in demand for consumer goods. As a result, businesses were pressured to make standardized goods in big quantities. Companies created a transfer line and a mass production system to meet the demand. Customers started to demand high-quality products at lower prices once the fundamental product needs were satisfied. As a result, businesses created operational strategies like TQM and JIT production methods. After customers' fundamental needs in terms of quality and affordability were met, they started to anticipate that their unique needs will be met through mass customization (e.g., flexibility and responsiveness). Companies began implementing computer integrated manufacturing (CIM),

flexible manufacturing systems (FMS), and agile manufacturing technologies in response. The market eventually went worldwide, forcing businesses to choose global operations based on joint ventures, outsourcing, and international operations supported by strategic alliances based on core competences. Additionally, the market demanded that we leverage IT and people. All competitive performance objectives, including price, quality, flexibility, dependability, and responsiveness, were required of businesses in order to compete. As a result, businesses created operational strategies and methods like BPR, lean, AM, and SCM. Companies have had little choice but to be adaptable and sensitive to the shifting market demands since the rise of electronic commerce (e-commerce) and numerous trade agreements, including the North American Free Trade Agreement, European Commission, and Association of South East Asian Nations. The integrated business process perspective, which is crucial for the physically distributed company environment combined with the Internet and ERP, led to SCM becoming well-liked among businesses in the following years. Companies are now concentrating on creating an RFID-based supply chain to provide complete company visibility and to better serve international clients (Gunasekaran, 2011).

Period	Objectives	Strategies/technologies
Beginning	Individual customer requirements	Craftsman production, artesian production
Post-World War II	Immense demand for consumer products	TQM, JIT, transfer line production systems
1975–1985	Medium volume and medium variety	QRM, CIM, FMS, and BPR
1985–1995	Cost reduction, high variety, and low volume	Lean, agile, and physically distributed enterprise environments
1995–2010	Higher variety and very low volume	Outsourcing, global manufacturing and market, agile, Internet-enabled SCM, 3PL
2010–	Global individualized products and services	Global SCM, virtual enterprise, RFID-enabled SCM, sustainability.

Figure 9. Evolution of Operations Management (Gunasekaran, 2011).

The moment has come to review the OM course offerings and business procedures. Global marketing, global operations, enterprise resource planning, global logistics, virtual enterprise, risk management, production planning and control in global supply chain, operations research in global operations management, value-based costing, multinational finance, e-commerce, e-banking, human resource management in global supply chains, security and global operations, outsourcing, culture and business management, are all modules that should be included in future OM curricula. The OM curriculum should include instruction in the working world. Industrial practices and training should

concentrate on the following in light of the development of marketing: International operations and marketplaces, global logistics, ERP, and online shopping; formulation, execution, and management of a strategy; outsourcing; demand management; 3PL; establishment and administration of virtual businesses; dependable supply chain; Global supply chain participation of small and medium-sized businesses; international production planning management; and sustainable operations management and business development (Gunasekaran, 2011).

2. Human Resources Management

2.1. Human Resources Management Practices

Organizations are dynamic entities that must strike a balance between the frequently incompatible needs for responsiveness to external environmental factors and the challenge of maintaining enough internal coherence and stability. An organization's internal and external surroundings, which are both always changing, produce a dynamic framework for the creation, development, and eventual extinction of HRM policies and practices (Jackson, 2014).

The functions and actions required for the efficient management of a company's human resources make up infrastructure corporate necessities. Historically, the main goals of these initiatives have been to recruit, keep, and inspire personnel. The key HRM practices are what we refer to as human resource management (HRM) practices (Schuler, 1984):

- Human resource planning;
- Staffing, including recruitment, selection, and socialization
- Appraising
- Compensation
- Training and development
- Union-management relationships

The benefits of having the proper people motivated to perform are numerous, and an improved capacity to attract and retain competent individuals who are motivated to perform is the outcome of effectively managing human resources. They consist of higher profitability, a lower staff churn rate, better product quality, cheaper production costs, and quicker corporate strategy acceptance and implementation (Schuler, 1984).

A review of Strategic objectives and Strategic thrusts helps firms obtain a basic grasp of where they might gain competitive advantages through their HRM practices (Schuler, 1984). The four areas of HRM practices that can provide you a competitive edge are as follows. These four goals stand in for both the company's upstream and downstream operations. Thus, the four are as follows: oneself (the center company); clients; distributors/service providers; and suppliers. Through the use of human resource management techniques, there are two strategic thrusts, or strategies to outperform the competition. One is a focus on cost and efficiency. A differentiation thrust is the second kind of thrust. The cost/efficiency thrust refers to HRM techniques used to increase production efficiency and, as a result,

reduce product costs. The differentiation thrust makes use of HRM procedures to set the product or business apart from its rivals (Schuler, 1984).

A comprehensive and coordinated approach to the employment and development of people is known as human resource management (HRM). It is possible to think of HRM as a management philosophy that is based on a variety of beliefs regarding human and organizational behavior. It is worried about the contribution that people can make to enhancing organizational effectiveness, but it should also be equally worried about the ethical aspect, or how people should be treated in accordance with a set of moral standards. Applying policies and practices in the areas of organization design and development, personnel resourcing, learning and development, performance and reward, and the provision of services that improve employee wellbeing are all part of human resource management (HRM). These are based on integrated human resource (HR) strategies that are in line with the company plan. Some individuals take issue with the word "human resources" since it suggests that people can be used as production factors just like any other. They favor "people management" instead. However, HRM is the most widely used term (Armstrong, 2014).

The field of human resource management (HRM) is focused on all facets of managing and employing individuals inside firms. Strategic HRM, knowledge management, corporate social responsibility, organization development, resourcing (workforce planning, recruitment, and talent management), learning and development, performance and reward management, employee relations, employee well-being, and the provision of employee services are all covered by this. Additionally, it has an international component. Line management, the HR function, and the HR architecture of systems and processes are all used to deliver HRM (Armstrong, 2014).

The objectives of HRM (Armstrong, 2014) are to:

● support the organization in achieving its goals by developing and implementing human resource (HR) strategies that are integrated with the business strategy (strategic HRM)

● contribute to the development of a high-performance culture;

● ensure that the organization has the talented, skilled and engaged people it needs;

● create a positive employment relationship between management and employees and a climate of mutual trust;

● encourage the application of an ethical approach to people management (Armstrong, 2014)

Related to HRM activities, a number of HRM practices has been applied based on corresponding theories (Armstrong, 2014):

- Motivation Theory examines the variables that determine behavior that is directed toward goals and, as a result, informs the strategies utilized in HRM to increase engagement (the situation in which people are committed to their work and the organization and are motivated to achieve high levels of performance).
- According to the theory known as "the resource based view," a corporation will have a competitive advantage if its resources are precious, uncommon, and expensive to replicate. It is asserted that HRM can significantly contribute to ensuring that the company's human resources meet these requirements.
- Organizational Behavior Theory explains how individuals and groups behave inside organizations and how such organizations operate in terms of their structures, procedures, and cultures. Therefore, it affects HRM strategies for developing organizational capabilities and designing organizations (the capacity of an organization to function effectively in order to achieve desired results).
- According to the contingency theory, an organization's environment and circumstances affect HRM practices. According to Paauwe (2004), this means that the relationship between the pertinent independent variables (such as HRM policies and practices) and the dependent variable (performance) will change depending on factors like company size, age and technology, capital intensity, degree of unionization, industry/sector ownership, and location. Contingency theory is linked to the idea of fit, which refers to the necessity for alignment between an organization's business strategy and its HR strategies, policies, and practices in the context of its internal and external environments. This idea is essential to strategic HRM.
- According to the Institutional Theory, organizations must adapt to challenges from both the internal and external environment in order to obtain legitimacy and acceptance.
- The importance of how employees contribute their knowledge, skills, and abilities to developing organizational competence is a topic covered by the Human Capital theory.
- According to the Resource Dependence Theory, organizations and groups can dominate one another by holding onto valuable resources. The distribution of power in the system is seen to be reflected in HRM activities.

- According to Boxall and Purcell's (2003) "AMO Theory," ability, motivation, and opportunity to participate are all factors that influence performance. Therefore, HRM methods have an impact on individual performance if they promote independent initiative, skill development, and performance opportunities. The formula serves as the foundation for creating HR systems that cater to the interests of employees, specifically their skill needs, motivations, and the quality of their work.
- According to the Social Exchange Theory, if employees feel that their employer has treated them well, they would reciprocate by contributing to the firm.

The concept of "human capital" refers to the skills, experience, and knowledge of people. Human capital theory provides justifications for the choices that people and organizations make regarding investments to improve "human capital." Individuals may be justified in spending time and money to increase their own human capital if doing so increases their chances of career progression, job mobility, and/or income potential (Becker, 1964). By applying this reasoning, expenditures in HRM systems that improve the company's human capital, such as hiring the most highly skilled personnel, educating staff to increase their understanding of the company, and rewarding top performers with greater compensation, should result in financial gains (Jackson, 2014).

According to the human capital and resource-based perspectives, one may anticipate that these methods will improve employee knowledge that is specific to the business and let employees take advantage of it. The broader idea of lean production is theoretically related to the practices, secondly (e.g., MacDuffie, 1995). Third, both in organizational practice and the research literature, these techniques are among the most common. Of course, other HRM procedures like recruiting, selection, and appraisal may also have an impact on how well an organization performs. In order to empower people or groups, significant operational management decision-making must be transferred from line management to individuals or groups. It includes a variety of programs, such as employment enrichment and delayering. Such increased autonomy is anticipated to improve company performance in a variety of ways, including by encouraging employees to work harder and more flexibly, encouraging initiative or proactivity, reducing the costs of supervision and other indirect costs, and giving people the chance to learn and use new skills. The majority of empirical research on the impact of empowerment on performance has been conducted at the individual-job level, but according to management theory, these effects are expected to translate into improvements in organizational

performance as well. This prediction dates back to McGregor's and Likert's early work in the 1960s and 1961, as well as more recent approaches to human resource management (e.g., Appelbaum et al., 2000; Pfeffer, 1994, 1998) Similar to this, investing in employee education and training would clearly improve organizationally specific knowledge, especially where this has a broad perspective that includes assisting employees in learning a wide range of skills, rather than simply providing them with the tools to carry out a specific job. Extensive training is the term Pfeffer (1998) uses to describe this method. The work on learning organizations strengthens the case for the impact of substantial training on organizational effectiveness (Senge, 1990). Employees are said to be better able to create high-quality goods and services in the most economical manner, adapt to change, and increase corporate competitiveness through product or process innovation if their skills and knowledge are improved. Finally, collaboration gives individuals the chance to exchange knowledge. Work done by teams of employees on a single project is referred to as teamwork. When a group is given significant responsibility, as in autonomous or self-managing teams formed under the sociotechnical systems approach to work organization, this type of teamwork is most frequently expected to improve performance. It is believed that these teams improve performance by energizing their members, ensuring the availability of a variety of skills required for the completion of interdependent tasks, reducing labor costs due to the need for less direct supervision, and giving members the chance to learn from one another (Birdi et al., 2008).

As a result of the practices' interdependence, it is anticipated that teamwork, intensive training, and empowerment will all work together to improve performance (Appelbaum et al., 2000; Pfeffer, 1994). The claim is that in order for empowerment to be truly effective, employees must be aware and skilled, and that expecting them to take on more responsibility and make decisions without the necessary skills is likely to have the opposite impact. Therefore, in order for empowerment to be effective, considerable training and development are required. Conversely, if employees' tasks and responsibilities are designed in a way that prevents them from using their knowledge and abilities in reality, investing in their training and development will be of minimal value. This is why empowerment is crucial. Likewise, emphasis on team effectiveness should come from both intensive training and empowerment. Teams improve performance by utilizing the greater variety of talents and abilities available to them as necessary for the task. Learning from in-depth instruction frequently includes developing teamwork and problem-solving abilities, which in turn helps to give the competences that are essential for team performance. In the more specific situation of self-managing teams, an emphasis

on empowerment throughout the company should also assist teams in decision-making and ensure that their internal processes are consistent with and supported within the larger organizational framework (Birdi et al., 2008).

Researchers have claimed that a variety of factors, such as cultural peculiarities, governmental regulations/policies, competitive priorities, and the adoption of managerial approaches like JIT and quality management, might cause HRM practices to vary between nations and/or industries. According to Hofstede (1980), national cultures influence the attitudes and conduct of employees (Ahmad, 2003).

Although there are numerous methods for businesses to obtain a competitive edge, one that is sometimes disregarded is through their strategies for managing their human resources. Companies can use HRM practices to obtain a competitive edge in two key ways: by benefiting both themselves and others, and by helping themselves. Therefore, it seems that including HRM factors in the strategy design stage rather than just the implementation stage would be advantageous. Specific HRM practices must be defined after the strategy is created and the ideal HRM thrust is determined. These procedures, like personnel and remuneration, are the ones that give the business its competitive edge. Additionally, choosing the best practices should be in line with the strategy and result in behaviors that support the plan. For instance, if employees need to cooperate, group or organizational level remuneration incentives should be offered rather than a system of individual-level incentives. Quality circles and union-management interaction should be formed if product quality is crucial. After the strategy is created, job analysis is used to identify the necessary behaviors. It's important to pinpoint the HRM practices that encourage these behaviors. They must be put into practice to maintain uniformity among HRM procedures. This hard-won consistency will go a long way toward ensuring that a competitive advantage achieved through HRM practices is maintained. Companies can benefit from utilizing their HRM practices on others in addition to employing them on themselves in order to achieve a competitive edge. Companies can obtain a competitive edge by specifically assisting their service providers, clients, or distributors with their business processes (Schuler, 1984).

They can gain a differentiating position in the eyes of their stakeholders in this way, which is frequently sufficient to gain preference and support when it matters most. The fact of the matter is that the company benefits from having strong and competitive suppliers, distributors, and customers in particular (Schuler, 1984).

Stakeholders are likely to influence some modifications when HRM systems develop and change through time. Shareholders may push for adjustments to the compensation of managers. Customers

may push for modifications to front-line staff training. To enhance family life, society could push for reforms. In an ideal scenario, the HRM system's enhancements spur improvements in valued outcomes, which in turn spur more HRM system improvements (Jackson, 2014).

2.2. Strategic HRM and Performance Improvement

A HRM system has traditionally had a short-term focus and been utilized as a bureaucratic control mechanism to increase productivity. Practitioners and experts now concur that managing human resources strategically can provide a source of competitive advantage (Ahmad, 2003).

The phrase "strategic HRM" is used loosely by human resource (HR) experts to convey their conviction that efficient HRM enhances corporate effectiveness. This is presumably accomplished by HR specialists who collaborate closely with line managers and have "a seat at the table" when important business decisions are made. This fundamental view of what "strategic HRM" entails is shared by many HRM academics. The field of strategic HRM is unified by the assumption that new insights about managing people at work can be gained through research that treats the many activities involved as an integrated HRM system which, if properly designed and linked to the larger context, yields beneficial results. The definition of strategic HRM has changed over time, between cultural contexts, and as reflections of the diverse disciplinary identities of strategic HRM scholars (Jackson, 2014).

The organizational players that put the HRM system into action through their daily activities also exhibit the interdependence that distinguishes system components. Social interactions among organizational members, including those involved in creating, distributing, and responding to components of the HRM system, bring HRM systems to life. It's sometimes referred to as the "HR Triad": the trio of line managers, target personnel, and human resources specialists. Traditionally, formal HRM policies were created by HR specialists in response to corporate strategies, supervisors implemented the rules through daily practices, and employees responded to their treatment. However, these positions are evolving. For example, HR professionals are now more actively involved in the business planning process, and written policies are now more open to interpretation by individual managers as they attempt to adapt to particular conditions that are fast changing and high-talent workers frequently bargain for customized employment agreements and working conditions (Jackson, 2014).

Prior to the development of strategic HRM, the "efficiency" of HRM was assessed using a combination of technical standards developed by the profession (such as validity), societal standards reflected in laws and regulations (such as fairness), and individual employee responses (e.g. job satisfaction and job performance). The strategic HRM perspective moved focus to other stakeholders' effectiveness standards. Owners' and investors' concerns have so far gotten the most attention, but other organizations', customers', and society's perspectives are also acknowledged as having some potential value (Jackson, 2014).

Some authors have suggested that labor economists and progressive industrial relations experts laid the philosophical roots of strategic HRM at the start of the 20th century. Such claims might be true given how uncommon truly novel concepts are. However, the majority of strategic HRM academics date the field's founding to a few decades later, just as the strategic management perspective began to take hold. The earliest, most generally cited contributions to strategic HRM were written in the 1980s, even though they were based on earlier talks that saw people as one of the important resources for which managers were accountable (Bakke, 1958; Drucker, 1954). Walker (1980) provided a practical explanation of how HR planning could be used to guarantee that HRM policies and practices were in line with an organization's business strategy by reflecting the duties of HR consultants and experts (Jackson, 2014).

Systems theory, role theory, resource-based theory, institutional theory, human capital theory, and social capital theory, among other theoretical views, were all used by authors as HRM evolved (Jackson, 2014).

The main focus of strategic HRM research over the past three decades has been the connection between HRM systems and financial success (Jackson, 2014). According to Becker and Huselid (2009), "the area of strategic human resource management (SHRM) has enjoyed a spectacular rise over the past two decades, both as an academic field of study and as a center of managerial practice." The resource-based view of the firm serves as a fundamental theoretical foundation for this strategy. This shows that human resource management strategies help organizations maintain a competitive advantage by fostering the growth of knowledge that is ingrained in the history and culture of the company and, as a result, is essentially unique due to its context-specificity. Given this emphasis, it is clear why resource-based thinking came to adopt the knowledge-based perspective of the company. Similar to this, it is suggested that HR practices seek to improve employee attitudes and behaviors as well as individual knowledge and abilities from the standpoint of organizational behavior. The

collective shifts in human capital, attitudes, and behaviors, as well as the corresponding organizational climate, should be significant enough to affect organizational performance if these effects are sufficiently pervasive in the employee population (Birdi et al., 2008).

The human resource management field, where focus is mostly on the impacts of SHRM-related activities on organizational performance, may have the most cogent relevant body of information on firm performance. Empowerment, thorough training, and teamwork are often essential components of SHRM measures, and numerous studies have demonstrated beneficial links with either subjectively or objectively measured firm performance. Although many commentators take such evidence as implying a causal influence, careful examination reveals this is, at best, premature. This is due, among other things, to the fact that not all studies discover relationships and that they are, once again, mostly cross sectional (Birdi et al., 2008).

A human resource system is described by Lado and Wilson (1994) as "a set of different but connected activities, functions, and processes that are intended to attract, develop, and keep (or dispose of) a firm's human resources." In the past, service firms have paid more attention to administration of this system than industrial organizations. But in both kinds of businesses, controlling this system well is crucial for improving operational performance. It goes without saying that without the necessary human resource management (HRM) procedures in place to create a consistent socio-technical system, advanced technology and new manufacturing techniques alone can do very little to improve operational performance. This is why manufacturing companies must carefully assess their current HRM procedures and change them as necessary to enable staff to successfully contribute to the enhancement of operational performance (Ahmad, 2003).

Several studies in the HR literature looked into how HR practices affected how well organizations performed. Although there are research on HR practices in the operations management literature, these studies have tended to focus on structural problems and analytical problems rather than human resources difficulties (Ahmad, 2003).

Numerous HRM procedures have been proposed by researchers throughout the years with the ability to raise and maintain organizational performance. These practices emphasize, among other things, employee selection based on compatibility with the company's culture, conduct, attitude, and the technical abilities required for the position, performance-based pay, and employee empowerment to promote teamwork. Seven HRM strategies have been put out by Pfeffer (1998) and are anticipated to improve organizational performance. The practices proposed are (Ahmad, 2003):

1. Employment security.

2. Selective hiring of new personnel.

3. Self-managed teams and decentralization of decision making as the basic principles of organizational design.

4. Comparatively high compensation contingent on organizational performance.

5. Extensive training.

6. Reduced status distinctions and barriers, including dress, language, office arrangements, and wage differences across levels.

7. Extensive sharing of financial and performance information throughout the organization

Organizations have the option to internalize or externalize employment. Building an employee skill base within the company is known as internalization of employment, whereas outsourcing human resource needs to agents based on the market is known as externalization of employment. Each alternative entails a price. The transaction cost hypothesis (Williamson, 1975) states that the choice of whether to internalize or externalize all of an operation's human resource requirements should be made based on the associated transactional costs. Such a decision-making process is myopic because it ignores the strategic repercussions of outsourcing HR. For instance, outsourcing human resource requirements can reduce the expense and complexity of bureaucracy. However, a company's continued reliance on outside resources may limit its capacity to build the fundamental competencies necessary for long-term market survival. Employee expertise, experience, and knowledge are recognized as assets by the human capital theory that have the ability to produce financial rent. But according to this notion, productivity increases are used to evaluate human resources. It falls short of giving tacit knowledge and causal ambiguity that are ingrained in an organization's human resource management system strategic importance. Researchers and practitioners have recently come to the realization that HRM systems can be used as strategic levers to concentrate on value creation rather than the previously stressed cost reduction. Researchers have emphasized the strategic component of HRM practices and debated about why these practices can result in competitive advantage, drawing on a behavioral psychology approach. The tacit knowledge that is embedded in a firm's distinctive human resources is difficult to replicate due to its characteristics, such as asset specificity, social complexity, path dependency, and causal ambiguity, according to the resource-based perspective of the firm, which emphasized this point further. The seven techniques outlined by Pfeffer (1998) are meant to cultivate these unique qualities in human resources and aid a firm in gaining a competitive

edge. Pfeffer (1998) is one scholar who has stated why these behaviors are anticipated to improve organizational performance. Over the years, there has been a lot of discussion on how HRM practices affect organizational performance. However, there is very little, if any, empirical validation of the findings in operations spanning nations and/or industries. The need to research HRM practices in the context of nation and industry has arisen as a result of recent developments in business toward globalization and mergers and acquisitions. The relationship between HRM practices and organizational performance must be generalizable, according to the literature (Ahmad, 2003).

Internally, "Employment Security" is consistent with other HRM procedures. Each of the other six HRM practices can be defended using similar justifications. These HRM practices can be considered a synergistic set because they are internally consistent with one another. Due to their mutually reinforcing support, a collection of internally consistent behaviors is more successful than the total of the benefits of the individual practices (MacDuffie, 1995). The resource-based view reinforces this idea by emphasizing the limited capacity of individual activities to produce competitive advantage on their own. These complementary resources can, however, work together to give a company a bigger competitive edge. The amount of effort each firm invests in utilizing each of the seven HRM strategies varies. An ideal situation may be one in which each of these seven HRM practices is developed, established, and applied to the fullest extent feasible, often when a business makes every effort possible to do so. A system like this one could be referred to as an ideal HRM system. It is anticipated that this ideal-type HRM system will produce the best organizational performance. The performance of an organization improves as its HRM system becomes more like the ideal HRM system. Furthermore, an organization with an HRM system akin to the ideal-type HRM system will explain substantially more variation in organizational performance than any of the individual HRM activities or any combination thereof, if bundling evokes synergy across HRM procedures as previously argued (Ahmad, 2003).

2.3. Human Resources and Operational Management

Numerous empirical research studies that looked at the effects of HRM methods on organizational performance were inspired by the interest in strategic human resource management (SHRM). However, there hasn't been much focus on how HRM methods affect operations management or how to generalize the results across nations and industries. Recognizing and resolving the disparities between HRM methods in various nations and industries is necessary for some business choices to succeed (such as globalization and merger and acquisition) (Ahmad, 2003).

The strategic human resource management (SHRM) viewpoint sees psychology-based approaches as essential to long-term competitive advantage, particularly empowerment, thorough training, and teamwork. Other methodologies, such as Integrated Manufacturing and Lean Production, focus more emphasis on operational efforts as predictors of organizational performance, such as Total Quality Management, Just-In-Time, Advanced Manufacturing Technology, and Supply-Chain Partnership (Birdi et al., 2008).

The predicted synergy between the activities is a characteristic of both Integrated Manufacturing and Lean Production from the perspective of SHRM. The following is the justification for integrated manufacturing. With each stage of production being finished just as the next has to begin, and the final stage being finished just in time to meet the delivery date, Just-In-Time aims to reduce work in progress and stock. There must be no unanticipated quality issues that cascade down the process, making the role of Total Quality Management in preventing such delays critical to success. Delays at any point would be severely damaging. Similar to the reduction of work in progress, creating the precise quantity of products needed by the customer (rather than for stock) necessitates quick transitions between stages, usually in smaller batches. Because of this, setup and changeover times are a crucial concern, and advanced manufacturing technology can help with this because of its programmability. The three practices work together in synergy in integrated manufacturing, each having a greater impact when the others are applied. Supply-chain partnership is an addition to lean manufacturing that is anticipated to strengthen the other practices by assisting in the timely delivery of components for just-in-time, preventing the importation of quality issues into the process, and obtaining supplies and components (Birdi et al., 2008).

According to sociotechnical systems theory, we should anticipate that both types of practice will have an impact on how well a corporation performs. Although Womack and colleagues are widely regarded as underplaying them, they do suggest that Lean Production involves employee empowerment as it "transfers the maximum number of tasks and responsibilities to those workers actually adding value to the car on the line." The extended concept of lean production is frequently taken to include human resource practices. Parker (2003) makes a similar argument, stating that Lean Production depends on" multi-skilled operators, often organized into small teams, being responsible for quality, continuous improvement, and issue solutions." As a result, we would anticipate synergies within and between the practices of operational management and human resource management. This is in accordance with Wall, Corbett, Martin, Clegg, and Jackson's (1990) findings that operator

empowerment can improve the performance of Advanced Manufacturing Technology as well as Ahmad, Schroeder, and Sinha's (2003) findings that HRM practices moderate the relationship between just-in-time and performance (Birdi et al., 2008).

Historically, the fields of operations management (OM) and human resources management (HRM) have been highly distinct. In reality, administrative problems with payroll and other difficulties are the main areas of interaction between operations managers and human resource managers. In academia, distinct communities of researchers studying the two topics, pulling primarily from different disciplinary backgrounds, publish their findings in disparate collections of publications. However, on a fundamental level, operations and human resources are closely intertwined. Operations frequently provide an explanation for or a means of limiting the consequences of human resource activities like salary, training, staffing, and communications. Traditional operations research models would typically interpret variations or anomalies as randomness or error variance. Human responses to OM systems frequently explain those variations or abnormalities (Boudreau et al., 2003).

A key distinction between the approaches of OM and HRM is that, while HRM research often produces frameworks to describe how to enhance or maximize behaviors, OM research typically seeks to develop frameworks that offer ideal solutions. For instance, most research on staff selection aims to increase the correlations between the results of the selection process and work performance. Some methods, on the other hand, pinpoint the ideal ratios of candidate pool size, test validity, and other variables in order to create a specific quantity or degree of qualifications among new hires. Undoubtedly, there is a lot of room for improvement in the HRM industry in general (Boudreau, 2003).

There is a long history of separation between the disciplines of operations management (OM) and human resources management (HRM). It has been uncommon for an operations manager to transition into a human resources management or vice versa in the business world. The two topics have been explored in academia by practically different communities of researchers who publish in virtually unrelated sets of journals. Despite this, almost all company contexts have close ties between operations and human resources. The realization of this truth creates numerous chances for significant advancements in both research and practice (Boudreau et al., 2003).

OM models are derived from fields including simulation, optimization, and industrial engineering. Typically, they are mathematical descriptions of manufacturing or service processes that include details like the quantity and variety of workers, customer requirements, production schedules, purchasing policies, step-by-step procedures, and timing of operations. Production or inventory levels

and volatility, as well as service and production bottlenecks, are outcomes that OM models forecast and explain. Models for human resource management are taken from fields including psychology, sociology, and inferential statistics. They discuss hiring and behavior procedures as well as how they relate to organizational structures, staffing and sourcing, learning and development, and incentives and recognition. Performance, attraction/retention, and loyalty/citizenship outcomes are predicted by and explained by HRM models (Boudreau et al., 2003).

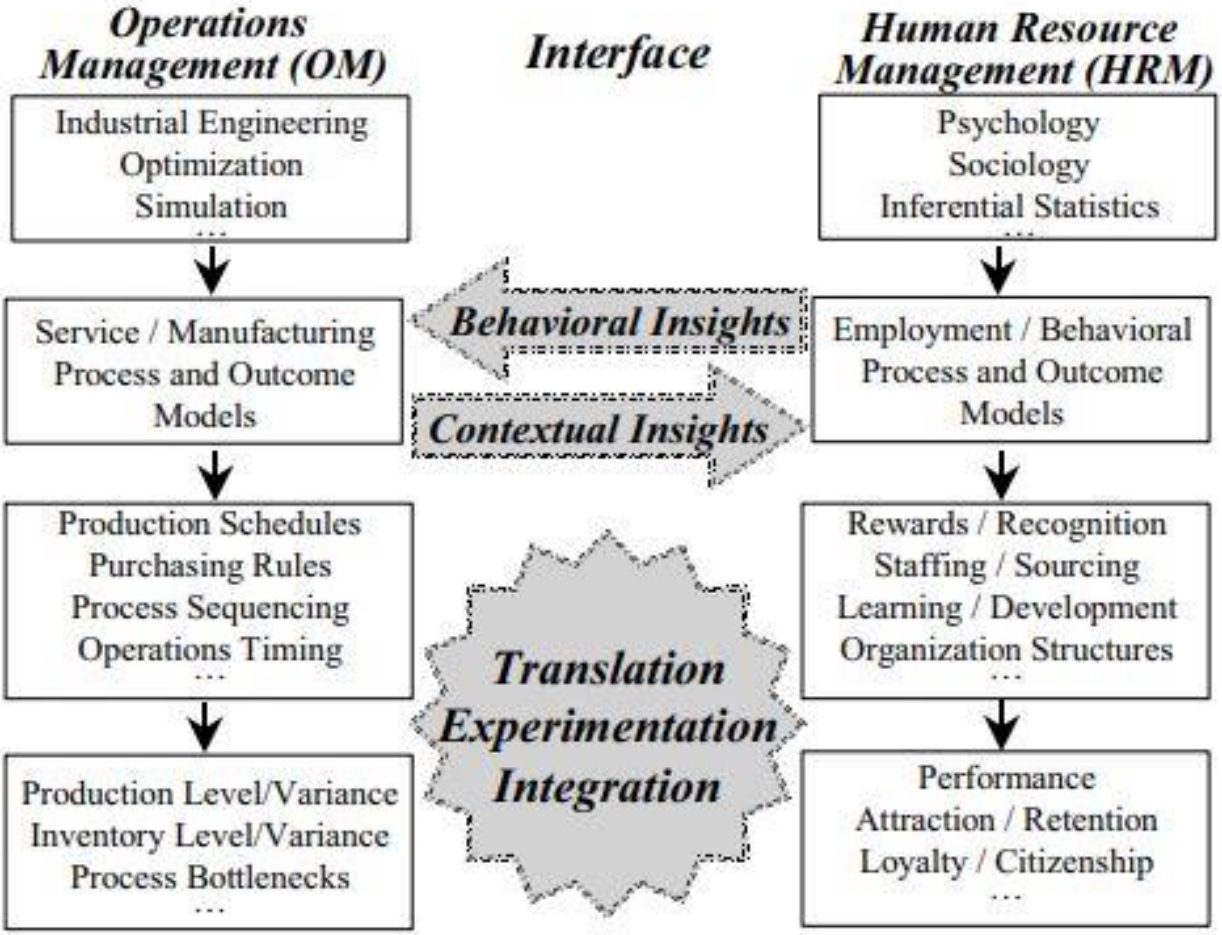

Figure 10. The Operations Management and Human Resources Management Interface (Boudreau et al., 2003).

The HRMOM interface can be demonstrated using a very broad range of workplace human behavior components. Every textbook on organizational design, organizational behavior, or human resources management has its own model or framework of the essential components. This HRMOM framework consists of four elements that underlie most work behavior models (Boudreau, 2003):

(1) Capability: The talents, knowledge, and skills required to carry out a task related to the organization's goals.

(2) Opportunity: when people are given or come across circumstances in which actions can be taken to achieve the desired outcome.

(3) Motivation: The need to carry out those acts as a result of the belief that they will lead to the desired results and rewards.

(4) Understanding: Being aware of how one's activities impact the system and the achievement of the overall aim.

The first three elements come from a long research tradition that suggests that each person's performance is a multiplicative function of ability and motivation, from critiques of the simple model (Campbell and Pritchard 1976) that contend that the environment affects how ability and motivation are expressed (Gilbreth 1909; Dachler and Mobley 1973); and from more recent research that contends that situational constraints and opportunity (such as technological advancements and shifts in the political landscape) play a role in how ability and motivation To further explain the relationship between OM and HRM, the fourth component, understanding, has been included. These and other human problems could "move the needle," or significantly alter the results of a process (Boudreau, 2003).

All modeling involves some level of simplification, and OM researchers and managers are conscious of the fact that their models incorporate skewed approximations of human behavior. In OM models, the following presumptions are frequently employed to simplify human behavior (Boudreau, 2003):

(1) People aren't a big deal. (Many models ignore people in favor of machines, hence no mention of people is made.)

(2) People are predictable and deterministic. People are always available (no breaks, absenteeism, etc.). Task times are predictable. Errors either don't happen or happen at random. Employees are all the same (work at the same speed, have the same values, and respond to same incentives).

(3) Employees are free agents (not affected by each other, physically or psychologically).

(4) The employees are "stationary." There are no learning, fatigue, or other patterns. Problem-solving is not taken into account.

(5) The workforce is not a component of the good or service. Although they support the "product" (by creating it, fixing equipment, etc.), employees are not expressly included in the client experience. System structure has no bearing on how customers engage with employees.

(6) Employees are soulless and untouched by things like loyalty, pride, and shame.

(7) Work is easily visible. Error in measurement is disregarded. It is not taken into account that observation can alter performance (Hawthorne effect).

Mathematical simulations of production and service environments are widely used in OM models to find previously undetected optimization opportunities. So, thinking about how these mathematical models might incorporate behavioral principles and information from HRM is one way to convert behavioral insights into the language of OM. The question of whether human variables might account for the disparity emerges if the OM-recommended policy is either more or less effective than the model predicts (Boudreau, 2003).

Better OM models can result from including a characteristic of human behavior into the study once it has been identified. For instance, many classical operations models make the erroneous assumption that individuals are essentially interchangeable pieces of machinery with random performance variance. However, people differ in terms of abilities, speed, and many other qualities; this is one of the most fundamental conclusions from HRM and industrial psychology. Therefore, it is not shocking if some of these traditional models do not correspond to reality. Some OM models take into account the fact that individuals have unique skill sets that enable them to be assigned to various jobs in different ways. The HRM insight that employees see and react to the setting of their work in non-random ways contradicts with these models' continued assumption that within-individual variation is random (or maybe non-existent). Such elements in OM models could establish a connection between OM and the HRM expenditures that draw in, keep, and develop employees and influence how they react to their surroundings (Boudreau, 2003).

2.4. Standardization in HR Management – ISO frameworks and the EFQM excellence model

Since the very beginning of the quality movement, several facets of human resources management have been valued as essential components within the models and paradigms of quality management. As a result, some of these elements were already present in the work of the field's pioneers. Deming (1982), for example, specifically mentioned some concepts like the implementation of job training, the implementation of a vigorous program of education and self-improvement, or the involvement of company staff in order to accomplish transformation when he outlined his famous "fourteen points for the transformation of the American industry." While Juran et al., 1990 placed special emphasis on

the provision of training, the formation of teams, and the acknowledgement of achievement in his approach for quality development, Crosby (1979) also made reference to the need for teams of employees in order to increase quality. Later academic writing on the subject has been characterized by a need to define the term "quality management," which has caused all suggestions made in this field to include elements specifically connected to human resource management. Together with process improvement and customer focus, teamwork is one of the three fundamental principles of quality management according to Dean and Bowen (1994). Even while Dale et al. (1994) acknowledge that there are substantial disparities in how the notion of quality management is defined, they identify a number of fundamental components that are universal, including education and training, teamwork, and employee involvement (Bayo – Moriones et al., 2011).

The implementation of quality management systems, of which the system based on the ISO 9000 quality standards series may be the best example, and the scheme provided by excellence models (or Total Quality Management Models), of which the EFQM model is the most common in Europe, are generally the two main frameworks within which businesses develop their ideas and practices of quality management. On the one hand, the ISO 9000 standard's implementation and certification of quality systems unquestionably make up the most well-liked methodology. The European Foundation for Quality Management (EFQM)-based evaluations, on the other hand, are gaining popularity in the improvement procedures (Bayo – Moriones et al., 2011).

The spread of flexible work organization methods in recent years is another important development. These systems are made up of a number of procedures whose main goal is to give employees significant decision-making authority and encourage their participation in business operations through information-exchange and communication between employers and employees (both in an ascending and descending fashion). Additionally, employees must learn more about the overall operational framework that the company uses to conduct its operations in order to become more multi-skilled and capable of doing a larger number of duties across a wider range of categories. As a result, judgments are made by people who are able to identify issues and, consequently, have a more in-depth understanding of their possible causes. This helps the company to respond more quickly and to take advantage of greater flexibility when handling unforeseen scenarios. Additionally, as long as these methods are seen as being employee-centered, they may be anticipated to result in stronger loyalty to the firm and higher levels of motivation and job satisfaction (Bayo – Moriones et al., 2011).

An organization must demonstrate its capacity to ensure that its product consistently complies with customer-applicable regulatory requirements and to address customer satisfaction through the effective application of the system, including processes for continual improvement and the prevention of nonconformity, according to the International Standard's ISO 9000 series, which sets out the requirements for a quality management system (Bayo – Moriones et al., 2011).

Alternatively, some businesses have chosen to create a management model using the EFQM model as a frame of reference, which is the excellence model created by the European Foundation for Quality Management. The EFQM is a non-prescriptive framework with nine criteria that include all of an organization's activities and interested parties/stakeholders, allowing for the evaluation of progress made toward excellence (Bayo – Moriones et al., 2011).

The "processes" are where ISO 9000 and EFQM most significantly overlap. Congruence between policy strategy and customer results is also very strong. However, ISO 9000 does not take society results into account (Bayo – Moriones et al., 2011).

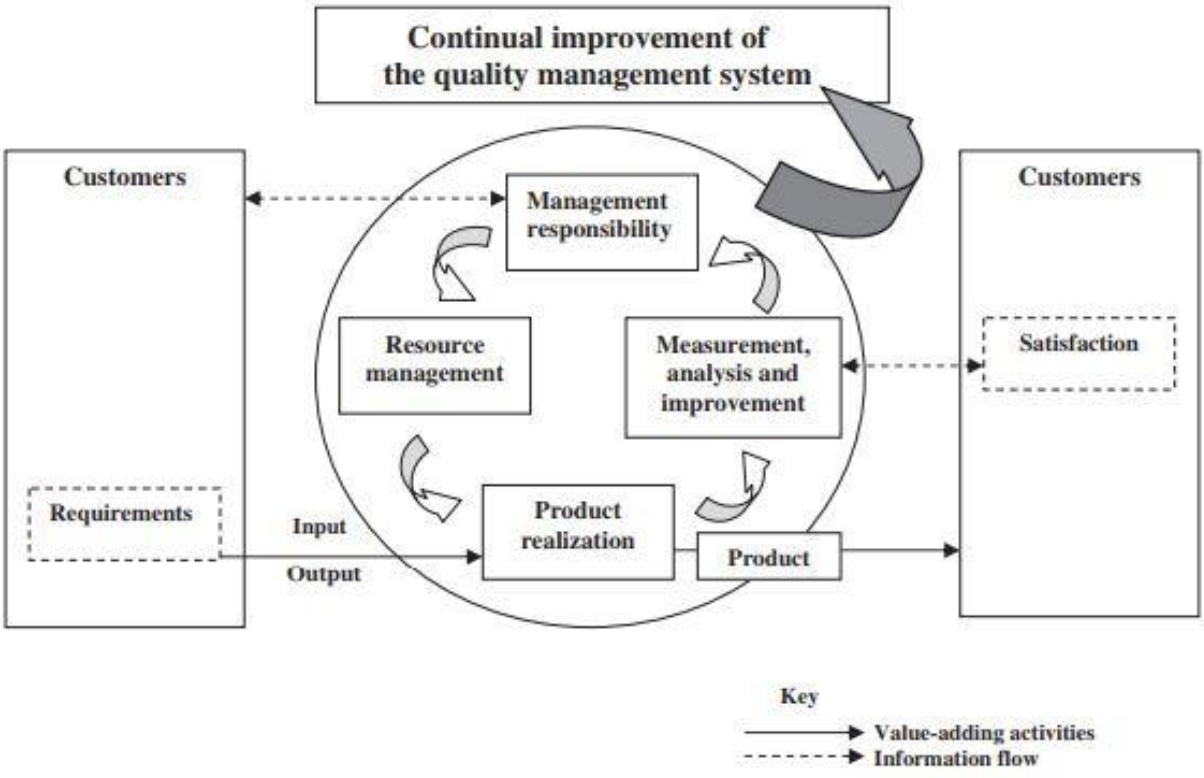

Figure 11. ISO 9000:2000 scheme. Source: Bergenhenegouwen et al. (2002).

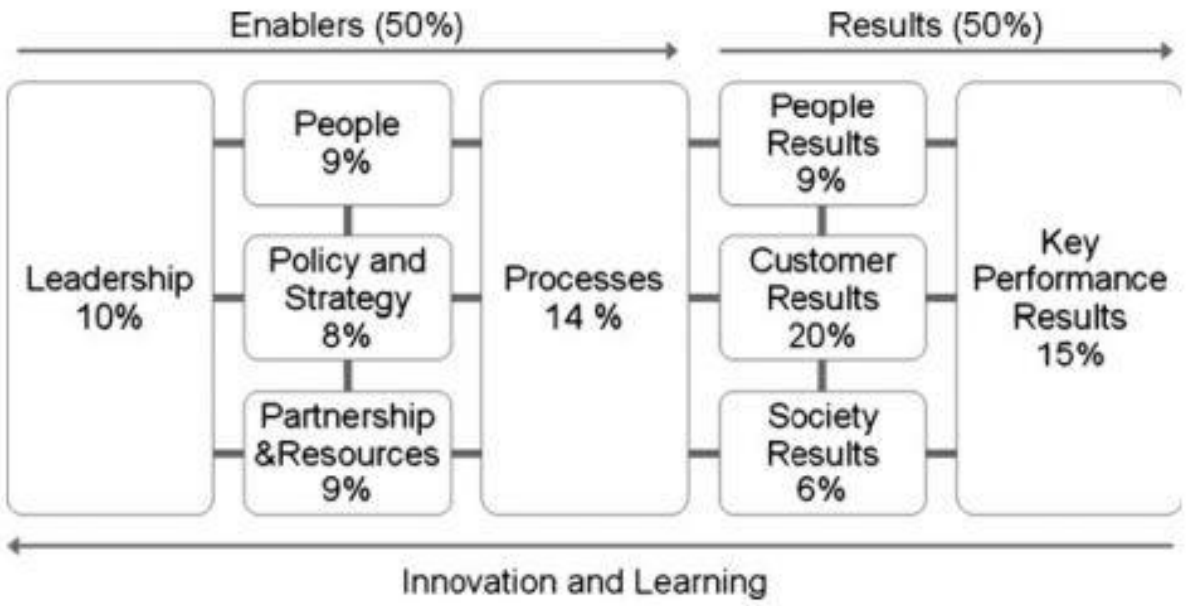

Figure 12. EFQM excellence model (Bayo - Moriones, 2011).

Both sets of principles acknowledge the value of a customer-centered approach and the crucial part played by leadership in generating both drive and focus. The updates to ISO 9000:2000 give processes and elements of continuous improvement a greater priority because they are crucial to the success of the Excellence model. It is clear that the Excellence model is evolving in the direction of ISO 9000:2000's emphasis on people and mutually beneficial supplier relationships. There are also obvious differences. The Excellence model provides a more comprehensive understanding of quality and excellence due to its expanded definition of partnership, emphasis on innovation and learning, inclusion of public responsibility, and more inclusive approach to results (balancing the requirements of all stakeholder groups). The plan-do-check-act cycle of Deming is evident in both models. A significantly larger focus than ever is placed in ISO9000:2000 on the use of measurement and analysis of findings, contributing to the review and improvement process (Russell, 2000).

Figure 13. Deming's PDCA cycle.

The ISO 9000 standard does not give issues pertaining to human resources management any additional weight. Its 1994 edition just mentions training in relation to this issue. Thus, clause 4.18 states that ‘‘the supplier shall establish and maintain documented procedures for identifying the training needs and provide for the training of all personnel performing activities affecting quality. Personnel performing specific assigned tasks shall be qualified on the basis of appropriate education, training, and/or experience, as required. Appropriate records of training shall be maintained’’. Subsequent revision led to the formulation of the ISO 9001:2000. This newer version includes a marked emphasis on human resources management, as devoting clause 6.2 in section 6 (‘‘Resource Management’’) to the subject: ‘‘personnel performing work affecting product quality shall be competent on the basis of appropriate education, training, skill and experience’’. In addition, clause 6.2.2 states that ‘‘the organization shall: (a) determine the necessary competence of personnel performing work affecting product quality; (b) provide training or take other actions to satisfy these needs; (c) evaluate the effectiveness of these actions taken; (d) ensure that its personnel are aware of the importance of their activities and how they contribute to the achievement of the quality of the

objectives and (e) maintain appropriate records of education, training, skills and experience''. (Bayo – Moriones et al., 2011).

Additionally, in section 5 on ''Management Responsibility'', clause 5.5.3 states that ''top management shall ensure that appropriate communication processes are established within the organization and that communication takes place regarding the effectiveness of the quality management system'', measures that are closely related to human resources management in the firm. An examination of the aforementioned points reveals that the ISO 9000 standard continually stresses the importance of things like training and competencies, as well as the requirement to assess the efficacy of the actions made in this area. Additionally, while item "d" acknowledges the need to encourage employee involvement, no concrete steps are provided. The emphasis on these elements, nevertheless, seems to be more evident in the statement of values that serves as the foundation for and source of inspiration for the standard. Thus, principle 3 is entitled ''People involvement'', and states that ''the organization shall ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of quality objectives.'' The necessity of employee participation in accomplishing organizational goals and continuous development is also explicitly mentioned in other principles, such as those relating to leadership and continuous improvement. Singh (2008) considers capable personnel to be one of the six important management practice constructs in this context. "Capable employees" are fully trained for the tasks they carry out, are aware of their responsibilities and objectives, are aware of how the organization's quality policies affect their work, participate in the creation of organizational and work plans, have their growth and motivation encouraged, and continuously improve their work output (Bayo – Moriones et al., 2011).

In comparison to ISO 9000 requirements, TQM or excellence models are significantly more comprehensible when it comes to human resources management. Employee involvement and team-based work organization are crucial components of human resources management models, which are regarded as a significant area of a company's management system. Particularly those with an interest in human resource management may find these models attractive. First of all, evaluation models and measurement studies on TQM include human activities because this is one of the theoretical elements that is covered by TQM models. Second, because in practice, how personnel at all levels of the hierarchy handle the adoption of TQM determines whether it is successful or unsuccessful. Improvements in performance need the integration of TQM and human factors. The administration of human resources needs to undergo significant adjustments. It should not be surprising, according to

Wilkinson (2004), that the philosophy of total quality management and many aspects of human resources management are compatible. After all, the conventional viewpoint on human resources management holds that it is dependent on corporate strategy. The relationship is clear because quality management is typically a key component of most organizational initiatives. Thirdly, in order to achieve quality performance—the main goal of TQM—human resources are required (Bayo – Moriones, 2011).

Focusing on the EFQM model, criterion ‘‘People”, makes reference to ‘‘how the organization manages, develops and releases the full potential of their people at an individual, team-based and organization-wide level’’. This criterion is broken down into five sub-criteria: planning, management, and development of human resources; identification, development, and maintenance of knowledge and skills of individuals within the organization; involvement and empowerment of individuals within the organization; existence of a dialogue between individuals and the organization; and, finally, rewards, recognition, and care for individuals within the organization. In addition, all of this is reinforced with criterion ‘‘People Results’’, which states that ‘‘excellent organizations comprehensively measure and achieve outstanding results with respect to their people’’ (Bayo – Moriones, 2011).

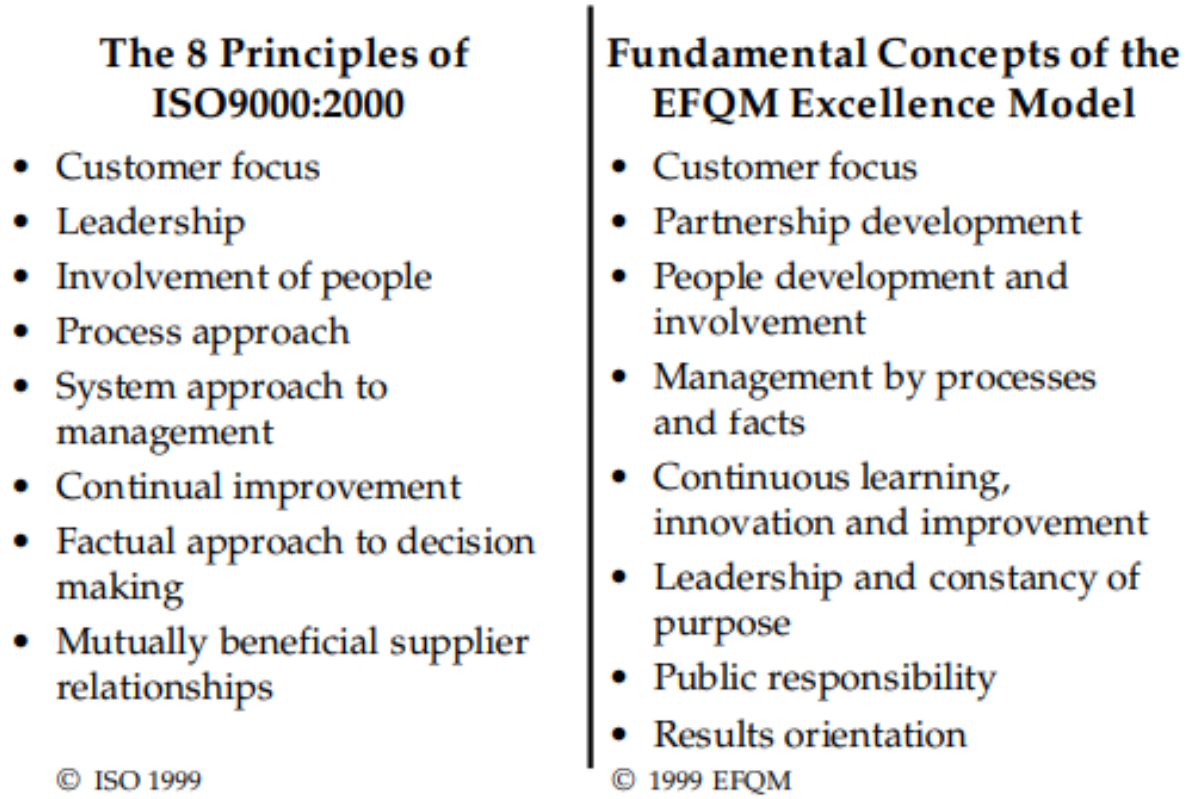

Figure 14. The underpinning Principles of ISO 9000 and EFQM (Russell, 2000).

It is conceivable to get the conclusion that the EFQM model values human resources management more highly than the ISO 9000 standard. Its tenets favor giving workers challenging assignments and giving them more freedom to execute their jobs effectively. This closely reflects the core tenets of flexible work arrangements. Because of this, companies using the EFQM model as their management framework may be expected to use certain work organization methods more frequently than companies using ISO 9000-compliant quality systems (Bayo – Moriones et al., 2011).

The information about the EFQM model's implementation is less precise since, unlike ISO 9000, there are no external certifications to measure its level of implementation. There is some information available about the businesses that participate in the yearly quality awards given by various organizations and based on the model. This is a relatively small percentage of all the businesses that might be using this strategy, though. Although it is believed that the application of ISO 9000 is clearly superior, there is no denying that this model has had a significant impact on quality management since it has been supported by the major organizations that support and promote quality (Bayo – Moriones et al., 2011).

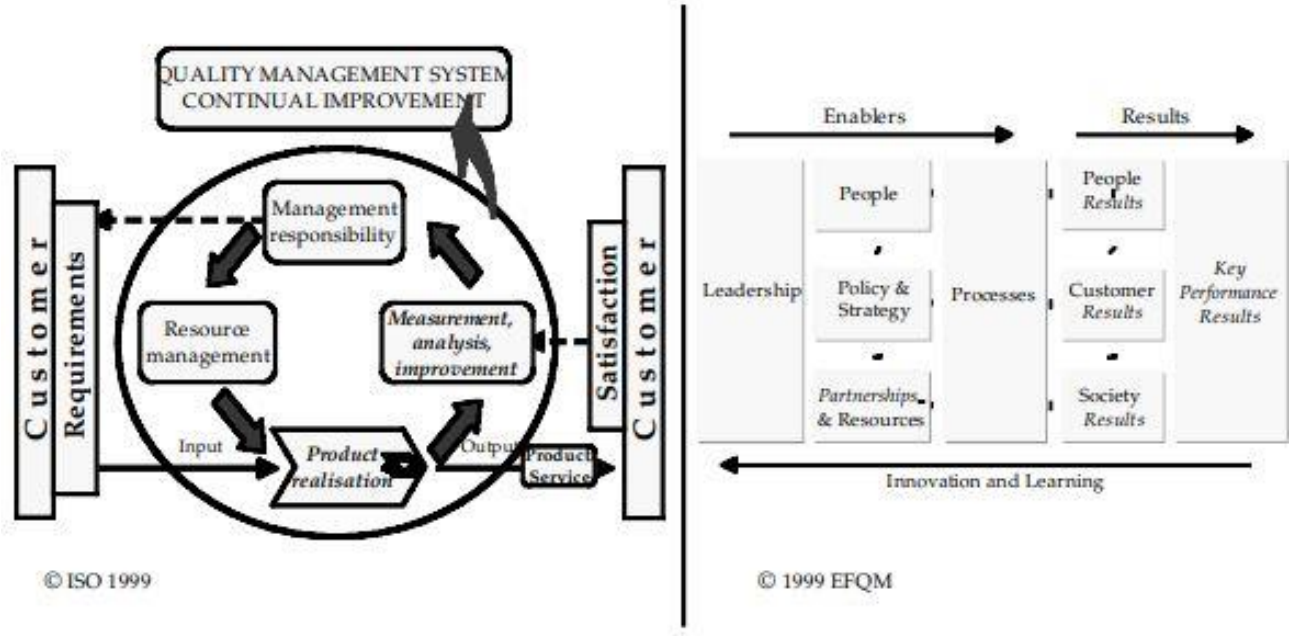

Figure 15. The basic ISO 9000 and EFQM 1999 models (Russell, 2000).

ISO 30400 is a new family of standards that was introduced globally in 2016. The ISO 30400 series covers global standards for human resource management (HRM) and consists of recommendations

and principles for organizations and human resource (HR) to work in way that is more purposeful, comparable, and consistent (ISO/TC 260, 2014). The series consists of the following standards:

- ISO 30408, *Human resource management – Guidelines on human governance*. This standard offers instructions for developing a human governance system that can effectively address organizational and operational needs while also fostering greater stakeholder collaboration, anticipating and managing human resource risks, and creating a company culture that is consistent with the company's values.
- ISO 30405, *Human resource management – Guidelines on recruitment*. This standard is intended for use by everyone involved in recruiting and offers recommendations on efficient hiring practices.
- ISO 30409, *Human resource management – Workforce planning*. This standard enables enterprises to more efficiently address their staffing needs, both present and future.
- ISO 30400, *Human resource management—Terminology*. The definitions of the key terminology used in human resource management standards are provided by this standard.

The guidelines encompass a variety of HR procedures and practices, including hiring, workforce planning, and HR analytics. The technical committee's business plan, ISO/TC 260 (2014), states that these standards are “embarking on a relatively new, underdeveloped area of work” (p. 11). As standards seek to enhance control, coordination, and predictability in business operations, organizations are frequently considered as the main beneficiaries. The fact that ISO 30400 has an extra viewpoint, namely to professionalize HR, makes it particularly intriguing. Global standards for HRM have been referred to as a solution to the problems of inefficiency and opaqueness in personnel management, as well as the propensity of HR professionals to create complicated solutions that make it challenging for managers to handle employee issues in a consistent and cogent manner. Global standards for HRM are therefore anticipated to increase uniformity, improve quality, and professionalize HR work (Ulfsdotter Eriksson, 2017).

3. Knowledge Management

3.1. Introduction to Knowledge Management Maturity

Maturity is the degree to which an object, technology, process or organization evolves over time (Klimko, 2001; Jiuling et al., 2012; Serenko et al., 2015; Escrivao & Silva, 2019). Maturity models (MM) in organizations methodically classify procedures and determine phases, which lead the manager's plans (Churchill & Lewis, 1983; Gaál et al., 2008). Knowledge, even though intangible, is an asset which like any other asset needs to be managed (ISO, 2015).

Maturity in Knowledge Management (KM) is the degree to which knowledge assets are effectively managed within organizations (Sajeva & Jucevicius, 2010). It symbolizes the ongoing phase-by-phase management of knowledge assets until knowledge is deliberately and methodically defined, managed, checked, stored, and shared while also generating useful results for the company (Kulkarni & Louis, 2003; Teah et al., 2006; Pee & Kankanhalli, 2009). The stages of evolution of KM efforts in an organization are described by KM maturity (KMM) (Pee & Kankanhalli, 2009). The phases of growth are defined by a knowledge management maturity model (KMMM), which also aids businesses in evaluating the development of KM practices, improving decision-making, and recommending performance improvements (Teah et al., 2006; Lin, 2007; Gaál et al., 2008; Oliveira et al., 2010; Lin, 2011; Abu Naser et al., 2016a). An organization's KM maturity is determined by how well it constantly manages its knowledge assets and applies them (Kulkarni, 2003).

Seventy eight percent of the corporations believe that they missed out on a fair number of commercial possibilities, due to not properly knowledge and eighty percent of the corporations regard knowledge as their strategic asset (KPMG, 2002/2003).

Knowledge Management (KM) is becoming more important for achieving sustainable business success (Paulzen et al., 2002). Mainly knowledge-based companies (e.g. financial services, chemical industry, consultants) have embarked on KM practices in order to rise to the challenges of the aggressively changing markets. This poses the question of whether these implemented practices are successful and whether the proper practices were selected to begin with. In an effort to address this question, both researchers and practitioners have designed several paths to measuring the success

and efficiency of KM. The systematic management of knowledge resources is defined as one of the crucial factors for sustainable competing leverages (Lee, 2005).

The process of defining "knowledge" and designing the metrics to determine if and to what degree is an organization effectively managing its knowledge resources is a complex exercise. Assessment is the first step towards enhancement, as one can't improve what one can't measure (Kulkarni, 2003). There are benchmarks and indicators for assessing and evaluating the degree of acceptance and maturity of any business practice that could possibly affect business process and success. Essentially, maturity models present the evolvement of an object over time. This "object" can be anything within the operational spectrum: a human being, an organizational process, a business initiative, or a technology. Maturity models are a natural application of the life-cycle approach, in the sense that all entities grow through stages of maturity over time until they achieve the ultimate level (Ping, 2009).

Organizations must learn how to learn, in order to become competitive (Aggestam, 2006). How an organization achieves maturity in this specific field is not determined. Knowledge management should concentrate on creating and managing knowledge stocks if knowledge is seen as an object or is equated with information access (Alavi and Leidner, 2001). If knowledge is viewed as a process, then the creation, sharing, and distribution of knowledge, as well as knowledge flow, are the suggested areas of focus for knowledge management. A knowledge management perspective that emphasizes developing core competences, comprehending the strategic advantage of know-how, and generating intellectual capital is suggested by the notion of knowledge as a capability.

This three-fold perspective could serve as the foundation for an integrated knowledge and resources management framework.

In the next sections a literature survey of research in KM assessment frameworks is presented. It was based on the most prominent literature review articles that assessed hundreds of frameworks and thousands of published papers in the field of KM assessment frameworks for the last thirty years. The research has formulated the research objective that this study addresses, namely: *the proposal of a novel integrated framework to KM Maturity Assessment as a holistic approach.* The literature survey also revealed a series of research questions associated with the study's main research objective:

RQ1. What is the relationship between human resources and KM?

RQ2. What is the relationship between strategy and KM?

RQ3. What is the role of leadership in KM?

RQ4. What is the role of performance measurement in KM?

RQ5. What is the relationship between change management – continuous improvement and KM?

RQ6. What is the relationship between process and KM?

RQ7. What is the role of enablers in KM?

RQ8. Which are the required enablers for a successful KM?

Section 3 also presents the result of the research regarding the research objective. Section 4 includes a literature survey on the standardization of Knowledge Management Assessment, formulating the extended research objective: *the proposal of a holistic and integrated Knowledge Management Maturity Assessment framework encompassing the core guidelines of ISO 30401 in order to be used by both researchers and practitioners*. In chapter 4 the GQC model is examined for implementation regarding the ISO 30401:2018 standard requirements. Finally, in Section 4.2 a discussion regarding the research questions is presented followed by the proposal for a KM specific integrated model. The figure below, depicts the approach followed in the thesis in presenting the literature survey, research questions and the proposed approach.

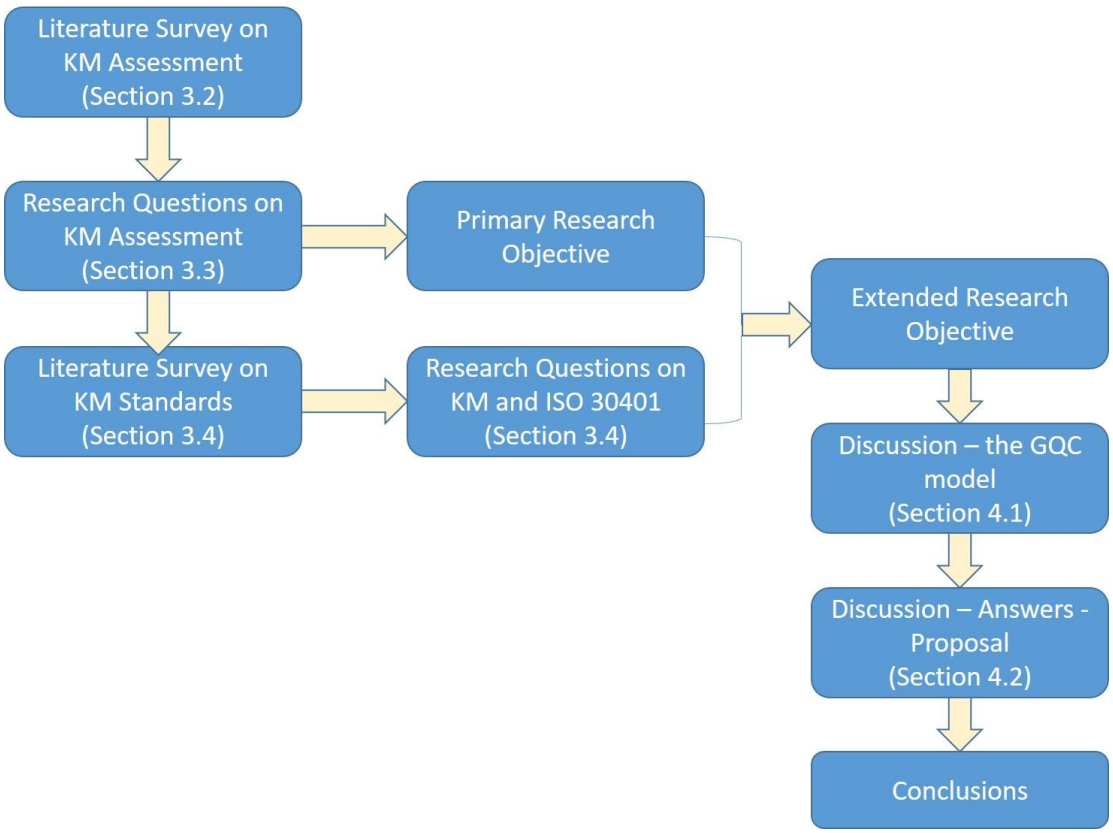

Figure 16. Research and Presentation Approach.

3.2. Literature Survey of Knowledge Management and Corporate Resources Management Maturity Frameworks

3.2.1. Literature Survey Methodology and results table

For the selection of the literature survey used in this research, the Scholar database was selected as the primary search base and the following methodology was applied (as depicted in the corresponding scheme).

"Knowledge Management Maturity Assessment" was defined as the primary search objective, returning more than a million results. However, when peer-reviewed filter was applied, the number was restricted to 74.000 results.

In the next step, the secondary research objective "organizational" was applied to further restrict the results. Reviewing the titles and abstracts of the mostly cited papers, additional keywords were defined, the critical success factors, such as human resources, process, technology, enablers, leadership, change management, corporate culture, continuous improvement, strategy. When these factors were used, the results came up to 19.900. Afterwards, strictly related to Information Technology Systems results were excluded to provide the final 13.000 results relevant to the research. These were sorted by relevance and the first 1.000 more relevant were abstract scanned manually, to select 100 of them. Finally, these 100 papers were full-text scanned manually to provide the 39 final selected results to be used in this research.

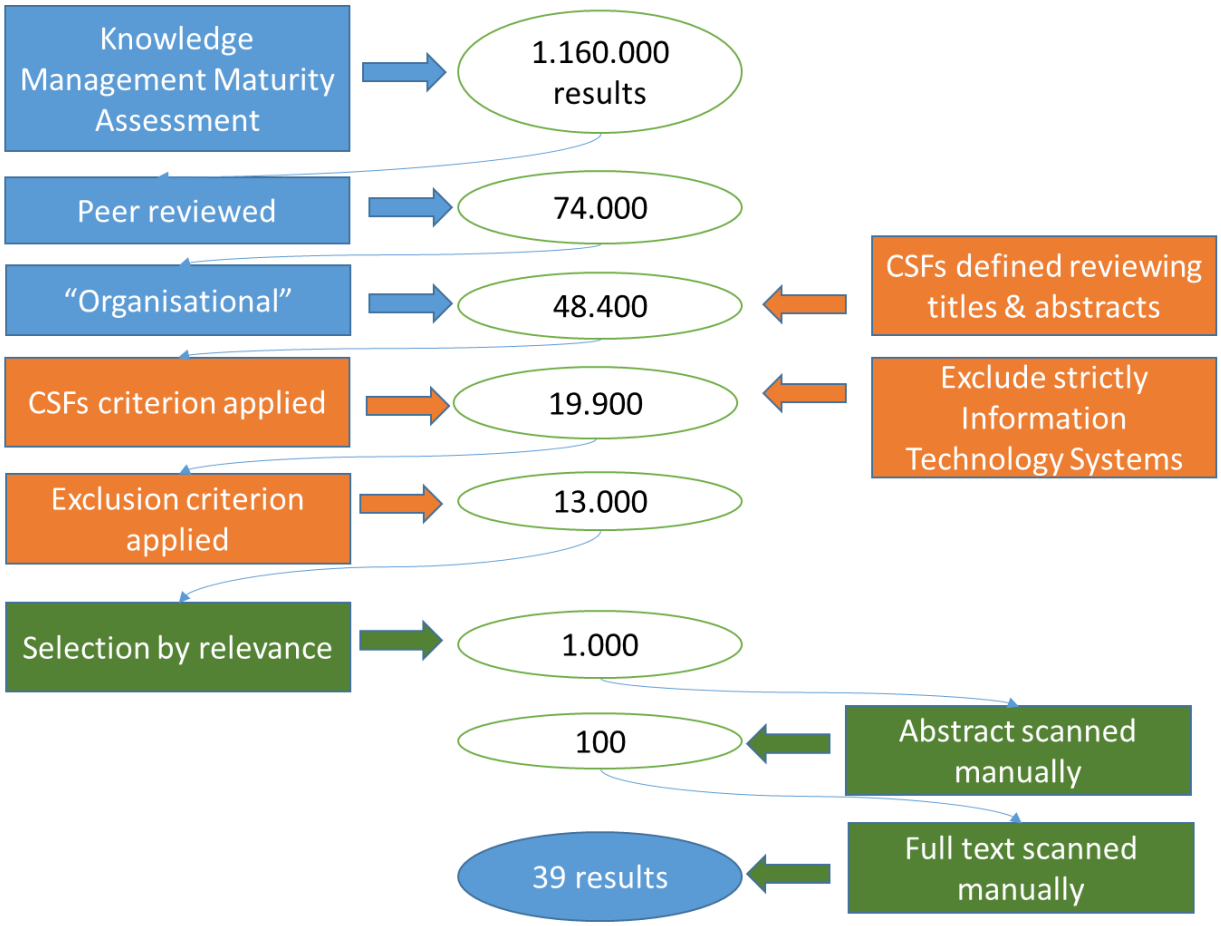

Figure 17. Literature Survey Methodology.

The research results of the literature survey on KM are shown in the table below, regarding subject focus.

Reference	Subject focus
Kochikar (2000)	In the framework of Infosys Technologies Ltd., created a generic KMMM. Default, reactive, conscious, convinced, and sharing are the model's five stages. People, process, and technology are the key areas taken into account.
Klimko (2001)	Developed a generic KMMM with five stages: initial, knowledge discoverer, creator, manager, and renewer, specifying each stage's characteristics in terms of focus, key processes, challenge, tool, and pitfall to foster consensus and shared understanding among managers of a firm using a top-down approach.
Paulzen et al. (2002)	A Knowledge Process Quality Model (KPQM) is proposed, based on quality management and process engineering, to assess and improve KM structures and processes. Supports systematic knowledge management learning and continuous quality improvement.

Berztiss(2002)	CMM for KMKE identifying KPAs: Knowledge requirements management, internal knowledge acquisition, uncertainty, awareness, training, knowledge representation, knowledge engineering techniques, user access and profiling, external knowledge acquisition, qualitative and quantative cost/benefit analysis, technical change management.
Ehms & Manfred (2002)	Focusing on strategy and goals, environment and relationships, people and competences, collaboration and culture, leadership and support, structures and forms, technology and infrastructure, and processes and roles organization, the KMMM of the Competence Center for KM at Siemens AG.
Kulkarni & Louis (2003)	Identified key maturity areas: lessons learned, expertise, data and structured knowledge in the form of a survey, the results of which indicate that self-assessment of KMM is possible.
Lee & Kim (2005)	Defined KMM factors through literature review and tested the model thorough a number of case studies. Confirmed the existence of four stages. Findings verified the existence of the temporal sequence in KM implementations, proposed a new management object, community of practice (COP).
Feng (2006)	Defined enablers and processes for: creation, storage, sharing and application, suggested factors for KMM, suggested a KMMM based on the concept of continuous process improvement and the capability maturity model (CMM).
Aggestam (2006)	KMMM aiming to set directions for Learning Organizations focusing on culture, leadership/ management, vision, organizational learning, work processes/ day-to-day activities, organizational IT memory, internal and external factors (system's thinking).
Isaai & Amin-Moghadan (2006)	Introduced an integrated framework built on evaluation, maturity level, and the APQC implementation road map toward a decision support system (DSS) for the methodical application of the framework with leadership, personnel skills, and process standardization as important components.
Teah et al. (2006)	Compared nine existing Knowledge Management Maturity Models (KMMM) to propose a General KMMM (G-KMMM), focusing on assessing the maturity of people, process and technology aspects with cross references to change management and strategy planning. Proposed that areas of key processes of an organization can be at different phases (one factor may be more evolved than another).
Yeh et al. (2006)	Through the case study of two companies, verified the KM factors concluded by other papers regarding: 1.strategy and leadership 2.corporate culture 3.people 4.information technology 5.organizational enablers.
Phelps et al. (2007)	Referred to the requirement for policy formation and identified the six "tipping points" as being people management, strategy direction, system formalization, customer needs, acquiring funding, and operational improvement.
Kruger &Snyman (2007)	Formulated a Knowledge Management Maturity Questionnaire consisting of six (6) sections, containing 101 descriptive questions, based on a seven - level KM maturity matrix, focusing on personnel and leadership awareness.
Lin (2007)	Developed a stage model that focuses on two key questions: (1) do organizations alter their KM practices over time in order to increase their effectiveness, and (2) do these changes occur as a result of socio-technical support?
Rasula et al. (2008)	Proposed an integrated KMMM based on three categories of critical success factors: knowledge-related, organization-related and IT-related factors.

Grundstein (2008)	Proposed a Model for General Knowledge Management within the Enterprise (MGKME) based on a sociotechnical approach focusing on people and value-adding processes.
Pee-Kankanhalli (2009)	Proposed a General KMMM that encompasses the initial, aware, defined, managed, and optimizing stages, with human resource planning, technology change management, continuous learning and improvement as KPAs.
Hsieh et al (2009)	Formulated a knowledge navigator model (KNM™) consisting of five maturity stages, three target management objects (culture, KM process, and information technology), 68 KM activities, and 16 key areas (KAs).
Jennex et al. (2009)	Influence on business processes, impact on strategy, leadership, and knowledge content are the dimensions used to gauge the performance of KM as a multidimensional concept.
Kruger & Johnson (2010)	Devised a questionnaire to investigate KMM, tested it and confirmed importance of elements such as the formulation of strategy, measurement, policy, content, process, technology and culture as enablers for KM.
Kuriakose et al. (2010)	Developed a morphological framework of Knowledge Management Maturity Model identifying six dimensions: Context, applicability, stages, assessment, validation, key areas.
López & Meroño. (2011)	Empirical study consisted of 310 Spanish organizations and structural equations modelling focusing on strategic knowledge management, innovation and performance. Organizational learning (OL) is acknowledged as a key issue on strategic management.
Lin (2011)	Survey data from 241 managers in large Taiwanese firms were collected and used to test the research model using the structural equation modeling (SEM) approach based on knowledge self-efficacy, top management support, and KM system quality.
Kim et al. (2014)	Defined four KM strategies: external codification, internal codification, external personalization, and internal personalization. A multiple contingency model of KM strategy is developed based on the technology-organization environment framework.
Massingham (2014) Part I & II	4 KM toolkits and 16 KM tools were tested over a 5-year period. The highest rating toolkit was knowledge strategy, followed by knowledge measurement. The most value was created by using KM to introduce objectivity into future thinking (future capability requirements) and decisions when filling competency gaps (sourcing).
Abu Naser et al. (2016a)	Used KMM to measure performance in two universities. Identified the most important factors affecting performance excellence as: Processes, KM Leadership, People, KM Outcomes.
Fashami & Babaei (2017)	Developed a behavioral maturity model for managers to examine effectiveness of knowledge management. An empirical case study showed that transformational leadership, human and social skills, knowledge orientation, emotional intelligence, trustful climate are identified as highly effective.
Escrivão & Silva (2019)	Provided a systematic review, an identification of main gaps and a comparison of existing KMMMs, which can potentially support the development of a complete and integrated KMMM.
Antunes & Pinheiro (2019)	Identified the link and evolution between the concepts of knowledge management, organizational learning and memory focusing on Human Resources.
Lee et al. (2019)	Suggested that the impact of KM capability on firm performance is more pronounced in the long term than in the short term. By contrast, knowledge management systems (KMS) is associated only with immediate, short-term financial benefits with such gains prone to instability in the long term.

Spanellis et al. (2020)	Contributed to KM literature by developing a dynamic model of KM, which shows how KM capability evolves over time within an organization. In this model, KM evolves from managing explicit knowledge through knowledge sharing to creating new knowledge.
Pereira et al. (2021)	Concluded that they are halfway through the adoption of KM systems after analyzing the general maturity level of European project-based organizations to determine which stages were more developed and what are the key steps to achieve successful organizational learning.
Demir et al. (2021)	This study looked at how KM practices and organizational sustainability interacted in ISO 9001-certified and non-certified businesses.
Bibi et al. (2020)	The need for information to be rethought theoretically provides a unified framework for corporate knowledge and sees knowledge management (KM) as a management role.
Arias Velásquez et al. (2021)	Assessments of case study in two universities have demonstrated the university performance and challenges associated to KM during COVID-19 via interaction with capitals: Human, structure and relational.
Veeravalli & Vijayalakshmi (2022)	Considered the impact of organizational HR and KM practices on knowledge seeking behaviors to support knowledge exchange dynamics and stimulate curiosity for learning amongst members.
Yantai Chen et al (2022)	Constructed a comprehensive theoretical framework of "data-driven context – dynamic capabilities – knowledge hiding," proposing three dimensions of "institutional environment – organizational innovation – executive/individual cognition" on building dynamic capabilities.

Table 1. Knowledge Management References Used in the Literature Survey (2000-2022).

Knowledge Management (KM) frameworks' aim is to collect the individuals' expertise knowledge and share it in the form of collective knowledge among the organizational entities, producing and establishing what is known as organizational knowledge (Kuriakose et al., 2010). The KM framework is dictated by business needs, aiming at performance improvement via collective knowledge. KM implementation within an organization is not strictly intended for -or limited to- certain fields, as KM covers various areas like Information and Communication Technology, Information Science, Systems Science and Engineering, Knowledge Engineering, Collaborative Engineering, Organizational Development, Change Management, Performance Management etc.

The implementation of KM cannot happen radically over a short period of time, as it implies primary changes in technological infrastructures, organizational processes, people and corporate culture. In that sense, KM is unlikely to be achieved in one giant leap (Teah, 2006). Starting from a point of deliberation and preparation, passing through strategic planning and training, the goal should be sustainable change, assessment and improvement throughout all corporate processes and resources. Knowledge Management is an evolutionary process of constant change and continuous improvement (Paulzen et al., 2002; Pee, 2009).

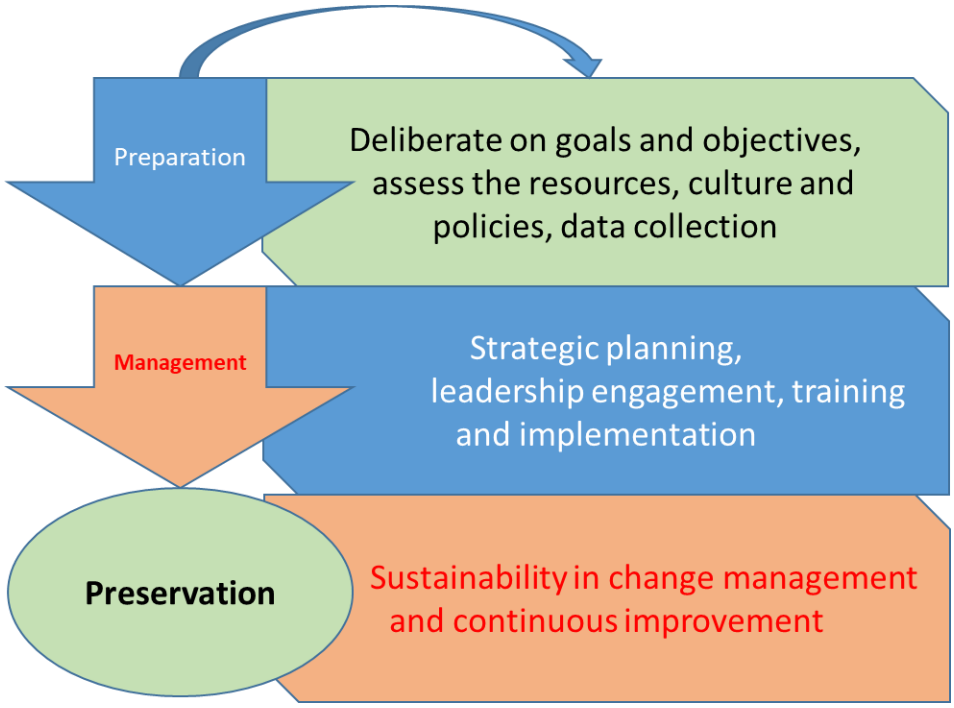

Figure 18. KM implementation process.

The evaluation of the current situation, the quantity and quality of organizational knowledge, the design of a specific plan based on the evaluation findings, business strategy, and knowledge maturity indicators, and the definition of an action program at the managerial and operational levels to improve knowledge are all components of a comprehensive framework to determine an organization's level of maturity and implement knowledge management practices (Isaai & Amin-Moghadan, 2006).

Practitioners and researchers have advocated the need for "Knowledge Management Maturity Models" (KMMMs) (Escrivao & Silva, 2019). KMMMs provide a road map for KM implementation. The concept behind any such model is based on strategic objectives and the best possible use of corporate resources available (Kuriakose et al., 2010). KMMMs direct organizations to performance improvement (Zaim, 2006). There is a strong relationship between KM processes and an organization's performance, whereas knowledge distribution, sharing and mostly knowledge creating have the greatest effect on KM practices' success and can also be used as performance benchmarks (Klimko, 2001).

KMMMs usually have the following properties in common (Kuriakose et al., 2010):

- The evolvement of any resource (object, human being, process, technology) is decomposed and presented through a small number of maturity levels (usually four to six).

- Levels are defined by specific demands which the “resource” has to meet on that specific level.
- Levels are progressively categorized, from a starting level to an ultimate level of excellence.
- While evolving, the resource graduates from one level and proceeds to the next, without the possibility to skip a level.

Some secondary principles dictate (Ehms & Manfred, 2002; Paulzen et al., 2002; Teah, 2006) that the model should:

- Be applicable to different objects of analysis, e.g. organizations as a whole, organizational unit, or KM systems. This can be achieved through targeting processes rather than specific objects of analysis.
- Consider the views of different participants. Specifically, Paulzen et al. (2002) suggest that employees should participate in the assessment of KM maturity.
- Provide a methodic well organized approach which will in turn provide transparency and reliability during the assessment phase, focusing on the significance of measurement and standardization.
- Procure qualitative and quantitative results.
- Be comprehensible and allow cross references to established management concepts or models.
- Support continuous learning and improvement.

KMMMS consist of stages, and a survey of the literature shows that the stages are typically presented in a similar way by different researchers (Escrivao & Silva, 2019). Despite some minor variations, KM is primarily caused by organizations not understanding the importance of their processes. With the goal of comprehending, gathering, preserving, and disseminating information, initiatives are designed or implemented as organizational awareness of the significance of KM grows. These initiatives are typically linked to supporting technology and activities. The creation of new knowledge is then given more attention. With time, KM procedures become formalized and widespread across the organization. The last level involves integrating KM techniques into enterprises' external environments and evaluating them in order to achieve continuous improvement.

The Capability Maturity Model (CMM) is a well-known maturity model that is extremely well-liked by businesses (Kuriakose et al., 2010). The Software Engineering Institute of Carnegie Mellon University created its most recent version, the Capability Maturity Model Integration (CMMI), which employs both a staged maturity assessment depiction and a continuous maturity assessment portrayal

for process improvement. The model contains five stages in the staged portrayal. "Initial" maturity level 1 is characterized by random and chaotic processes. The second maturity level is referred to as "Managed," and it is characterized by procedures that are organized and carried out in accordance with organizational policy. The third maturity level, "Defined," is distinguished by the usage of established procedures to create consistency throughout the business. The fourth degree of maturity, "Quantitatively Managed," is distinguished by the management of process performance through quantifiable goals. The fifth maturity stage, referred to as "Optimizing," is characterized by continuous process performance improvement through ongoing, creative process and technical advancements.

Four CMM-based KMMM were identified (Teah, 2006): Siemens' KMMM (Ehms & Manfred, 2002); Infosys' KMMM (Kochicar, 2000); Paulzen et al. (2002) Knowledge Process Quality Model (KPQM); and Kulkarni and Freeze's (2004) Knowledge Management Capability Assessment Model (KMCA).

Kochikar (2000) developed a generic KMMM, in the context of Infosys Technologies Ltd. The model has five stages: default, reactive, aware, convinced and sharing. The assessment methodology is objective. The model does not specify anything about validation. The Key Areas considered are people, process & technology (Kuriakose et al., 2010).

Paulzen et al. (2002) developed a Maturity Model for Quality Improvement in Knowledge Management, called Knowledge Process Quality Model (KPQM). The model has five stages: initial, aware, established, quantitatively managed and optimizing. The model addresses the assessment on a universal level, however it does not clearly define a methodology. The model's validation is discussed as potential future work. The three key areas are technology, people, and organization. The model's basic tenet is that corresponding management structures can be made better in order to enhance knowledge processes. KPQM is designed as a maturity framework that ensures the identification of different levels of maturity and the implementation of a continual quality improvement procedure.

A KMMM was created by Ehms & Manfred (2002) to satisfy Siemens' requirements. Initial, repeated, specified, managed, and optimizing are the first five stages of the model. The described assessment process is unbiased. The validation process is not covered by the model. The model identifies eight Key Areas: leadership and support, people and competences, collaboration and culture, people and objectives, environment and partnerships, processes/roles and organization, strategy and knowledge goals, and knowledge structures and forms. These three components make up this methodology: a model for development, one for analysis, and one for auditing. Because these model tools may be used to gather important information in terms of quantity and quality to direct the KM

implementation project, using them can generally lead to an understanding and evaluation of an evolving and at the same time complete expansion of knowledge management.

A Knowledge Management Capability Assessment Model (KMCA) was created by Kulkarni and Freeze in 2004 to specify the capability levels of a company in several knowledge disciplines. Six capability levels—difficult, achievable, encouraged, enabled, managed, and continually improved—are presented by the model. The model employs common questions to determine the subjective assessment process. The process of validating a model involves using empirical approaches. Expertise, lessons learned, knowledge papers, and data are the four categories under which knowledge can be arranged. These regions, which are essentially the Key Areas, are referred to as knowledge capability areas (Kuriakose et al., 2010).

Feng (2006) created a new KMMM and tested it in a business bank using the concepts of continuous process improvement and the Software Engineering Institute's Capability Maturity Model (CMM). Previously, the approach for evaluating the maturity of models was created from the viewpoint of enablers. A model was created by Feng from the viewpoint of the knowledge management process. Then, isolating knowledge management from the viewpoint of knowledge management process, KM enablers are utilized as components of tools or methodologies to accomplish every knowledge management process objective of every maturity level (five maturity levels in total).

Escrivao & Silva (2019) draw the conclusion that by default, KMMMs based on CMM see the organization as an information-processing machine and ignore characteristics that pertain to people, knowledge, and learning. Such approaches devote too much time to dealing with technological challenges and neglect to take organizational culture, a crucial component of knowledge management (Lee & Kim, 2001; Kruger &Snyman, 2005). Additionally, software engineering is composed of highly structured procedures, narrowly focused process regions, and quantifiable outcomes. But KM procedures are not standardized, and its operations are distributed across the business and among a large number of knowledge handlers. As a result, KM outputs are not clearly recognized (Berztiss, 2002; Kulkarni & Louis, 2003). To obtain a comprehensive evaluation of KM development, KMM must be measured from a variety of angles. As a result, KMMMs have crucial regions that, in some way, differ from CMMs (Kulkarni & Freeze, 2004). As a result, CMM-based KMMMs can present a limited viewpoint by treating the organization as a product, disregarding the more accurate perception that an organization is a social creation formed out of live humans with goals and aspirations. The difficult

challenge of managing organizational knowledge has less to do with technology and more to do with the relationships between competency, context, and human resources.

Non-CMM-based KMMMs share less common characteristics amongst them than CMM-based KMMMs (Teah. 2006). They are based on the process of maturity of organizations and are based on the concept of supremacy of a managerial perspective above others (Klimko, 2001; Gaál et al., 2008) as opposed to CMM-based models which are based on maturity process of products, like software, and often advocate the supremacy of a technical perspective above others (Klimko, 2001; Gaál et al., 2008).

Klimko (2001) developed a generic KMMM. The model has five stages: initial, knowledge discoverer, knowledge creator, knowledge manager and knowledge renewer. The model does not define a validation or assessment methodology and defines the requirements of each stage in the sense of focus, key processes, challenge, tool, and pitfall (Kuriakose et al., 2010).

Lee and Kim (2005) used a triangulation approach to develop a stage model. It addresses the process of building organizational capacity of knowledge management. According to the model, organizational capability of knowledge management grows through the following four stages: Initiation, Propagation, Integration, and Networking. In the survey results, it is possible to observe the temporal sequence of knowledge management implementation which Lee and Kim could not verify in their earlier study in 2001.

Aggestam (2006) presented a draft version of a maturity model with the objective of setting guidelines on how to become a Learning Organization and to help people and organizations in identifying where they are in this process, using a set of stages. The method is an analysis of quality terms based on both theoretical and empirical data. The main target groups for the results are practitioners in strategic positions and researchers in this field of research.

Isaai & Amin-Moghadan (2006) presented an integrated approach that addresses three issues, including implementation road mapping, maturity stages, and evaluation. Two modules that are taken into account for maturity and assessment are connected as two parallel procedures. This implies that with thorough investigation, we may first determine the organization's KM maturity level's score (based on the assessment module), and then map the score to a maturity level (using the CMU maturity model). The relationship between the maturity and implementation modules can be used to determine the best course of action for KM promotion.

Teah (2006) reviews, compares, and integrates existing Knowledge Management Maturity Models (KMMM) to propose a General KMMM (G-KMMM), which focuses on assessing the maturity of people, process and technology aspects of KM development in organizations.

Kruger and Snyman (2007) developed a Strategic KMMM. Six stages in maturity are identified: Information and Communications Technology (ICT) as an enabler for KM, deciding on KM principles, ability to formulate organization-wide knowledge policy, building knowledge strategies, formulation of KM strategies and omnipresent knowledge. An assessment or validation methodology is not defined by the model, however the maturity requirements for each level are described in general terms.

Grundstein (2008) suggests that knowledge is not manageable, as if it were data or information. In that sense, Knowledge Management (KM) should refer to actions that both generate and use knowledge, instead of dealing with knowledge itself. In this way, Grundstein presented a sociotechnical approach of KM within the organization and evolved it into an empirical model called the Model for General Knowledge Management within the Enterprise (MGKME).

Pee and Kankanhalli (2009) proposed a generic KMMM. The model includes five stages: initial, aware, defined, managed and optimizing. The assessment methodology used is objective and the proposed approach was used in a case study to provide validation for the model. The Key Areas considered are people, process & technology (Kuriakose et al., 2010).

Researchers most commonly define five stages of KM maturity(Rasula, 2008): Start-up stage (1); the organization is characterized by only a few KM activities; Take-off stage (2); the organization's KM strategy is developed and its development is characterized by the need of KM structure and resources; Expansion stage (3); the organization is increasing visibility of KM leadership and initiatives and is characterized by a more structured approach to address the barriers and risks; Progressive stage (4); the performance of KM activities is enhancing and the organization is characterized by a focus on KM measuring methods increasing maturity low performance high performance; Sustainability stage (5); the highest stage, where the organization expends effort in sustaining the performance of KM practices and KM becomes an integral part of the organizational culture.

An organization acquires and creates knowledge for different goals and using different methods, and we need to consider the aspect of how to collect knowledge, insights, and significant expertise over time (Wiig, 1994).When it comes to human resources, people need to be trained and educated on how to In people: Train and educate people in order to distribute their know-how and skills as well

as to enhance the ways they perform everyday tasks. When it comes to storage and archiving, knowledge needs to be documented and databases need to be built to spread knowledge. Finally, knowledge needs to be integrated in standards, technology and operating practices in order to improve technology and the way it is used. If practitioners in strategic positions want to initiate a process aiming to become a Learning Organization (LO), Aggestam (2006) recommends that they start with a KM project on a functional level in the sense that there is no point in beginning by arguing "why" since an answer to that question would be too vague (Senge, 1994). This suggests the use of KM as an approach to becoming a LO. Senge (1994) advocates that by simply providing an organization with methods and instruments to use, new ways of thinking are bound to emerge.

The majority of the KMMMs reviewed identify people-related, process-related, and technology-related KPAs (Teah, 2006). The remaining KMMMs also refer to these aspects even if they do not explicitly mention these KPAs. Together, it is expected that these KPAs can provide a comprehensive KM assessment.

Yeh's (2006) research and case study intended to identify the critical part that enablers play in implementing knowledge management within an organization. The findings on the part played by the enablers showed that: regarding strategy and leadership, acquiring tangible support by top management is gravely important. Findings regarding organization culture enablers suggest that the formulation of a culture of sharing is the most important factor but also should be supported by information technology. The research on people enablers revealed that, in addition to training programs and educational courses that guarantee learning, a program centered on the motivation of the workforce is a crucial critical element. Findings of information technology enablers revealed that, in addition to digitizing documents, creating a dedicated team focused on putting knowledge management into practice is one of the most important factors. Its role goes beyond merely managing knowledge, as it simultaneously broadens knowledge management by being in charge of coordinating several departments and facilitating communication between them.

Rasula (2008) advocates that the model should consist of more than one factor, observing that: one factor cannot represent a general situation of KM maturity in an organization because the latter is dependent on more than one critical success factor (CSF); Some factors are interdependent and cannot be taken out of context (e.g. high quality of IT tools does not yet mean there is an adequately developed organization climate to support the use of it). Thus, the eight chosen factors that should build the KM maturity model are: Knowledge-related (accumulation, utilization, sharing and

ownership); Organization-related (people &organizational climate and processes); IT-related (capturing knowledge and usage of IT tools)

The initial step to creating a KMMM is to define the factors necessary for KM development, in order to be able to understand how these factors behave in each phase and level in the future (Escrivao & Silva, 2019). However, practitioners often choose the key factors without validation from a scientific point of view, whereas others dismiss certain key factors to the evolvement of KM, considering them to be quite complicated and difficult to measure. These observations point to the conclusion that existing models are inadequate, dictating thus a need for selecting key factors that should comprise a KMMM systematically and using scientifically validated empirical data (Teah et al., 2006; Pee & Kankanhalli, 2009; Lin, 2011).

KM and KMMMs have been widely researched and analyzed in theory, but not adequately in project-based environments (Pereira, 2021). There is a need for a KMMM conceived for the reality of projects, and for implementing KM practices with as minimum as possible effect projects' time schedules and budgets. In addition, it should be interesting to study whether more adjustable models can result in more reliable assessments and can assist in guiding the sequential steps of KM framework implementation. People, infrastructure and organizational culture are often studied inseparately, even though it is more possible that they are in different maturity phases and need to be measured separately.

3.2.2. Knowledge categorization: Tacit vs Explicit Knowledge, Internal vs External, Public vs Individual

Knowledge is often classified as either tacit (implicit) or codified (explicit) (Massingham, 2014). Tacit knowledge is the knowledge in an individual's head (Polanyi, 1967). Knowledge that can be transferred using a formal, systematic language is referred to as codified knowledge (Nonaka and Takeuchi, 1995). In the sense that you need one to utilize the other, tacit knowledge and codified knowledge are two sides of the same coin. When describing the KM toolkits that assist in managing knowledge resources, this distinction is crucial (Massingham, 2014). The distinction between tacit and explicit knowledge was first made by Polanyi (1967), who made the following claim: "While tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied".

As a source of distinctiveness and competitive advantage, tacit knowledge is frequently more valuable. However, it may or may not be observable in usage, be complicated or simple, and may be a component of a system or an independent feature (Winter, 1987). There is an extra difficulty, though: tacit knowledge, which people carry around with them, can only fully contribute to the economy when it is expressed explicitly in organizational processes. However, this conversion procedure or flow is neither automatic, simple, or readily repeatable (Nonaka and Takeuchi, 1995).According to Demir (2021), "intangible knowledge management" refers to a company's internal and external performance, including strategies for customer happiness and loyalty, brand reputation, stakeholder policies, and staff engagement and retention (Brito et al., 2020; Darroch, 2005). When compared to tangible resources, it is extremely unlikely for a rival firm to imitate and apply these variables and strategies in order to gain an edge (Bratianu & Orzea, 2010; Karamustafa & Ülker, 2020; Pereira et al., 2019).

The SECI (Socialization, Externalization, Combination, Internalization) Spiral of Conversion model l is a four-step process of knowledge creation including: socialization, externalization, combination and internalization (Nonaka and Takeuchi, 1995). Between tacit (implicit) and codified (explicit) information, there is a conversion process that produces knowledge. According to Nonaka and Konno's (1998) SECI model of organizational knowledge creation, there are three levels of social aggregation (individual, group, and organization) and the model relies on gathering externalized knowledge and editing and processing it through documents, plans, reports, and market data in the combination stage (Grundstein, 2008; Demir, 2021).

Any business that attempts to market new products must establish a thorough understanding of tacit and explicit knowledge. The stages that should be taken into consideration in the following step are innovation, creativity, management, and commercialization (Isaai & Amin-Moghadan, 2006).

Explicit knowledge is “knowledge that can be expressed in words and numbers and shared in the form of data, scientific formulae, specifications, manuals, and the like” (Nonaka & Konno, 1998). This kind of knowledge can be readily transmitted between individuals formally and systematically (Demir, 2021). Tacit knowledge is defined as being “highly personal and hard to formalize, making it difficult to communicate or share with others” (Nonaka & Konno, 1998). Dzenopoljac et al. (2018) suggest that an effective KM pushes an organization’s members to share their expertise which in turn ensures the formulation of tacit knowledge into explicit knowledge for obtaining KM success. However, if explicit knowledge is poorly managed, the potential for creating new knowledge might be limited (Spagnellis,

2020). KM's attractiveness is based on the argument that intangible assets, such as knowledge, have replaced tangible assets as the principal driver of economic growth (Boisot, 2002).

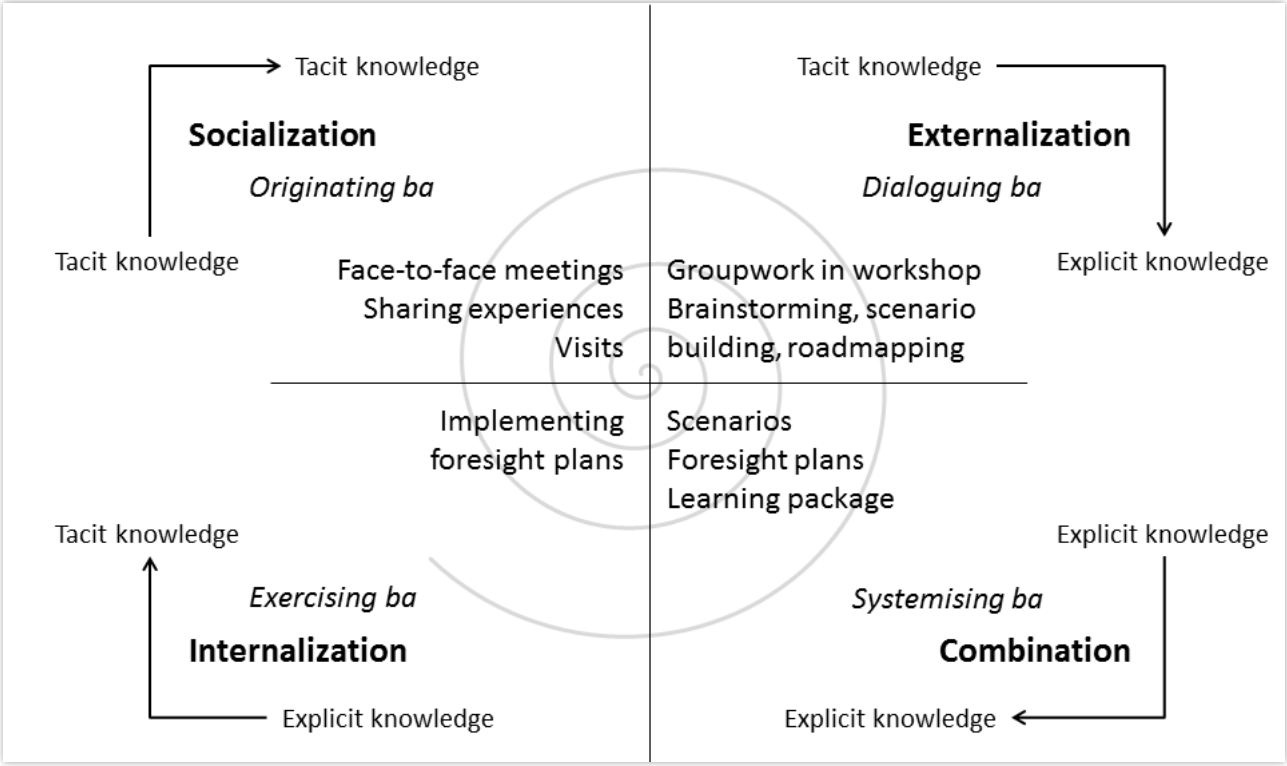

Figure 19. Nonaka's SECI spiral Model, 1995.

Apart from tacit and explicit knowledge, Demir (2021) also classifies knowledge as private/public and individual/social knowledge (Bryant, 2003; Zaim, 2006). Berztiss (2002) distinguishes internal from external knowledge. Internal knowledge resides in an organization itself, in the form of data bases and data warehouses, and, most importantly, the skills of people. External knowledge is gathered via personal contacts and communication media. After the knowledge requirements have been determined, a systematic approach to the gathering from internal sources of items of knowledge relevant to the requirements needs to be established.

3.3. Literature Discussion and Research Results

During the literature survey, some commonly referenced critical success factors, enablers and key elements were identified to be presented in this section.

3.3.1. Human resource management (education, training, inspiration, rewards, sharing) as a Critical Success Factor in KMMMs

The ability of an organization to use and leverage knowledge is greatly dependent on its Human Resources, which is practically who generates, uses and shares that knowledge (Antunes & Pinheiro, 2019). KM projects happen in an organization. Implementation of a KM system and practices ignites questions that guide the members to new ways of thinking, e.g. about organizational learning, shared vision, leadership and learning culture. This can be identified as the beginning, first in the minds of people, and then in processes, discussions, operations etc. (Aggestam, 2006).

The institutionalization of a training program is considered a priority task (Berztiss, 2002). Initially, everybody in the organization is to be informed about the purposes of KM and Knowledge Engineering, and how the KM-KE program will affect them. Specialized training needs will become apparent as the KMKE program develops, particularly with respect to KE techniques, and the group in charge has to provide appropriate training opportunities for the rest of the groups.

According to Yeh (2006), since knowledge is maintained within the individual, the most crucial aspect of knowledge management is figuring out how to allow a person's hidden knowledge to be shared with other employees so they can use it and turn it into knowledge for the company. As a result, encouraging employees to interact and share their expertise with others is a crucial component for an organization to advance knowledge management (Nonaka and Takeuchi, 1995).In terms of the organizational environment, encouraging a culture of knowledge sharing and top management support may lead to managers and employees interacting and socializing with one another, which will likely increase the effectiveness of KM. To execute KM programs, managers need to make an effort to encourage healthy social contact among staff members and provide them the freedom to develop initiatives for new opportunities (Lin, 2011). Participation will be improved by organizational practices including pertinent training, knowledge-sharing-enabling HR policies, and curiosity-fostering KM practices (Veeravalli & Vijayalakshmi, 2022).Knowledge is developed and managed through human activities and technical methods to connect people from different departments and administrative levels in certain situations, such as educational institutions, where knowledge management is such organizations' primary goal. Individual and collective learning processes are improved by the process of forming working groups and trusting relationships that produce and share their own knowledge, which in turn improves and evolves both individual and organizational performance (Abu Naser, 2016).

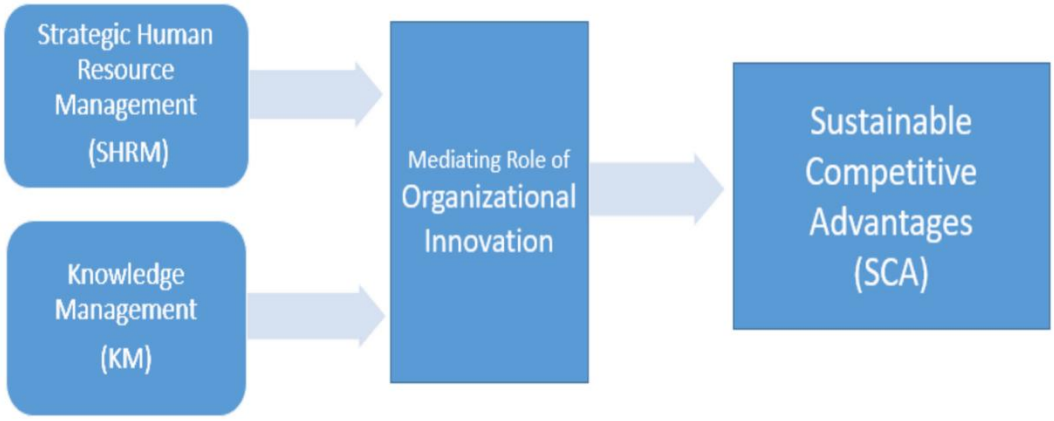

Figure 20. KM research model, by Alfawaire & Atan, 2021.

Experience shows that there can be strong resistance to the introduction of KM-KE (Berztiss, 2002). A common cause of this resistance is that users have to go through very complex access procedures and extensive search to arrive at items of knowledge they are looking for. Moreover, users who could benefit from knowledge that has been collected by an organization are often unaware of its existence. The setting up of user profiles that reflect the interests of users in some detail would allow the matching of knowledge needs and knowledge availability. Knowledge can be encouraged by a set of collaborative practices of HRM (Antunes & Pinheiro, 2019).

Knowledge hiding (KH)—an intentional attempt to withhold or conceal knowledge from others (Connelly et al., 2012)—is quite a prevalent phenomenon in the workplace (Singh, 2019; Peng, 2013), but KH has always had negative influences on creative performance, interpersonal relationships and organizational development (Cerne et al., 2014; Connelly & Zweig, 2015; Jiang et al., 2019; Chen, 2022). In the era of big data, a majority of traditional organizations have transformed into knowledge-intensive ones (Ciampi et al., 2020), where big data aspects can motivate KH behaviors and then have adverse consequences for firms (Ghasemaghaei, 2018; Ghasemaghaei & Turel, 2020).

3.3.2. **Process (acquisition, storage, conversion, dissemination, application, creation) as a Critical Success Factor in KMMMs**

Various representations of knowledge have been studied in different contexts. Knowledge can be expressed as interpreted data, rules, and processes (Berztiss, 2002). Knowledge management is seen

as the management of the processes of generating, storing, accessing and disseminating of the intellectual assets of an organization (Antunes & Pinheiro, 2019).

Paulzen et al. (2002) define: 1. Managing Knowledge processes to support business processes. This includes the management of activities such as using or distributing knowledge and 2. Managing Knowledge processes to support the organizational knowledge base (organizational memory), e.g., the management of storing new knowledge, or evaluating existing knowledge.

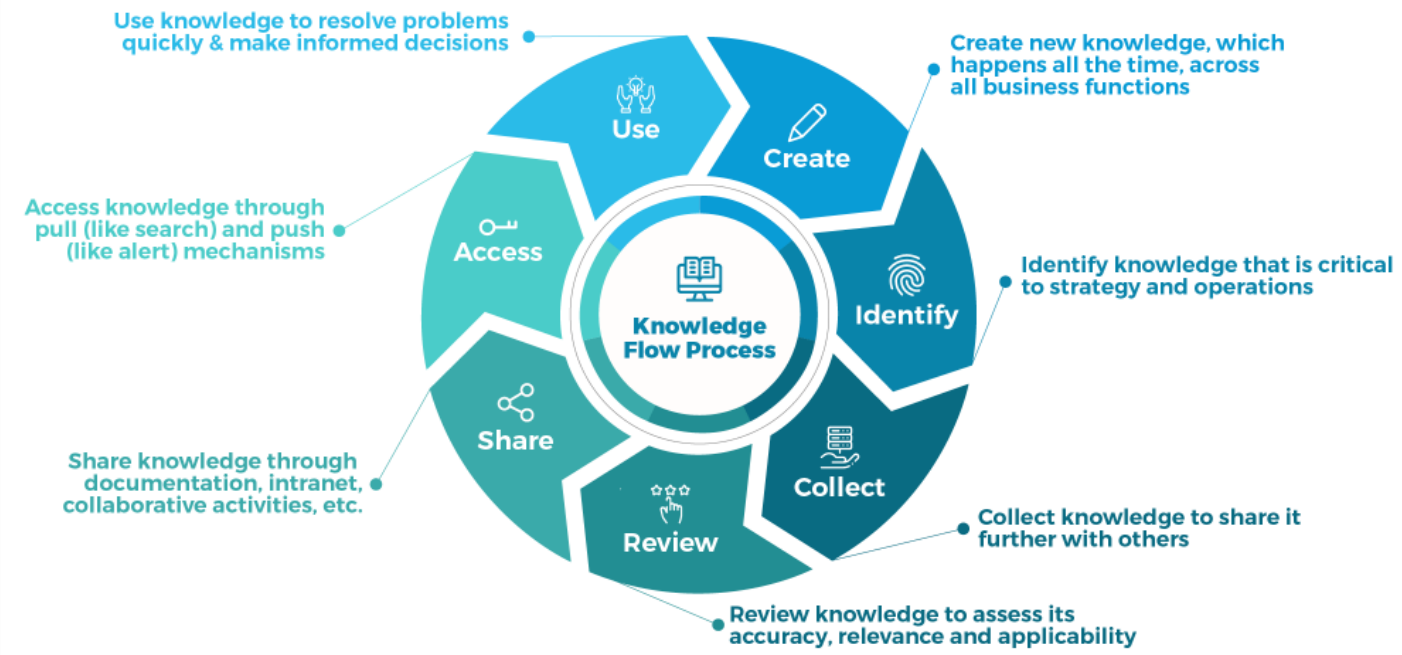

Figure 21. Knowledge Flow Process, source: https://www.searchunify.com/blog/7-ways-to-future-proof-your-knowledge-management-strategy/

In Ehms & Manfred's model (Siemens, 2002), emphasis is placed on characteristics of procedural organization within the context of a process-based organization when discussing concerns relating to organizational structure and the assignment of knowledge management tasks. Finding a way to incorporate knowledge management activities into these particular business operating procedures is the goal in this situation. This CSF addresses a number of topics, including "processes and their documentation"; important processes, including their knowledge components, are described; KM activities and "knowledge explication" have been appropriately added to "business processes"; attempting to explicate implicit knowledge to an appropriate extent, "using knowledge in decisions"; knowledge relevant to decision-making is not simply available, but is used systematically in decision-

making processes, "KM roles"; there are new roles such as Content Steward, Knowledge Coach or CKO, "organizational structure"; the organizational structure fosters extensive knowledge management networks and activities, "projects," the processing and use of knowledge obtained from projects as well as knowledge needed for projects, new knowledge generation is encouraged both directly and indirectly through "innovations."

Common and particular objectives can be used to categorize the KM process goals (Feng, 2006). The goal that should be accomplished in the knowledge management process is called the common objective, and the goal that should be accomplished in the knowledge management sub-processes is called the specialized objective. Likewise, there are two types of management practice: common management practice and specific management practice. Common management practices can be used to accomplish general objectives, and specific management practices can be used to accomplish specific objectives. To reach a certain maturity level, an organization must meet the necessary goal of a particular level. A company's knowledge management maturity can also be determined by looking at the management techniques that have been implemented.

Top management seeking to establish effective KM programs must support four processes: knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection (Lin, 2007).For instance, knowledge acquisition, which involves the gathering of data and the generation of knowledge, is crucial because it fosters creativity at all levels of an organization, from the individual to the collective. Knowledge conversion is the process of organizing, structuring, storing, and combining organizational knowledge for later use. This helps establish an organizational memory to provide quick and easy solutions. Knowledge application involves the utilization of the knowledge for work-related problems. The application of knowledge improves employee job satisfaction and creates business value. Knowledge protection is important to protect the creativity and interests of knowledge owners.

Massingham (2014) points that the most useful definition of KM for the purposes of managing knowledge resources is the product versus process view. The product view implies that knowledge is a thing that can be located and manipulated as an independent object. This is based on managing structural capital – document management systems, data bases and lessons learned. It is about sharing best practices, standard operating procedures, and about storage and retrieval (i.e. structuring repositories). This view of KM tries to separate the knowledge from the knower (Mentzas et al., 2003). On the other hand, the process view places emphasis on ways to promote, motivate, encourage, nurture or guide the process of knowing, and abolishes the idea of trying to capture and distribute

knowledge (Mentzas et al., 2003). It views KM as a social communication process, facilitated by collaboration and cooperation support tools. Knowledge is closely tied to the person who created it and is shared through person-to-person contact. This view of KM does not try to separate the knowledge from the knower.

Organizational memory can be seen as the outcome of organizational learning, which can be thought of as a process. Establishing the viewpoint that organizational memory is a result of organizational learning will have this effect (Antunes & Pinheiro, 2019). Tools including document management systems, information management systems, search and index systems, expert systems, communication and collaboration systems, and intellectual asset systems, according to Nazim and Mukherjee (2016), should make it easier to create, share, and use knowledge (Demir, 2021).

3.3.3. Technological enablers in Process oriented KMMMs vs People oriented KMMMs as a Critical Success Factor

According to Weber's (2002) theory, there are two types of knowledge management (KM) thinking: one is based on technology and is mechanistic, productivity-driven, and based on the deployment of systems; the other is based on constructivism, cognitive principles, and interaction techniques [Gaßen, 1999].Rules form the basis of expert systems, and logic programming provides one way of representing them. Knowledge representation has been an important concern of AI and cognitive science (Berztiss, 2002).In level one of their maturity model, Kruger and Snyman (2007) propose that before any formal endeavor in knowledge management commences, an organization must have a certain amount of ICT and information management (to render effective knowledge management).

Figure 22. Knowledge Management Chart, source: https://stangarfield.medium.com/100-knowledge-management-specialties-50-km-components-and-50-alternative-names-for-km-87f2d8b09c6

The ISO 30401:2018 ("Knowledge Management Systems") takes the process view of knowledge. This is why it's essential to have its development, consolidation, retention, sharing, adaptation, and application so that workers may make wise decisions and take coordinated action, resolving issues based on past experience and fresh future insights (ISO, 2018, pp. 04).

Models of social/technological enablers identify the factors that may affect the foster and success of KM practices and related instruments. Contingency models acknowledge that the success of KM initiatives depends on the context in which they are implemented. Knowledge-oriented models concentrate on the processes of knowledge collection, sharing, application, and generating to understand the mechanisms through which value is derived from knowledge (Pee, 2009).Human-oriented, operational, technology-oriented, and process-oriented management are the four types of knowledge management processes that, according to Demir (2021), are most helpful in improving organizational effectiveness (Heisig, 2009; Inkinen et al., 2015; Kianto et al., 2018).

Organizations have to increase the use of information technology in order to address the issue regarding the flow of information (Yeh, 2006). The knowledge needs can be expressed as requirements, i.e., statements of what is needed without the details of how the needs are to be satisfied. Considerable literature exists on requirements gathering and software management. An important part of requirements determination is the identification of stakeholders, i.e., people who,

in the case of software, will authorize, develop, use, and be affected by a software product, and therefore need to be consulted in the requirements acquisition stage. In most cases, the stakeholders are gatherers and organizers of knowledge, and people who will benefit from the knowledge (Berztiss, 2002). So, initially there is the need to identify key aspects of KM process (knowledge capturing, knowledge transformation, knowledge implementation and knowledge protection), KM effectiveness (individual-level and organizational-level KM effectiveness) and socio-technical support (organizational support and information technology dissemination)(Lin, 2007).Lin's fundamental proposition is that: (1) KM adapts over time through the development of its process dimensions and more effective KM; and (2) Socio-technical support results in more mature KM practices, with the two variables of the socio-technical perspectives being: organizational support and IT diffusion.

For example, an organization should cultivate a social interaction culture that encourages employees to create and share knowledge with colleagues and acts as the engine of the evolution of KM. Moreover, the path taken from 'initiation' to 'maturity' can potentially be influenced by IT diffusion. IT helps an organization generate, store, and exchange knowledge with employees, suppliers, or customers, thereby assisting the KM process. Consequently, organizations should strive to balance the efficiency of the KM process with socio-technical support's potential for knowledge creation (Lin, 2007).One's willingness to seek information is likely to be influenced by the amount of knowledge on KM systems that is available and the value that is attached to it (Veeravalli & Vijayalakshmi, 2022).

Information systems (IS) facilitate the development of knowledge management systems (KMS) that enables KM initiatives (Alavi & Leidner, 2001; Sarka et al., 2019; Bibi et al., 2020). This perspective conceptualizes knowledge in relation to information, adopts a hierarchical view of knowledge, for example, data- information- knowledge (Alavi & Leidner, 2001; McInerney, 2002; Schultze & Leidner, 2002). The primary focus is to develop IT infrastructure and create KMS (Mao et al., 2016; Spender, 2005). The purpose of KMS is to facilitate the creation, sharing, and utilization of organizational knowledge (Alavi & Leidner, 2001). However, IS should not be confused as a solution to capture knowledge (Darroch, 2003); it is rather an enabler that facilitates the knowledge processes (Centobelli et al., 2017; Fink & Ploder, 2009).Organizations should consider as their main objective to increase the capacity of individuals and organizational knowledge enhancers (Antunes & Pinheiro, 2019). Information technology is the fundamental tool for knowledge management, because it enables the transference of experience among employees much faster. An information system can provide instant,

integrated, or even smarter interface platform to make knowledge management much easier to employ (Yeh, 2006).

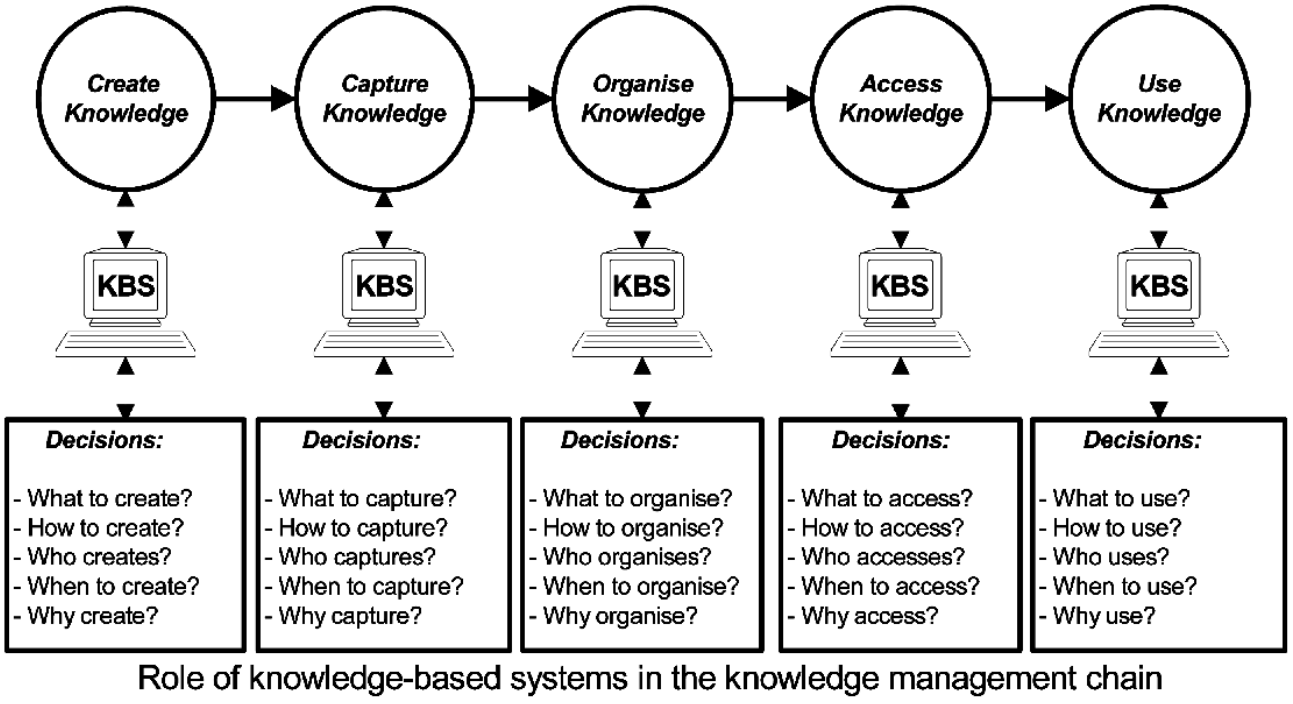

Figure 23. Role of KMS in KM, by Soliman & Spooner, 2000.

Situational considerations may be crucial to take into account in the development of KM in addition to people, process, and technology elements (Pee, 2009). For instance, the manager of the Call Center Unit in Pee's case study at an IS company that supports a large university highlighted that the local legal jurisdiction did not recognize the legality of electronically filed documents unless their process flow was certified by an established accounting firm as a major barrier impeding users' adoption of documentation systems. The institution determined that it was more cost-effective to stay with paper documents because the certification process was time-consuming and expensive, and the usage of an EDMS (electronic document management system) was frequently viewed as optional. This implies that hypothetical models for the future could have to take environmental factors outside of organizational control into account.

3.3.4. Leadership (support of top management, team guidance, motivation, coordination) as a Critical Success Factor in KMMMs

Top management support does not directly influence members to participate in KM systems to seek knowledge (Veeravalli & Vijayalakshmi, 2022). In the process of carrying out knowledge management, the designated teams have to deal with the different aspects of corporate culture, workflow processes, and the integration of group members' knowledge. They also need significant and explicit support from top management, because it is likely that during the process they will encounter resistance from employees (Yeh, 2006).

Organizations can provide opportunities for behavioral maturity of managers to establish knowledge management (Fashami & Babaei, 2017) and managers should pay special attention to the more general knowledge associated with the context of the firm, as is supports the introduction of various types of innovation (Antunes & Pinheiro, 2019).

Leadership sets the tone for the corporate culture, and as culture is the product of the team's acquired knowledge, it will eventually define the necessary leadership on its own (Schein, 2004). A visionary leader is needed as the first step in creating a learning organization (LO) (Senge, 1990). According to Zaim (2006), managers typically do not recognize the value of current experience in their organizations, despite the fact that knowledge exchange is a crucial component for organizations.

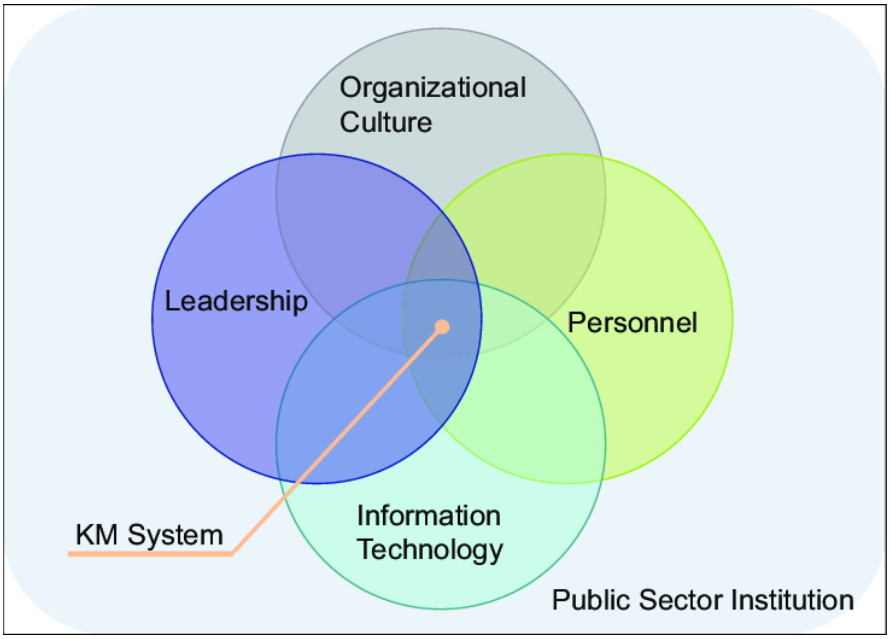

Figure 24. Knowledge Management implementation in public sector, by Almudallal et al. (2016).

Fashami & Babaei (2017) proposed and tested a Behavioral Maturity Model in an Iran Insurance Company. The top five priorities included transformational leadership, human and social skills, knowledge orientation and organizational knowledge, emotional intelligence of managers and trustful climate. As the results showed, training courses for managers, personnel empowerment and transformational leadership are highly important.

When Teah (2006) proposed and tested a generic KMMM, findings showed that the main concern of unit managers was that their units might be unfavorably rated. Therefore, in order for a KMMM to correctly reflect reality, management must refrain from using it as a tool for punishing and reprimanding underperforming units. Instead, it should highlight any areas in need of more support and direction.

Kruger and Snyman (2007) argue that the next level of maturity constitutes a conscious commitment, especially from business managers, to start embracing endeavors in knowledge management. At this level of maturity, ICT should already be geared towards supporting knowledge management endeavors. Additionally, managers should alter their management style to encourage creativity, sharing, and utilization of new knowledge among employees. Organizational rewards may provide temporary incentives for KM initiatives, but are not a fundamental force in organizational KM evolution. Managers thus should not emphasize organizational rewards (such as salary incentive, bonuses, promotion incentive, or job security) as a key driver of more mature KM practices (Lin, 2011).

Lin (2011) advocates that when it comes to the individual aspect, efforts to cultivate targeted mutual relationships of employees are significant for the initiation of a structured and effective KM system. Thus, managers can improve employee perceptions of mutual benefits and address the crucial issue of establishing interpersonal trust into their organizations, which is an important issue in initial KM initiatives and strives. Lin's study also demonstrates open communication with employees to be an important variable to facilitate the success of KM implementation and institutionalization. Managers must consider that KM can continue to evolve when employees believe that the organization is offering a safe environment in which they can express themselves. Openness in communication helps eliminate resistance barriers to KM implementation, and without open communication, successful KM evolution might not exist. Knowledge self-efficacy is an important enabler during KM evolution. This finding suggests that managers should pay more attention to providing useful feedback to enhance employee knowledge self-efficacy. For instance, by choosing and

hiring pro-active workers with high cognitive attitudes, high self-esteem, and intrinsic motivation, a highly self-efficacious workforce can be created. Managers can also improve perception of knowledge self-efficacy among valued knowledge employees by pointing out to them that their contribution in knowledge management gravely affects the KM further development.

3.3.5. Change Management and Continuous Improvement as Critical Success Factors in KMMMs

Knowledge is sustained by sharing and supporting technologies. The processes and constructions, the interconnections between knowledge assets align with its distribution and interpretation while retention takes place through the organizational memory (Antunes & Pinheiro, 2019). Building capacity for continuous learning, sustainability, and knowledge renewal is one of the organization's main objectives (Pereira, 2021).

Examining the adequacy of the current activities and, if required, making reasonable alterations seems logical in order to manage knowledge in a permanent and successful manner in the future (Ehms & Manfred, 2002). For KM to be further evolved efficiently, it needs to grow from simple enthusiasm into a cross-sectional operation permanently instilled in the company.

In Massingham's case study (2014) the Knowledge Creation toolkit (KCT) provided participants with learning capabilities to increase their creativity. In this way, the KCT aimed to create value through problem-solving and continuous improvement. The techniques were grounded in the learning theory. The KCT selected for testing comprised: creative abrasion (Leonard and Sensiper, 1998); parallel thinking (De Bono, 1985); SECI Model (Nonaka and Takeuchi, 1995); expert teams (Easterby-Smith and Lyles, 2005, p. 169); and double-loop learning (Carroll et al., 2005).

While developing and implementing a KM proposal, an organization will often examine a change management process, by trying to alter some of the attitudes and beliefs of the management and the employees. In spite of the long-term perspective of most change management plans, short-term enhancements need to be accomplished so as to maintain enthusiasm and dedication on all organizational levels (CWA 14924-1:2004). Change management most often is expressed in the form of corporate culture change.

Corporate culture is the combination of value, core belief, behavior model, and emblem. It represents the value system of the company and will become the employees' behavior norm. Every organization's culture is an independent entity different than any other organization (Yeh, 2006).

Corporate culture is a fundamental tool for knowledge management, because only a culture of mutual trust helps the employees trust and depend on the information provided by one another, thus raising the motivation for mutual sharing.

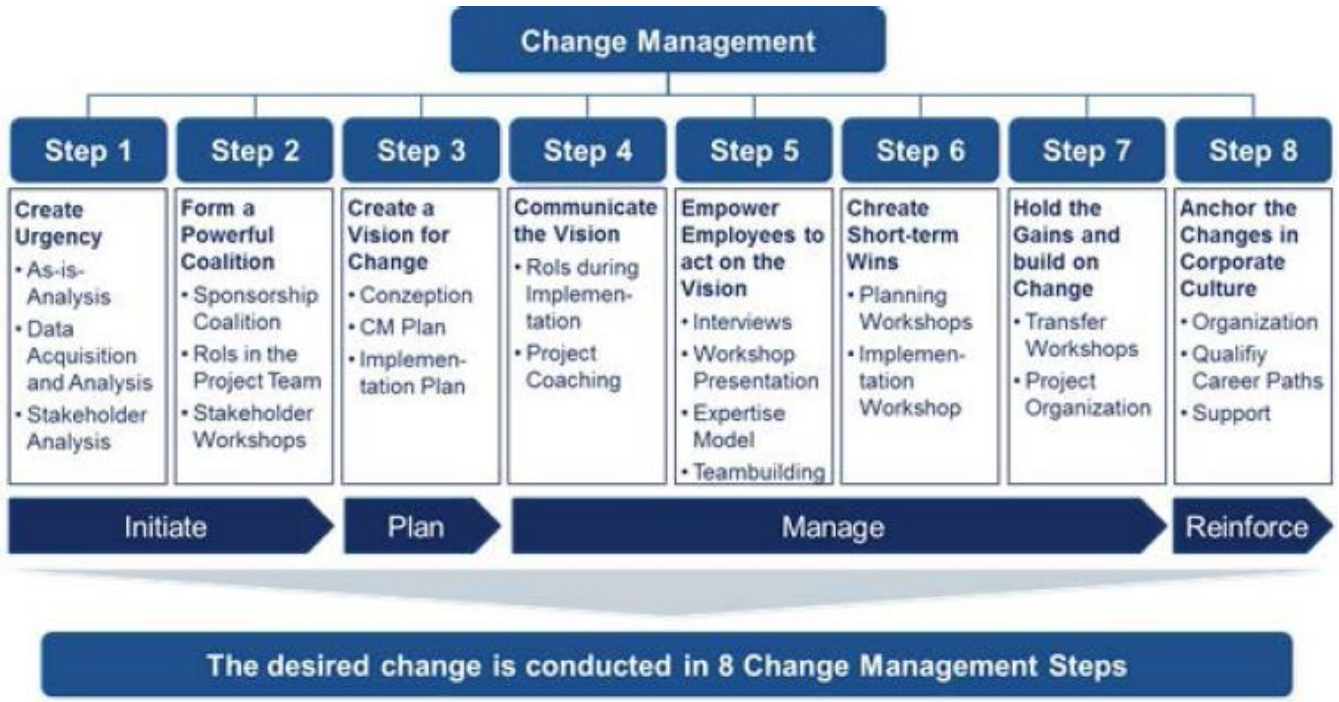

Figure 25. Kotter's Change Management Model, by Wanner (2013).

3.3.6. Strategy as a Critical Success Factor in KMMMs

Kruger and Snyman (2007) hypothesized that progressions in knowledge management maturity (from a strategic perspective) are directly related to an increased ability to speed up the strategic cycle of imitation, consolidation and innovation. Organizational culture and strategy are the most important components for successful knowledge management, followed closely by IT (Hung et al., 2005). Growth clearly depends on switching from an opportunistic strategy to one that targets and accepts certain specific types of work and clients or builds a brand and market position (Phelps, 2007). The usefulness of outside interventions that support small and medium-sized firms (SMEs) in developing strategy, however, has not been thoroughly studied in the literature. Although it is well recognized that strategy consultants are frequently employed, there is little proof of the value or knowledge they provide.

Research was conducted by Massingham (2014) to evaluate a variety of best practice knowledge management (KM) concepts used to manage knowledge resources. As part of a large-scale longitudinal transformation initiative, four KM toolkits and 16 KM tools were examined over a five-year period (2008–2013). Each tool was evaluated using a strategy, implementation, and performance evaluation methodology created to test KM complaints. The highest rating toolkit was knowledge strategy, followed by knowledge measurement. The most value was created by using KM to introduce objectivity into future thinking (future capability requirements) and decisions when filling competency gaps (sourcing). Massingham defined the management of knowledge resources as identifying the firm's competitive position in terms of what it knows (strategy), protecting this position (retention), growing this position (creativity) and benchmarking (measurement). Strategy was considered to be a management capability and not something to be taught to all staff. The need for a knowledge strategy emerged during management meetings to identify existing and future capability requirements in each discipline (e.g. mechanical engineering). The research team worked with discipline leaders to develop capability plans. This later evolved into work with a special committee, formed to develop a method for making objective decisions on knowledge strategy. The toolkit selected for testing included competency mapping, which is evaluating competency levels, surpluses and deficits, in many traditional (e.g. experience) and non-traditional (e.g. external relationships) ways. The results were compared against management expectations, i.e. a baseline score, to quantify organizational needs – i.e. competencies – against actual capability – and produce competency gap analysis at very finite levels. Knowledge strategy had the most direct impact on performance, particularly financial impact in terms of more efficient workforce management (e.g. strategic alignment). This reduced the total workforce cost.

3.3.7. Performance Measurement as a Critical Success Factor in KMMMs

Responding to debate surrounding the evolution of performance measurement and management, Kruger (2005) is of the opinion that a merger between strategy formulation, performance management and knowledge management has the capacity to add a dimension of geography to the knowledge–strategy cycle, opening up social interplay and enabling organizations to interact and trade knowledge (even tacit knowledge) with the very forces that shape competitiveness.

Lee et al. (2019) attempted to address the issue of how sustainable the economic rewards achieved through efficient use of knowledge management (KM) capabilities and resources are. To answer this question, a study was conducted in a company for a number of years and the data formed the basis in his research of defining the degree to which KM resources affect over time the company's performance from a financial aspect. The study's outcomes point to the fact that the effect of KM capabilities on the financial performance within an organization become more definite in the long term rather than in the short term. By contrast, knowledge management systems (KMS) is associated only with immediate, short-term financial benefits with such gains prone to instability in the long term.

In Massingham's large- scale study (2014) the results showed that KM has direct and indirect, financial and non-financial, impact on firm performance. First, in terms of the aspirational business model LOC, knowledge strategy increases awareness of organizational direction, purpose and role clarity, improving the capacity to respond to change; knowledge measurement enables strategic alignment and career management producing growth in capability; knowledge retention increases productivity through reduced knowledge loss and better use of experience; and knowledge creation increases change, initiative and motivation, leading to improved problem-solving and business improvement. Second, in terms of practical outcomes, knowledge strategy improved strategic alignment and created financial impact in terms of cost-benefit analysis, that is, the incremental cash flows generated by the investment; knowledge measurement improved value management in terms of input measures: increased resource acquisition (budget), and output measures: increased value for money for stakeholders from improved work quality (critical activities). Knowledge retention improved psychological contract (employees' emotional relationship with their organization), and knowledge creation improved value management (improved performance).

Lee et al. (2019) suggest that organizational performance is not determined by how much firms know, but how effectively firms use what they know through KM Systems. On the other hand, the advantages resulting from the use of KM Systems are not sustainable over time. A consequent suggestion, therefore, is for managers to foster and support organization-wide KM capabilities to ensure long-term economic sense of security through KM initiatives. When it comes to KM performance, organizations need to learn "how to fish" rather than "how to eat a fish" meaning that other than using KMS to promote a short-term success, they more importantly need to obtain knowledge in enhancing KM capabilities to achieve long-term and sustainable financial outcomes.

3.3.8. What constitutes KM success leading to performance excellence

Success in KM is a multilayered idea. The right knowledge must be captured, delivered to the appropriate user, and applied to enhance organizational and/or individual performance. The factors of influence on corporate operations, impact on strategy, leadership, and knowledge content are used to gauge the success of KM (Jennex, 2009).

López & Meroño (2011) conducted an empirical study that consisted of 310 Spanish organizations and structural equations modelling using two proposed KM strategies: codification and personalization. They concluded that both KM strategies impact on innovation and organizational corporate performance directly and indirectly (through an increase on innovation capability). Both codification and personalization strategies have a positive impact on financial results. Managers can use these findings as an argument to negotiate with and convince to stakeholders about the goodness of implementing KM projects. Also, findings demonstrate a different effect of KM strategies on diverse dimensions of organizational performance. With a clear KM strategy organizations can be more innovative, achieve better financial results, improve processes and develop human resources' capabilities. And, in turn, those benefits foster the link innovation-performance.

The overall results of Massingham's two-part study (2014) indicate that performance excellence can be measured using KM maturity. An important conclusion from the study is that KM is embedded in other organizational systems (OS), and the influence of these OSs should be taken into account in any assessment of KM's success or failure. Processes, KM leadership, people, and KM outcomes are the most crucial variables affecting performance excellence (Abu Naser, 2016).

On the one hand, there is the viewpoint that sees KM achievement as a process indicator. The efficient accomplishment of clearly defined organizational and process goals through the systematic application of both organizational tools and information/communication technologies for a targeted creation and utilization of knowledge as well as for making knowledge available can be characterized as successful knowledge management (KM). Improved knowledge-intensive business processes are supported by KM. An illustration would be the technical KMS components supporting the technology forecasting process of an IT consulting firm (Henselewski et al., 2006).Additionally, a component of the success of KM is the efficient application of knowledge processes (such as acquisition, creation, sharing, and codification). Therefore, this viewpoint focuses on quantifying the extent to which KM enhances the efficiency of business and knowledge operations (Jennex, 2009).

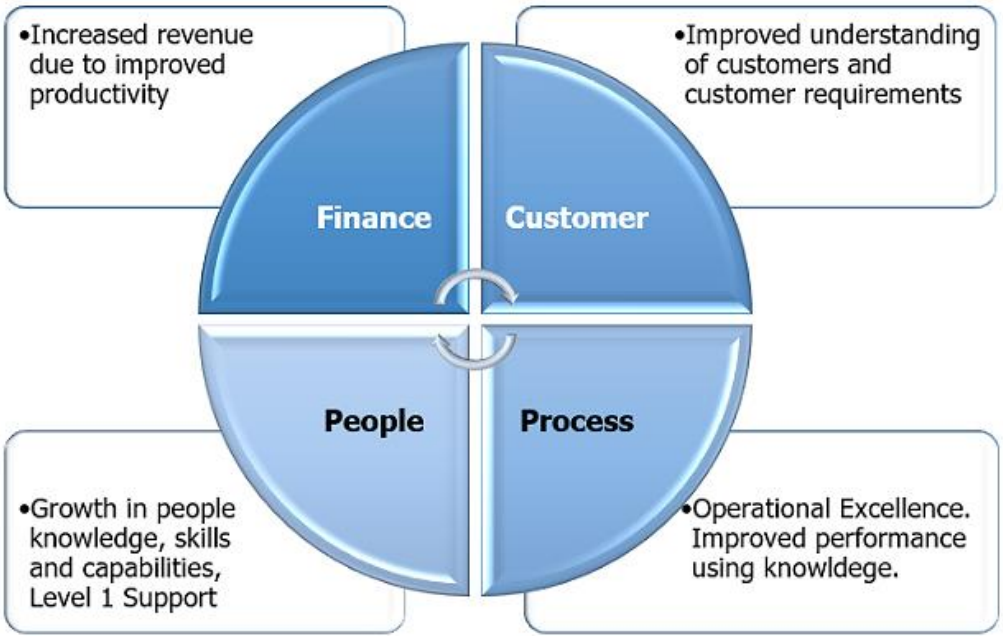

Figure 26. Balanced scorecard components for KM, by Neetu Choudhary on October 21, 2019. Posted in Articles, KPI.

KM success, on the other hand, can be seen as an outcome metric. The varied results of knowledge process capabilities that exist inside an organization as a result of undertaken KM efforts are consequently seen as a metric of KM success. The improvement of product and service quality, productivity, innovative activity, competitive capacity, market position, proximity to customers, customer satisfaction, employee satisfaction, communication, knowledge sharing, knowledge transparency, and knowledge retention are typical outcomes in terms of organizational performance (Jennex, 2009).

The inability of knowledge management practitioners to correctly measure the level of knowledge management maturity attained within organizations is preventing them from doing so, but more crucially, it is causing managers to lose faith in knowledge management as a strategic enabler. Unless theory culminates in usable tools, contributions made by knowledge management scholars will be of no or very little value to organizations embarking on knowledge management endeavors (Kruger, 2007).

Ultimately, it is probable that practitioners and researchers have different priorities when it comes to KM success. While practitioners appear to be focused on KM success as being connected to its impact on organizational performance and effectiveness, researchers do not appear to have a clear understanding of KM success. Since there aren't enough practitioners providing input, it's impossible

to declare this with certainty. However, it is expected that practitioners would focus on organizational impact as a measure of KM and KMS success. Given that KM is an action discipline, researchers should accept this focus and incorporate it into their investigations. The preliminary set of success dimensions must be examined critically, though, as previous discussions have shown that there is conflict between what is regarded as an antecedent and thus necessary for success, and what is regarded as a reflection of success. This is made more complex as factors that are antecedents to KM need to be preserved to sustain continued KM success (Jennex, 2009).

The literature survey of research in KM assessment frameworks and standards, as presented in the previous sections, revealed a series of research questions associated with this study's research objective. These questions are:

RQ1. What is the relationship between human resources and KM?

RQ2. What is the relationship between strategy and KM?

RQ3. What is the role of leadership in KM?

RQ4. What is the role of performance measurement in KM?

RQ5. What is the relationship between change management – continuous improvement and KM?

RQ6. What is the relationship between process and KM?

RQ7. What is the role of enablers in KM?

RQ8. Which are the required enablers for a successful KM?

To provide answers to these questions, a literature survey was presented in the previous Table with the approaches used per reference in the survey. In addition, in the following Table, the CSF occurrence per reference is presented. The literature review revealed the need for KM classification and the development of an integrated approach that encompasses all these different KM categories has been advocated through the literature survey.

	CSF FOCUS										ENABLERS	
Reference	HUMAN RESOURCES	PROCESS	LEADERSHIP	CHANGE MANAGEMENT	PERFORMANCE MEASUREMENT	CONTINUOUS IMPROVEMENT	INFORMATION AND KNOWLEDE MANAGEMENT	STRATEGIC	CUSTOMER	SUPPLIER RELATIONSHIP	ORGANIZATIONAL RESOURCES ENABLERS	ORGANIZATIONAL ELEMENT ENABLERS
Kochicar (2000)	✓	✓					✓					
Klimko (2001)	✓	✓	✓			✓	✓	✓			✓	✓
Paulzen et al. (2002)	✓	✓			✓	✓	✓				✓	✓
Berztiss (2002)	✓	✓		✓			✓		✓	✓		
Ehms & Manfred (2002)	✓	✓	✓				✓	✓	✓		✓	✓
Kulkarni (2003)	✓	✓		✓	✓	✓	✓					
Lee & Kim (2005)	✓		✓	✓	✓		✓		✓	✓	✓	✓
Feng (2006)	✓	✓				✓	✓	✓	✓	✓	✓	✓
Aggestam (2006)	✓	✓	✓				✓	✓			✓	✓
Isaai & Amin-Moghadan (2006)	✓	✓	✓		✓		✓	✓		✓	✓	✓
Teah et al. (2006)	✓	✓		✓	✓	✓	✓	✓			✓	✓
Yeh et al. (2006)	✓		✓				✓	✓			✓	✓
Phelps et al. (2007)	✓	✓				✓	✓	✓	✓			
Kruger (2007)	✓	✓			✓		✓	✓				
Lin (2007)	✓	✓		✓		✓	✓				✓	✓
Rasula (2008)	✓	✓	✓		✓		✓	✓			✓	✓
Grundstein (2008)	✓	✓	✓				✓		✓	✓	✓	✓
Pee (2009)	✓	✓	✓		✓	✓	✓	✓			✓	✓
Ping Jung (2009)	✓	✓	✓		✓	✓	✓	✓	✓	✓		
Jennex (2009)	✓	✓	✓		✓		✓	✓				
Kuriakose et al. (2010)	✓	✓	✓	✓			✓	✓				
Kruger (2010)	✓	✓	✓		✓		✓	✓				
López & Meroño (2011)	✓	✓			✓		✓	✓			✓	✓
Lin (2011)	✓	✓	✓				✓				✓	✓
Kim et al. (2014)	✓	✓	✓		✓		✓	✓	✓		✓	✓
Massingham (2014)	✓	✓	✓	✓	✓		✓	✓	✓			
Abu Naser (2016a)	✓	✓	✓		✓		✓					

Fashami & Babaei (2017)	✓		✓				✓				✓	✓
Escrivão & Silva (2019)	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
Antunes & Pinheiro (2019)	✓	✓	✓				✓	✓			✓	✓
Lee et al. (2019)	✓	✓			✓		✓				✓	✓
Spanellis et al (2020)	✓	✓	✓	✓		✓		✓				
Pereira et al. (2021)	✓	✓	✓		✓	✓					✓	✓
Demir et al (2021)	✓	✓	✓		✓	✓	✓	✓	✓			
Bibi et al. (2020)	✓	✓					✓	✓			✓	✓
Arias Velásquez et al (2021)	✓	✓			✓		✓				✓	✓
Veeravalli & Vijayalakshmi (2022)	✓		✓		✓		✓				✓	✓
Chen et al (2022)	✓		✓	✓			✓				✓	✓

Table 2. Literature Survey Finding Table: Critical Success Factors.

3.4. Standardization and Knowledge Management

3.4.1. ISO 9001/2018

Organizational knowledge management was introduced on September 15 of 2018 to the followers of ISO 9001 as KNOWLEDGE MANAGEMENT RESEARCH & PRACTICE 3 “7.1.6, organizational Knowledge – The organization shall determine the knowledge necessary for the operation of its processes and to achieve conformity of products and services. This knowledge shall be maintained and be made available to the extent necessary. When addressing changing needs and trends, the organization shall consider its current knowledge and determine how to acquire or access any necessary additional knowledge and required updates” (ISO, 2015; Wilson & Campbell, 2016). Knowledge is acknowledged throughout the standard, not just in clause 7.1.6 where it is referred to as "organizational knowledge" (Wilson, 2016). The different iterations of ISO 9001's process and procedure description indicate a capturing of organizational experience and knowledge. According to Mosch (2007), standards are

information that has been codified. They reflect generations' worth of labor and expertise, and a company's quality manual serves as a repository for its process knowledge (Zetie, 2002).

Clause 7.1.6 of the ISO 9001:2018 implies that to meet the new version of the standard, an organization should have:

- A definition of the critical organizational knowledge (knowledge about operation, process, goods and services);
- A system for maintaining, protecting and accessing that knowledge;
- A system for acquiring or accessing (and potentially for creating) any new knowledge, as things change.

This new provision does not establish a Knowledge Management standard or make Knowledge Management a statutory prerequisite for an organization. It is a requirement in a quality standard and calls for giving knowledge the attention it needs to guarantee high-quality products and services. However, in order to comply, a company must have plenty Knowledge Management components already working as part of its Quality Management system, as opposed to only planning them. Therefore, there has to be a suitable structure for experience-based learning, including lesson learning. Mentoring, recording tacit knowledge, and sharing knowledge are all necessary components of a proper knowledge retention strategy. An organizational knowledge audit, benchmarking, and strategy must also exist in order to identify the key knowledge gaps and the critical knowledge required to deliver high-quality goods and services. A system (including roles, procedures, and enabling technology) must exist for maintaining knowledge and making it accessible to the level required.

Not enough empirical studies exist that support the correlation between ISO 9001 practices, KM, and organizational sustainability (Demir, 2021). Demir conducted a case study and observed that ISO 9001 certified companies performed adequately better when it came to knowledge creation, use and sustainability, yet when it came to storing and sharing, great issues arose. From the knowledge generating stage to the use process, managers need to promote initiatives across their organizations. Utilizing knowledge effectively has a direct impact on how sustainable an organization is. Organizational sustainability is an area in which ISO 9001 certified companies do better, but this is so because they rely less on explicit knowledge and more on tacit knowledge. If businesses wish to maintain their organizational sustainability over time, they must establish techniques to turn their tacit knowledge into explicit knowledge. According to Wilson (2016), businesses that utilize explicit

knowledge and are more mechanical than those that use tacit knowledge and are more organic would seem to be more compatible with ISO 9001 certification.

There are two main reasons why this organizational knowledge requirement clause was added: 1. to protect the organization from knowledge loss, such as that caused by employee turnover or the inability to record and communicate information; 2. to promote knowledge acquisition inside the organization, such as through learning from experience, mentorship, and benchmarking (Fitzgerald, 2021). Intellectual property, knowledge gained through experience, lessons learned from failed and successful projects, capturing and sharing undocumented knowledge and experience, and the outcomes of improvements in Processes, Products, and Services are among the Internal Sources of Knowledge of Products and Services to showcase within the new clause of ISO 9001; Standards, academia, conferences, and receiving information from clients or outside suppliers are examples of External Sources. A big, complicated company can decide to put in place a formal knowledge management system. A smaller, less sophisticated business, however, might opt for simpler approaches, including keeping a logbook of design choices or the characteristics and performance of chemical compounds that were created and evaluated.

Every business, according to Hammar (2016), has unique expertise that makes them stand out from the competitors. It is generally known as "tribal knowledge" when this knowledge resides with specific long-term employees and is not recorded. While this can be effective, it runs the risk of being lost when these employees leave the organization. Using the ISO 9001:2018 clause on organizational knowledge, Hammar suggests a few knowledge management techniques: The most obvious method of gathering information is through work instructions. A work instruction can be one of the simplest ways to capture information if a procedure must be carried out in a certain way to avoid issues and can be readily written down and understood; Checklists are another obvious way to capture basic knowledge. A checklist can be a useful tool to utilize if the knowledge consists of several things to check before a work is accomplished; Training Programs: The greatest technique to record information is sometimes to capture the key aspects of the process, which might be done by including them in a training program; On-the-job training: When the information simply cannot be recorded in writing, it may be advantageous to use on-the-job training, in which a senior and knowledgeable individual instructs others on the unrecorded organizational knowledge; Knowledge database: Since many businesses save “lessons learned” for the end of a program, designs that are still in development may not reap their benefits until much later. By entering them into a database for review throughout design, you can

record the knowledge, issues, or successes that have arisen with a good or service. When the next product design is being developed, using the immediately captured organizational knowledge, the knowledge may be reviewed. After capturing organizational information, you must apply it in your system, especially when making changes. The knowledge database serves as a feedback mechanism for the design function. A change needs to be made to the design process to guarantee that the knowledge database for "lessons learned" is closely checked during design so that a correction or improvement that has been found and recorded in the database does not go unnoticed.

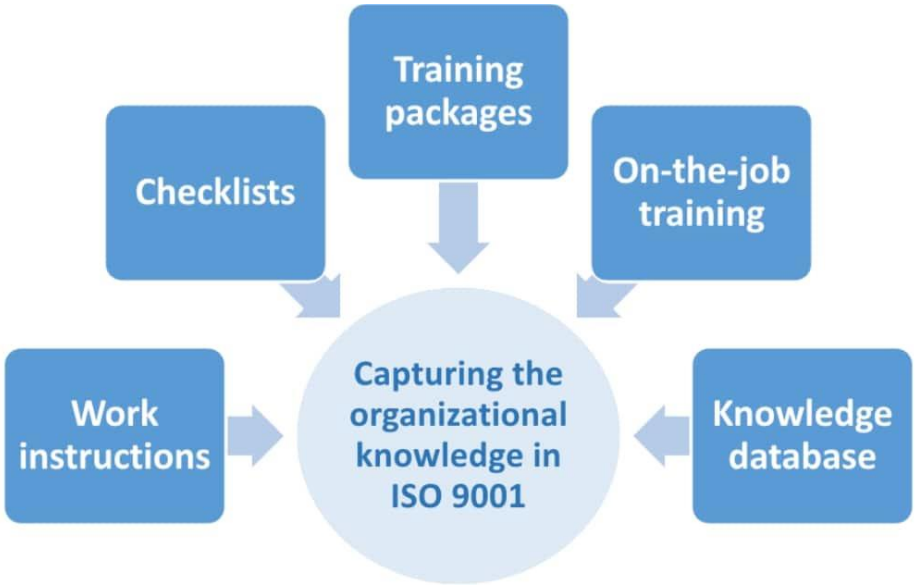

Figure 27. Capturing the organizational knowledge in ISO 9001, by Mark Hammar (2016).

The possible need for more thorough documentation could force quality systems back toward the strict ISO 9001: 1994 requirements that were later lowered as a result of excessive bureaucratization and the development of rigid and unresponsive systems. Many of these worries should be allayed by the fact that ISO quality standards are more about processes than prescriptive methods and practices. Nevertheless, some 36 years after the release of British Standard BS 5750: 1979, ISO 9001: 2015 has acknowledged the strategically significant role of knowledge as a resource (Andreeva and Kianto, 2012; Kianto and Ritala, 2010; Grant, 1996; Van der Speak et al., 2002). This is crucial and shows how information is becoming more and more important within firms (Wilson, 2016).

3.4.2. The European Guide to Good Practices in Knowledge Management (edited by the European Committee for Standardization, CEN-CWA 14924-1, 2004).

Grundstein (2008), who made significant contributions to the creation of this Guide, identifies two key KM approaches: 1. A technological perspective that emphasizes technical and application viewpoints; this perspective leads one to see knowledge as an object and ignores the significance of people 2. A sociological perspective that emphasizes that people's minds and social interactions are where information is largely found. While drafting the CEN-CWA 14924, Weber (2002) defines the five core knowledge activities as: a) Identify knowledge b) Create (new) knowledge c) Store knowledge d) Share knowledge e) Use knowledge. To get better results from these core knowledge activities, two crucial conditions must be met. The first step is to align or integrate the key activities into the routine duties and organizational procedures. The second need is that the core activities be properly balanced to take into account the unique characteristics of each business process and organization. A KM solution shouldn't just concentrate on one or two discrete tasks.

Weber (2002) also provides a first draft of the core modules, as shown in the figure below, with a short description.

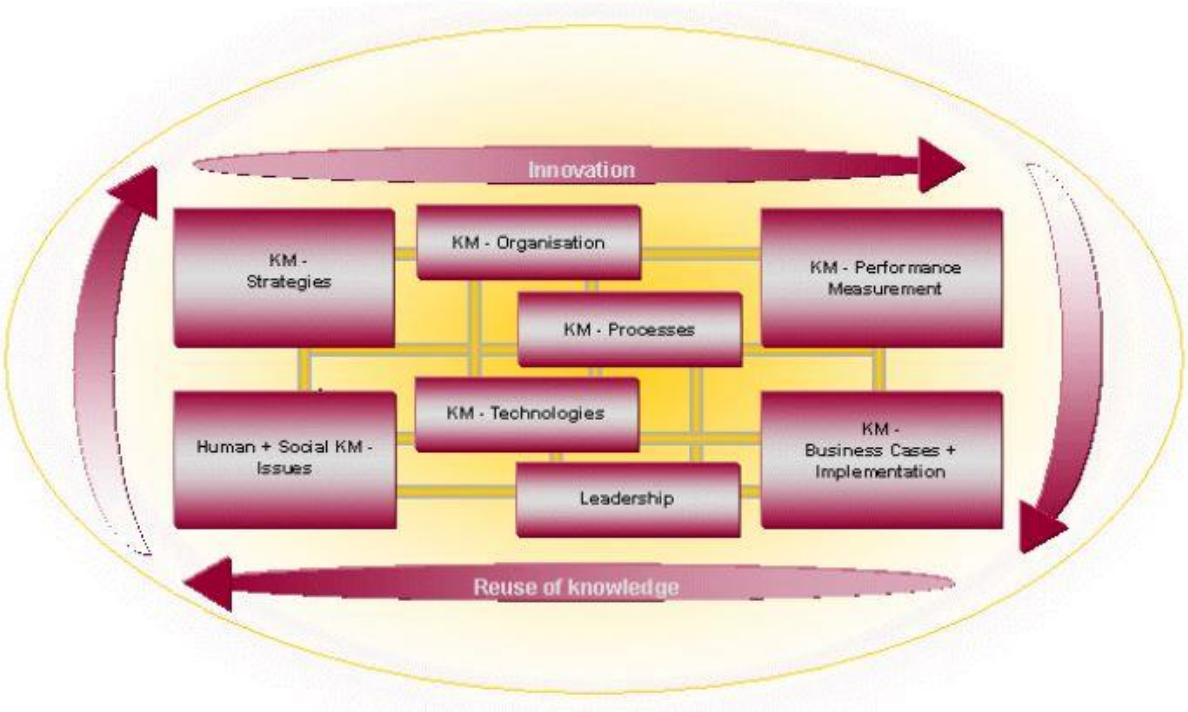

Figure 28. Core modules of the CEN-CWA 14924-1, 2004, by Weber (2002).

KM strategies – In the sense of direction, meaning to set goals and objectives by clearly defining at the same time the means to achieve these goals

Human and social KM concerns - By describing the role played by human resources, issues pertaining to culture and trust relationships, etc., this module especially tackles the reality that knowledge is dependent on people and exchanged on a social level

A knowledge-friendly organization can be built, operated, and maintained with the help of the KM framework. This will cover both the organizational structure and job descriptions for a "KM organization." It must be regarded as a guideline for adjusting current organizational structures to support KM.

Knowledge management (KM) processes: This module will explain how business processes have been adapted to KM. It will also cover general organizational processes, which will assist the entire target group become more effective at obtaining, disseminating, and preserving information.

Which KM technology should I use for what purpose? The module "KM technologies" of the KM framework will provide an answer to this basic query. It provides an overview of current and emerging KM technology and will aid organizations in making the best choice regarding this challenging KM issue.

What are the essential ingredients for a KM leader's introduction within the organization? Which qualities are preferred or assumed? Which tasks ought the leader to prioritize? Leadership and the environment are the main topics of the "leadership" KM framework module.

A KM system cannot be enhanced if the performance of the system cannot be quantified. Additionally, this module “KM performance measurement” offers criteria for evaluating a KM system's maturity as well as guidelines for advancing a KM system.

KM business cases and implementation - Business cases and execution for knowledge management are covered in this module, along with a basic roadmap. It will guide firms in developing the business case for KM as well as assist them in installing and establishing their KM system. This implementation methodology can be tailored to meet particular business objectives and requirements because of its broad nature.

A higher priority is given to soft issues in business settings that use knowledge management (KM), such as social and cultural considerations, individual motivations, change management strategies, and new and improved business procedures that promote cross-disciplinary knowledge sharing, communication, and collaboration with technology serving as an enabler.

The following is a definition of the CEN-CWA 14924-1, 2004, scope: KM success is a delicate balance. However, it is equally important to keep in mind the "bigger picture" — the larger financial, technological, and structural issues facing the company as it strives to innovate more quickly and within which any corporate KM initiative invariably takes place. Although it has been demonstrated through experience that socio-cultural issues are frequently the most difficult to address, This work item aims to establish a complete framework for KM implementation within and among companies throughout Europe, with a focus on SMEs, by referring multiple aspects, such as economic, socio-technical, techno-structural, and socio-organizational. This framework can evolve and adapt in the future. This study will address aspects of organizational performance, added value, financial and economic standards, interactions between information systems and people, and interactions between information systems and the organization (missions, structure, processes and relationship networks).It will also cover socio-organizational topics like governance, power dynamics, managerial techniques, knowledge transfer, incentive and reward structures, corporate culture, and morals and values. One would think that by taking into account such a framework, socio-culturally motivated KM activities might be guaranteed to produce fair outcomes rooted in a thorough examination of the organizational context. Approach: In Europe and abroad, there are numerous intriguing and useful frameworks. Finding a framework (or combination of frameworks) that is relevant and useful to European business organizations, particularly SMEs, will be the main goal of this effort. This framework will serve as a foundation for decisions on the use of KM in various business settings (CEN-CWA 14924-1, 2004).

Two primary types of the enablers—personal knowledge capabilities and organizational knowledge capabilities—complement one another. The knowledge-related actions mentioned above should be considered as being enabled by these capacities. Personal knowledge is made up of the traits that must be developed on an individual and group level in order to produce gains in knowledge handling, including ambition, skills, conduct, experience, tools, and time management. Leadership must develop organizational knowledge capabilities to enable efficient knowledge handling by internal stakeholders (such as managers and staff) and external partners throughout value-adding operations (such as providers and customers). The creation of an organization's collectively available information, or its so-called "knowledge assets," as well as the usage of technology and infrastructure are all examples of these capabilities. They also include the organization's goal, vision, and strategy (CEN-CWA 14924-1, 2004).

3.4.3. ISO 30401 Knowledge management systems: The requirements for effective organizational knowledge management.

A collection of recommendations and standards for knowledge management are proposed in ISO 30401 (ISO, 2018), which is made available by the International Organization for Standardization. The standard is an effort to assist companies in standardizing their management of the information they have gained and will continue to obtain. According to ISO 30401, managing knowledge requires valuing a number of knowledge-related factors, including its nature (which is intangible, complex, and human-created), value, focus (on organizational goals, strategies, and needs), adaptability, shared understanding, environment, culture, and interactivity (Zeferino et al., 2020).

The scope of the ISO Knowledge Management Standard, according to the ISO documentation is to "set requirements and provide guidelines for establishing, implementing, maintaining, reviewing and improving an effective management system for knowledge management in organizations. All the requirements of this document are applicable to any organization, regardless of its type or size, or the products and services it provides".

In the purpose section, the ISO Knowledge Management Standard states "The purpose of this ISO management system standard for knowledge management is to support organizations to develop a management system that effectively promotes and enables value-creation through knowledge". The KM Standard's guiding principles are summarized in the list below:

1. The influence of information on an organization's mission, goals, objectives, policies, procedures, and performance is what makes it valuable. Unlocking the potential value of knowledge is accomplished through knowledge management.

2. Focus: Knowledge management supports corporate goals, plans, and demands.

3. Adaptive: There isn't a single knowledge management solution that works for every firm in every situation. Depending on the requirements and environment, organizations may design their own approach to the breadth of knowledge and knowledge management, as well as how to implement these efforts.

4. Knowledge management should involve interactions between people, employing content, procedures, and technologies as necessary for common understanding.

5. Workplace environment: rather than managing knowledge directly, knowledge management focuses on fostering the lifecycle of knowledge.

6. Culture: Knowledge management efficacy depends on culture.

7. Iterative: Knowledge management needs to be phased and include feedback and learning cycles. Determining the organization's pertinent concerns for knowledge management is its responsibility. For instance, recognizing stakeholder needs and expectations, establishing KM's scope, fostering continuous improvement in KM, ensuring that outdated knowledge is discarded, transforming and transferring knowledge, activating knowledge through processes, human capital, technologies, and infrastructure, and fostering KM culture are all examples of things to consider. Support, Planning, Leadership, and Governance, information documentation and protection, and operation, performance evaluation, and continuous improvement, are the most recent needs (Zeferino et al., 2020).

A strong point of the standard is that it includes mechanisms for transforming different types of knowledge through human interaction, externalization (recording, documentation, or coding of knowledge), curation and combination (synthesis, formalization, structuring, or classification of codified knowledge), accessibility, and internalization (for easy access and understanding). Additionally, there are four processes in the Knowledge Management System: socialization (explicit / tacit), combining (explicit / tacit), externalization (tacit / explicit), and internalization (explicit / tacit) (Zeferino et al., 2020).

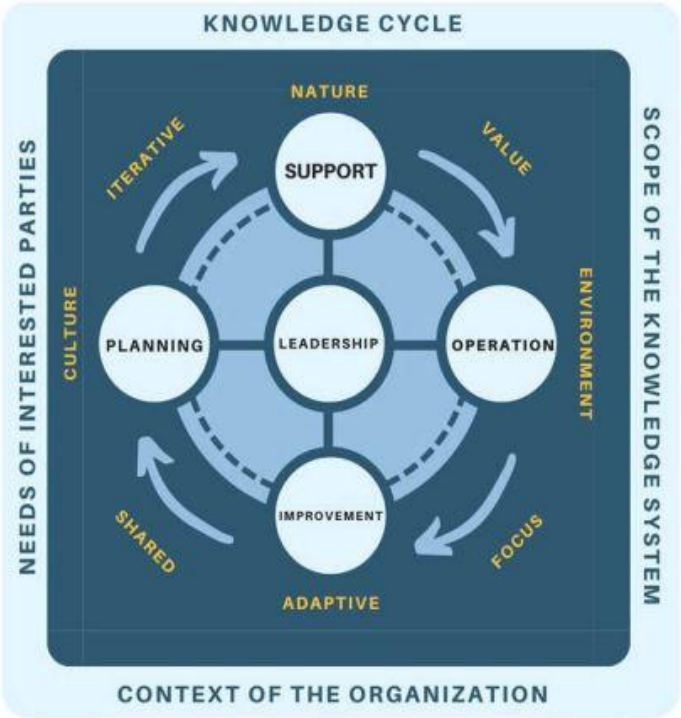

Figure 29. Knowledge management system based on ISO 30401, by Zeferino et al. (2020).

Analysis of the standard, shows that in order to meet a great number of its requirements many organizational management capabilities need to be previously established, like process flow, strategic planning, internal audits and performance indicators (Zeferino et al., 2020). As a result, it is challenging to construct a uniform criterion for determining adherence based on individual standard items. It seems that a model for the simultaneous implementation of all of the Standard's requirements should guarantee the effective implementation of the framework in order for the KM assessment to be finished. It was also observed that the standard encourages leadership to form a structure of working groups and teams designated with tasks focused on the implementation of KM, which makes it difficult for small sized companies to implement the Standard. Also, the Standard does not take into account the diversity in KM strategies, given that organizations set different knowledge goals.

Strengths	Weaknesses
Creating a pattern	Is knowledge standardizable?
Guiding principles	t is necessary to invest in a KM audit?
Manage knowledge	There is a need to certify the KMS?
Audit	Expensive consultancies
Certification	False impression of the actual use of KM
Evaluation	Indirect metrics
Recognition	Lack of focus on learning
Unconformities	Lack of assessment of the dissemination of KM
Measuring system	Small business deployment
Knowledge measurement	High investment
ISO dedicated teams	Casting the KM system
Focus on supporting documentation	Lack of control of standard effectiveness

Figure 30. Positive and negative points of ISO 30401, by Zeferino et al. (2020).

The research regarding the Standardization of KM and existing standards, as presented in this section, posed three more research questions, related to the primary research objective:

RQ9. What is the link between KM Standards and KM Maturity models?

RQ10. Can a KM maturity assessment framework be applied for the assessment of ISO 30401 implementation?

RQ11. Can a generic KM maturity assessment matrix be developed for ISO 30401 implementation?

The study's research objective was extended to accommodate and address these questions to: *the proposal of a holistic and integrated Knowledge Management Maturity Assessment framework encompassing the core guidelines of ISO 30401 in order to be used by both researchers and practitioners*.

4. Proposal for a novel integrated KMM framework; a holistic approach

4.1. The GQC Quality Management Maturity Model & ISO 30401:2018 application

Organizations view knowledge as a strategy that improves their management processes and helps them address issues and challenges (Zeferino et al., 2020). There is no disputing the value of knowledge and, in particular, its management. However, there is still a lack of consistency and dependability in the management of this crucial strategic asset. Standardization must be based on needs because it does not automatically give benefits (Weber, 2002). Standardization's overarching goals include facilitating global trade in goods and services and fostering collaboration in the fields of knowledge, science, technology, and business (ISO, 2001).

Many KM ideas like system approaches or continuous learning are also fundamental ideas of Quality Management (QM). Adopting the established QM concepts for the relatively new theory of KM could therefore give valuable insights for further developments. From a QM perspective, an ideal model for evaluating KM should contain the following elements (Wilson and Asay, 1999): (1) Focus on processes; (2) Employee involvement; (3) Continuous learning and improvement; (4) Measurement and standardization. The level of 'standardization' instruments may range among, e.g. best practice, common approach, guideline, reference framework, or finally a real standard (Weber, 2002).

The most important standardization components, according to experts, are a single KM framework, consistent KM terminology, and a common KM implementation strategy (Weber & Kemp, 2001). Standardization is an evolving process that is motivated by user issues.

It is necessary for multinational corporations (MNCs) to manage their knowledge flows effectively in order to gain or maintain competitive advantage (Kang, 2012). The knowledge management (KM) process needs to be cost effective, which can be achieved through a standardized "one-size fits all" strategy. Some scholars argue that a standardized KM strategy is not possible in international KM, since countries are different and cultural differences make it necessary to adapt the KM strategy with regard to different cultures. This reveals a question about standardization versus adaptation of KM.

One can recognize that the method or process standardization has produced significant benefits from a variety of viewpoints (e.g., organizational, financial, production, etc.), using the analogy of other industries like information technology or the automotive industry (Weber, 2002). The KM domain,

however, consists primarily of soft objects as opposed to these rather hard-driven themes, making it more challenging to be viewed holistically. KM is a young discipline, thus it is possible to discuss the value of standardization from a variety of intriguing angles. The following are the primary factors that speak against a uniform KM approach: It takes a long time to standardize something properly. This is due to the compromising nature of standardization, the difficulty, and the possibility to achieve a critical mass and wide range of consensus. Any standardization process can only be effective if this wide understanding is gained by all interested parties, most particularly the users and stakeholders of the standardized items. Standards run the risk of falling behind the needs of everyday practice because of the length of the procedure and the required steps of preparation. The question of "what is a sensible degree of standardization of a soft subject like knowledge management in a comprehensive and structured, but yet useful, manner?" is another important one regarding standardization. Standardization and constructivism may be mutually exclusive ideas that cannot possibly coexist.

Most of the time, standards are considered as a hindrance to human progress in terms of creativity and adaptability (Weber, 2002). People view standards as a framework that prevents them from developing original, novel solutions outside of the predetermined parameters. Standards are viewed as a restriction to these particular aspects of freedom, not just in the context of creativity but also in the sense of peoples' adaptability. Because if knowledge is used, attention will be drawn to non-compliance rather than to learning and/or distributing knowledge, which is a knowledge management system's goal (Zeferino et al., 2020). A generalizable model of stages is difficult to use because of the varied structure of the small and expanding business sector, according to Phelps (2007).

However, Weber (2002) notes a variety of factors that support standardizing KM, including the following: Transparency will result from the activity itself, which will bring together all relevant institutions and bodies and lead to a single understanding and terminology through the process itself. The advantages of KM development will be accessible to a wider audience thanks to "standardized" KM elements (such as common approaches to KM processes, knowledge technologies, knowledge-based human resources, KM strategies, etc.). Additionally, from the perspective of KM experts, standardized KM procedures will enable the experts to adopt a verified global (or even globalized) common vocabulary. This suggests that communication will be simpler and can begin from a higher shared base. Standardizing some of the key KM elements can free up more energy and creative space for (customized) specifications for specialized and unique solutions. Finally, venues for further study

and instruction will include standardized KM components, such as a shared KM framework. Future work in the KM area will be able to start from a higher level thanks to an established KM framework.

According to Weber (2002), the majority of reasons raised against KM standardization can be categorized as general objections to standardization, meaning they are not KM-specific.

Many research questions have arisen in the literature regarding the association of KM maturity assessment of CFS with main management principles. In Glykas Quality Compass (GQC), these principles are considered as necessary conditions or factors to accomplish ten, quality concepts, which are divided in three categories (Glykas , 2019):Five core concepts (Customer focus, Human Resources management, Leadership, Process focus, Strategic focus), three intra-core concepts (Performance Measurement, Change Measurement, Continuous Improvement) and two auxiliary concepts (Information-Knowledge management, Partnership, Social Responsibility and Stake holders' value).

The core concepts are:

1. Customer focus: Focusing on the way the product or services are delivered to the customers. Focusing on the customer segment and supporting processes. For example, Quality Function Deployment is a technique for analyzing customer focus.

2. Human resource management: It comprises of 4 elements namely performance measurement, training and education, rewards and incentives and career pathing.

3. Leadership: It is a soft skill which involves empowering of individuals in an organization. It is very important and deals with how authority and decision making is delegated to the human resources.

4. Process focus: Process flow is the sequence of activities. Process management deals with the activities and flow of activities.

5. Strategic focus: Deals with developing business objectives and the critical success factors.

The intra-core concepts are:

6. Performance measurement: Measurement of the efficiency and effectiveness of all organizational elements namely managerial system, job description, organizational structure and processes-procedures.

7. Change management: The management of the change in all organizational elements in a controlled manner.

8. Continuous improvement: Using PDCA (the Deming Cycle) to continuously improve all elements of the organization.

The auxiliary concepts are:

9. Information-Knowledge management: Knowledge comprises of education, experience and training. Knowledge management is serving knowledge, using knowledge to achieve something. It deals with the way knowledge is documented in an organization.

10. Partnership, Social Responsibility and Stake holders' value: Partnership is the relation with the suppliers, subcontractors and outsourcing firms. Social responsibility is the responsibility with all other authorities in the wider community. Stake holder is anybody who has influence or interest in the company functioning.

The aforementioned factors have been encountered in the literature survey, in all of the models and frameworks that were researched, individually or combined with each other. The Glykas Quality Compass (GQC) framework provides a matrix, a ten-to-ten table, founded on the ten, most crucial, critical-success factors, which are identified in current, maturity-assessment frameworks and the ten, best-known enablers, which are identified in literature. The matrix can be used with reference to the CSFs during the design of the framework and with reference to the enablers during the implementation of the KM framework, for the three-fold managerial perspective Processes – Human Resources – Information Technology.

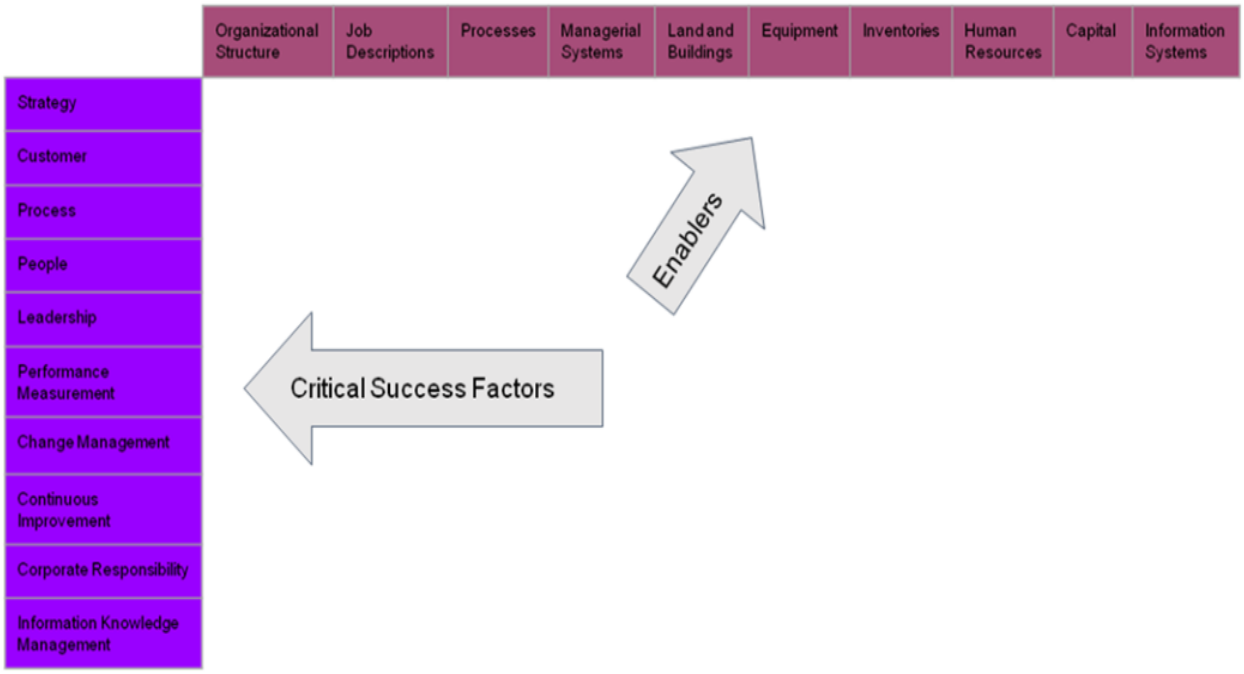

Figure 31. . Framework of Glykas Quality Compass (2019).

In order to examine whether the GQC can be expanded to apply to the ISO 30401 requirements, given that the standard's scope is to "set requirements and provide guidelines for establishing, implementing, maintaining, reviewing and improving an effective management system for knowledge management in organizations. All the requirements of this document are applicable to any organization, regardless of its type or size, or the products and services it provides", the 30401 clauses presented in the following table were compared to the factors of the ten by ten matrix defined by the GQC, as shown in the Table below.

4.1	Understanding the organization and its context
4.2	Understanding the needs and expectations of interested parties (stakeholders)
4.3	Determining the scope of the Knowledge Management System
5.1	Leadership and commitment
5.2	Policy
5.3	Roles, responsibilities and authorities
7.1	Resources
7.2	Competence
7.3	Awareness
7.4	Communication

8	Operation
9.1	Performance evaluation (monitoring, measurement, analysis and evaluation)
9.2	Internal Audit
9.3	Management review
10.1	Non conformity and corrective actions
10.2	Continual improvement

Table 3. Documentation Requirements of the ISO 30401:2018.

	Organizational Structure	Job Descriptions	Processes	Managerial Systems	Land and Buildings	Equipment	Inventories	Human Resources	Capital	Technology and Information Systems
STRATEGY	4.1	7.2		4.3, 7.3	7.1	7.1	7.1	7.1, 7.2	7.1, 7.2	7.1
CUSTOMER	4.2							7.4		
PEOPLE	7.1, 7.2, 7.3, 7.4	7.1, 7.2, 7.3, 7.4	7.1, 7.2, 7.3, 7.4	7.3			7.1	7.1, 7.2, 7.3, 7.4		7.1, 7.2, 7.3, 7.4
PROCESS	8	8	8		8	8	8	8	8	8
LEADERSHIP	5.1, 5.3	5.3		5.2				5.1, 5.3		
CHANGE MANAGEMENT	7.3, 7.4									
PERFORMANCE MEASUREMENT	9.1, 9.3	9.1, 9.3	9.1, 9.2	9.1, 9.2, 9.3				9.3		9.1
CONTINUOUS IMPROVEMENT	10.2	10.1, 10.2	10.1, 10.2	10.1, 10.2	10.2	10.2		10.1, 10.2	10.2	10.2
INFORMATION AND KNOWLEDE MANAGEMENT	9.3	9.3	7.1, 8, 9.1, 9.2, 10.1	4.3, 8, 9.1			7.1	9.1, 10.1		7.1, 9.1, 10.1
PARTNERSHIP, CSR, STAKEHOLDERS	4.2			7.4				8		8

Table 4. Implementation of the ISO 30401:2018 requirements on the GQC framework.

The holistic approach of the GQC maturity assessment model, combining CSFs with quality management principles and organizational resources could be implemented for the assessment of the ISO 30401:2018 Knowledge Management Systems Standard, providing a useful guide for the continuous improvement of organizations while at the same time, providing an image of the level of maturity when it comes to knowledge management in everyday processes. The GQC approach could

also assist the members of the knowledge management implementation team clarify the KM theory and link it properly and easily to everyday activities (Glykas, 2019).

This research could be used as a recommendation and implementation guide according to the ISO 30401:2018 for an organization in order to test the GQC method. Such a case study would provide findings, tools and categories to expand the GQC model, producing thus a generic GQC KM maturity framework to be used as reference by future researchers in the field of KM maturity assessment.

4.2. Proposed Knowledge Management Maturity Model

Based on the extended literature survey of Sections 2 and 3, questions (1) to (8) have been adequately researched providing answers and conclusions. Through the literature survey which included case studies publications:

-Human resources, processes and technological enablers have been identified as primary factors and enablers in the prominent literature. The reference Table of the literature survey section, clearly identifies this People – Process – Technology three-fold perspective as the most commonly encountered and referenced in KM theory and KM frameworks (RQs 1, 6, 7, 8).

-Leadership may be a factor not so much encountered in literature and case studies results, however it is the core principle defined by the ISO 30401:2018, around which all KM concepts and steps evolve (RQ3).

-Strategy is an often highly rated CSF in KM case studies, in a more generic perspective, as encountered in most management systems (RQ2).

-Performance Measurement, Continuous Improvement and Change Management (mostly presented through the prism of corporate culture) are identified as secondary but still necessary factors for a successful KM implementation system (RQs 4, 5).

Regarding research questions (10) and (11) and the primary research objective (proposal), the following literature and methodology milestones have been identified and taken into account:

a. The Tacit – Explicit Knowledge distinction combined with
b. The SECI (Socialization, Externalization, Combination, Internalization) Nonaka spiral model for continuous improvement
c. The People – Process – Technology three-fold perspective

d. The existing KM frameworks CSFs: Human resources, Process, Technology, Leadership, Customer focus, Strategy, Performance Measurement, Change Management and Continuous Improvement
e. The Leadership- cored cycle of the ISO 30401:2018

The GQC ten-by-ten CSFs-enablers model was examined as a possible answer to these research questions, providing an integrated solution to the overlap of the aforementioned literature key points while at the same time dealing with the non – overlapping, but still critical factors and core principles encountered in the KM literature. A design of this overall matrix proposal was constructed to represent these five KMMMs theories, covered by a spider-web version of the GQC model. This integrated spider-web edition GQC KM model can be used for testing and further examination of the KM implementation and assessment systems (Bougoulia & Glykas, 2022).

The design methodology steps were the following:

1. The Knowledge is depicted as a triangle, where each one the three- fold GQC enablers perspective People – Process – Technology points is a vertex. The "PPT" three – fold factors are also the most encountered in the literature CSFs as previously presented in Table 2.
2. Leadership, another GQC CSF, is placed as a core inside the triangle around which all other aspects rotate, as defined by ISO 30401. This is presented as a concentric circle outside the triangle.
3. The Knowledge triangle is split in the middle, with the Explicit form of Knowledge on the left and the Tacit form on the right.
4. The SECI model is applied, by the rule Tacit to Tacit -> Socialization, Tacit to Explicit -> Externalization, Explicit to Explicit -> Combination, Explicit to Tacit -> Internalization, representing thus another CSF, the Continuous Improvement factor.
5. The GQC CSFs matrix is applied as an octagonal web to encompass the already included five CSFs (People, Process, Technology, Leadership, Continuous Improvement), placing the remaining five GQC CSFs: Strategy, Communication (Partnerships, Corporate Social Responsibility, Stakeholders' value), Customer Focus, Change Management and Performance Measurement on the corresponding five axes.

In the resulting design, Socialization begins with defining Strategy, uses Communication (third parties input) and is used in Technology. Externalization begins with Technology, uses the focus on Customer needs, and is incorporated in Processes. Combination begins with Processes, is applied through Change Management tactics and is used in Performance Measurement. Internalization begins with proper Performance Measurement, focuses on People and ends in redefining the Strategy and so forth.

This perpetual sequence design can be used for both implementing and improving a holistic KM system, while at the same time staying in line with the ISO 30401 guidelines and requirements.

The web-like relationships between factors, enablers and KM aspects can be used as a Knowledge Management Maturity Assessment model's parameters, constants and KPIs.

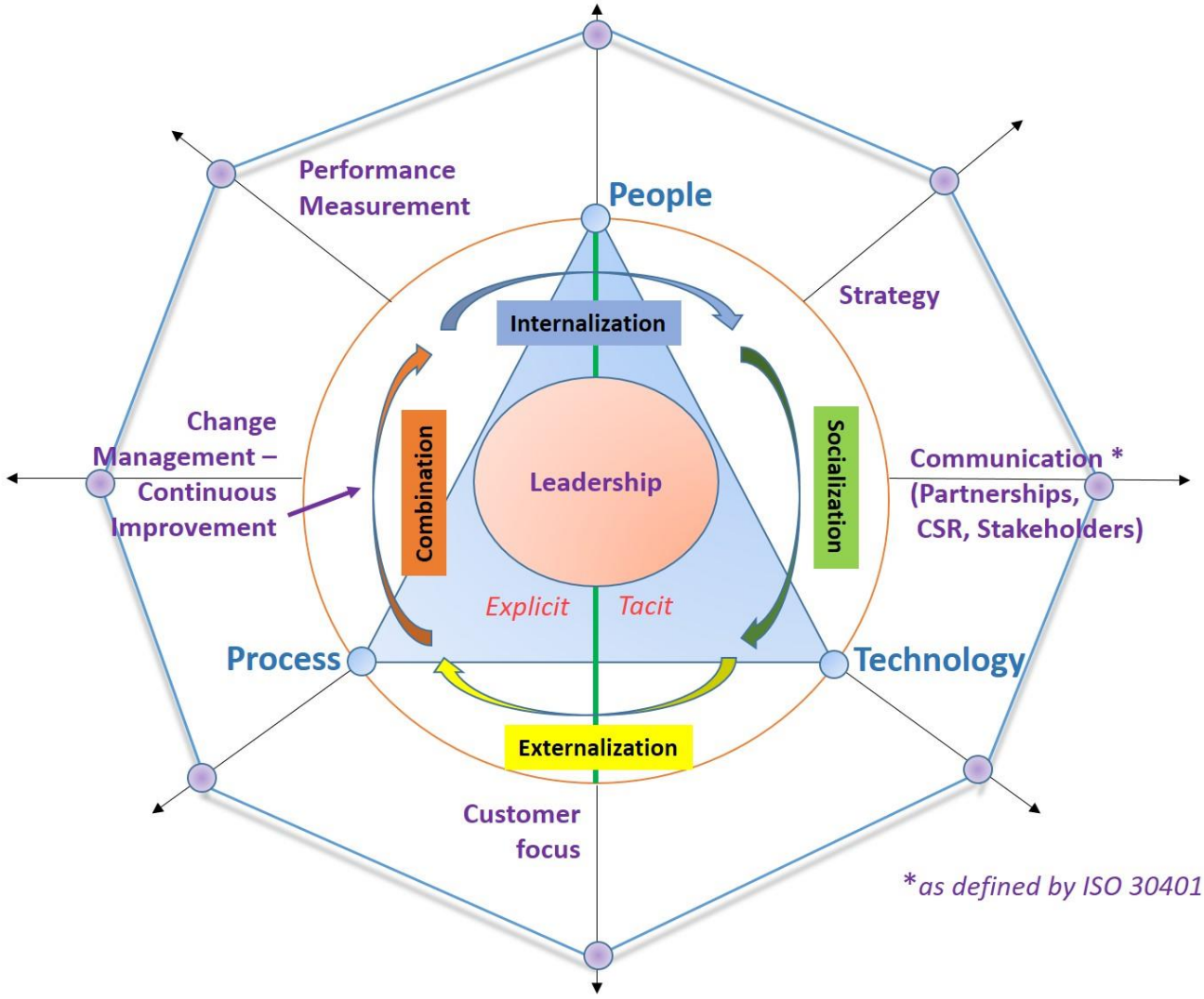

Figure 32. The GQC spider-web version KM proposal model.

A proposal for such a model is presented, using the newly introduced definition of an “Outward – Inward” combination approach to use the same model as an Implementation Framework & a Maturity Assessment Model.

In this approach, the Outward phase represents the implementation stages and the Inward phase represents the maturity assessment process. Thus, it allows for the same stages to be used in a complimentary fashion. The two phases can stretch over the period of one year, for example, implementing practices can be the focus for nine months, followed by three months of assessing the results and the maturity. This also allows for repetitiveness to achieve optimal levels, year after year.

Another key point of the proposed “Outward – Inward” approach model, which is depicted in the following Figure, is that it allows for an organization to be at a different implementation stage or assessment level for each of the eight factors that represent the eight axes that form the framework’s guidelines. Leadership however, which is the core of the model proposal, must at any time be included in every implementation stage and assessed respectively during the 3-month assessment period.

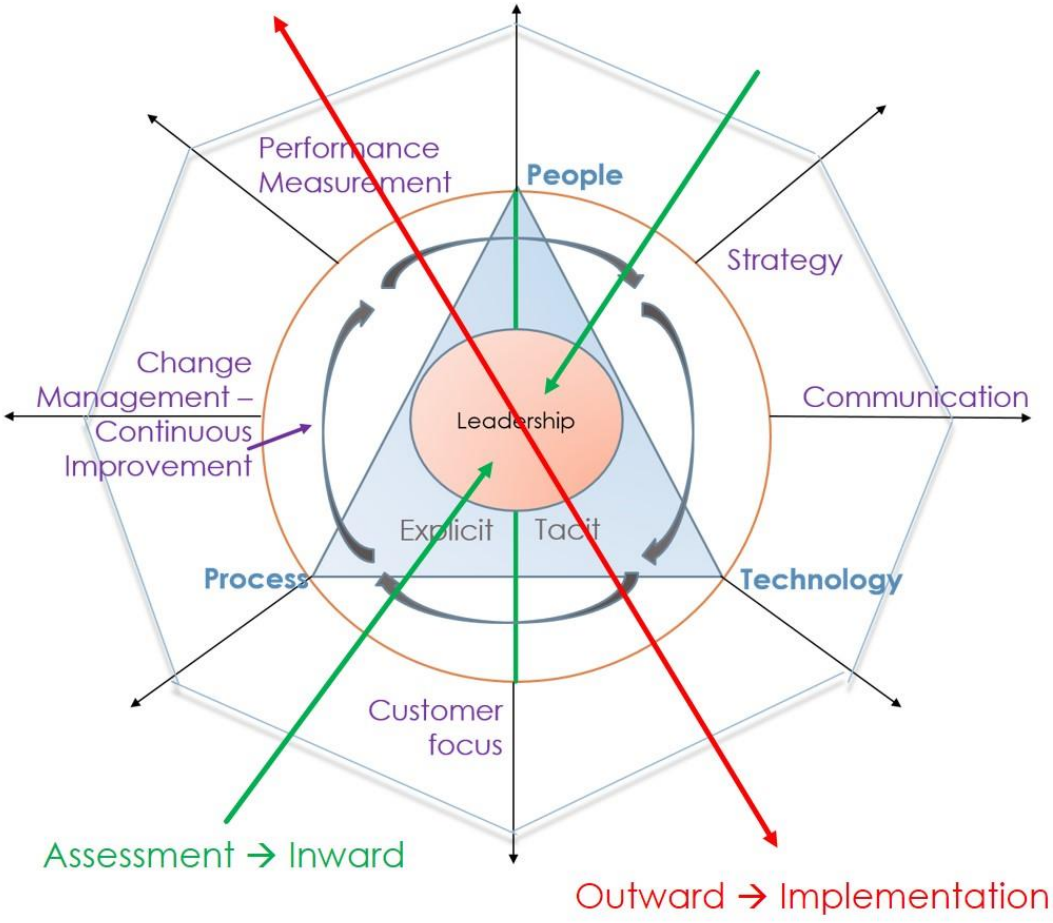

Figure 33. The proposed "Outward - Inward" approach.

Five phases of KM maturity are most frequently identified by researchers: startup stage (1); there aren't many KM activities in the organization; Take-off stage 2: The organization develops its knowledge management strategy, which is defined by the requirement for KM structure and resources; Expansion stage (3); the company is making KM leadership and initiatives more visible, and it is distinguished by a more systematic approach to addressing the risks and barriers; Progressive stage (4); the company is characterized by a focus on KM measuring methodologies rising maturity poor performance high performance; the performance of KM activities is improving; The final stage, known as the "sustainability stage," is when a business makes a significant effort to maintain the effectiveness of its knowledge management methods and practices while KM becomes ingrained in the culture of the organization.

Businesses love the widely used maturity model known as the Capability Maturity Model (CMM) The Capability Maturity Model Integration (CMMI), which uses both a staged maturity assessment representation and a continuous maturity assessment portrayal for process improvement, was developed by the Software Engineering Institute of Carnegie Mellon University. The staged portrayal of the model has five stages. Random and chaotic processes characterize "initial" maturity level 1. The term "Managed" refers to the second maturity level, which is characterized by processes that are planned and carried out in line with organizational policy. The application of standard operating procedures to provide uniformity across the entire organization characterizes the third maturity level, "Defined." The management of process performance by quantifiable goals distinguishes the fourth degree of maturity, "Quantitatively Managed." The "Optimizing" maturity stage, which is the fifth, is defined by continuing, innovative process and technological improvements that increase process performance continuously.

Given that knowledge management is highly related to and dependent on Information Technology, the CMM’s implementation stages are an optimal fit to encompass the respective stages in this research’s proposed model, as this model is previously described. The five implementation stages: 1. Initial 2. Managed 3. Defined 4. Quantatively Managed 5. Optimizing can also be used in a reverse inward approach, as the maturity assessment levels for each of the eight key areas of the proposed framework: 1. People 2. Technology 3. Process 4. Change management – Continuous improvement 5. Strategy 6. Communication 7. Customer focus 8. Performance Measurement, always weighted by the Leadership implementation/ assessment factor.

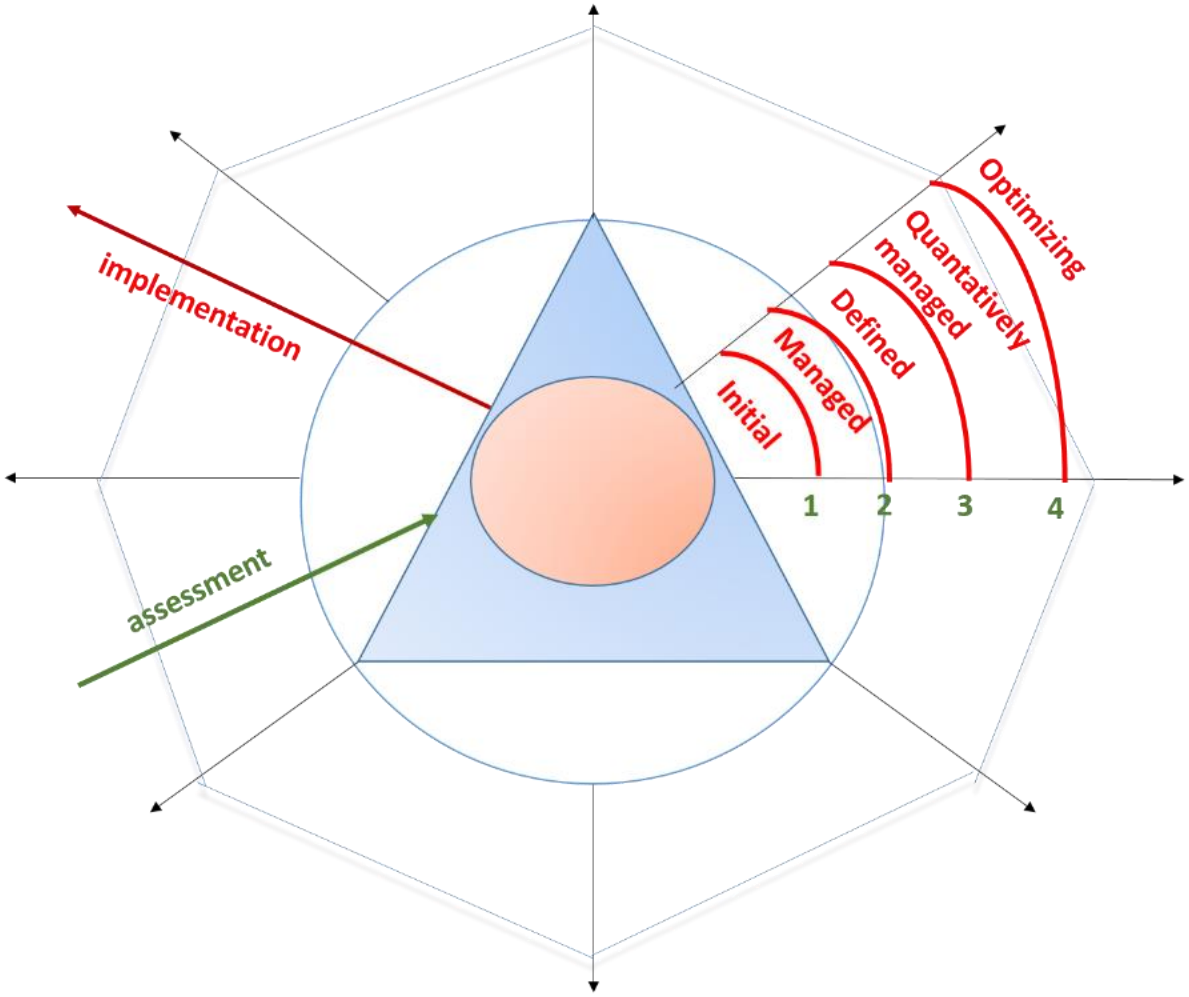

Figure 34. The maturity levels of the proposed model.

In this manner, common properties and key characteristics of KMMMs encountered throughout the literature, are represented in the framework proposal: Any resource's evolution (whether it an object, human being, process, or technology) is broken down and presented through a select few maturity levels (usually four to six). From a starting level to the pinnacle of perfection, levels are gradually categorized. Without the option to skip a level, the resource evolves by graduating from one level and moving on to the next. Additionally, a KMM model should, in accordance with the subsequent secondary principles: be adaptable to various objects of study, such as organizations as a whole, organizational units, or KM systems; a methodical, well-organized approach that focuses on the importance of measurement and standards and which will, in turn, give transparency and reliability during the evaluation phase; provide both qualitative and quantitative outcomes, be easy to understand and allow comparisons to well-known management concepts or models, and facilitate

ongoing learning and development. While designing the maturity assessment proposal, the following ideas from the literature were taken into account.

To find the major knowledge gaps and the essential information needed to offer high-quality products and services, an organizational knowledge audit, benchmarking, and strategy are also necessary. There must be a system in place for keeping information and making it available at the necessary level, including roles, procedures, and enabling technology (ISO, 9001).The one- year repeated cycle that is proposed in this research's model, allows for the annual maturity assessment results to be used as a benchmarking basis while at the same time, to be taken into account while redesigning strategy and goals for the next year's implementation stages. The basic knowledge management tool-kits of the ISO 9001, are considered a fundamental aspect of the model.

Institutionalizing a training program is viewed as a top goal. Everyone inside the organization must first be made aware of the goals of knowledge management and knowledge engineering, as well as how the KM-KE program will affect them. Organizational practices such as relevant training, knowledge-sharing-enabled HR rules, and curiosity-fostering KM procedures will increase participation. Knowledge requirements and knowledge availability could be matched with the creation of user profiles that accurately reflect users' interests. A collection of HRM collaborative methods can promote knowledge.

The idea behind any such model is based on strategic objectives and the optimal use of existing company resources when it comes to the maturity model's assessment standpoint. Organizations are directed to improve performance by KMMMs. There is a significant correlation between knowledge management (KM) practices and an organization's performance, with knowledge creation, sharing, and distribution having the most impacts on KM practices' success and serving as performance standards.

The model should include multiple factors, as one component cannot accurately depict the overall state of knowledge management maturity within an organization because this is based on multiple key success factors (CSFs); Some variables are interconnected and context-sensitive (e.g. high quality of IT tools does not yet mean there is an adequately developed organization climate to support the use of it). Thus, the following are the eight variables that should be included in the KM maturity model: Organizational (people & organizational atmosphere and processes); Knowledge-related (acquisition, utilization, sharing and ownership); and IT-related (capturing knowledge and usage of IT tools). (Armstrong, 2014).

Management must refrain from utilizing a KMMM as a tool for punishing and reprimanding underperforming units in order for it to accurately reflect reality. Instead, it need to draw attention to any areas that require additional guidance and help. Paulzen et al. (2002) specifically recommend that staff members take part in the evaluation of KM maturity.

One corporation took a particularly intriguing approach to measuring when they disseminated "business basics" around the globe and at all levels as performance indicators on important activities. Business fundamentals, such as delivery, cost, customer, or people measures, are shared by all professional staff members of the organization; however, these measurements are self-driven rather than management-driven. Individuals use a straightforward grading scale to gauge their success in relation to these company basics and essential processes. The organization-wide formal evaluation is then conducted every quarter in relation to the business fundamentals. In order to provide an integrated approach to measurement across the business and a compelling example of integrating process measures with other organizational metrics, the same approach is used to track individual performance, performance against goals, and process performance (Armistead, 1997).

Given that Leadership is in the core of the proposed model, one needs to elaborate on the aspects related to leaders and leadership and its relationship with organizational enablers. Since leadership is a complex concept, many theories have been developed to try to explain it. These theories, which are outlined below in brief, have evolved over time and examine a variety of aspects of leadership and leadership behavior. They are complementary to one another in many ways, and collectively they contribute to a thorough grasp of what the leadership process entails. The fundamental and, for many, most well-known theory of leadership is trait theory, which analyzes leadership in terms of the traits that effective leaders possess. But it has its limitations, and rather than concentrating on the personalities of leaders, pragmatic research was done to determine what behaviors constituted leadership. Employee as differentiated from job-centered behavior, and the processes of deliberation and starting structure were identified as the two dimensions of leadership behavior, respectively, by the key leadership behavior studies done by the Universities of Michigan and Ohio State (Armstrong, 2014).

Adair created the most compelling analysis of what leaders do (1973). He clarified that a leader's three primary responsibilities are to: They clearly state what the group is expected to perform in order to define the task in point one. 2 Complete the assignment; this is the group's purpose. Leaders see to it that the group's goal is achieved. Frustration, discord, criticism, and perhaps even the group's

eventual dissolution will occur if it is not. 3 Keep up strong interpersonal connections, both between themselves and other group members and within the group. If these connections help complete the task, they are effective. They can be divided into those who are interested in the team, its morale, and its sense of unity, and those who are interested in individuals and their motivations. According to Adair, the three areas of need that leaders must meet are the greatest way to articulate the demands on them. These are: 1) task needs—getting the job done; 2) individual needs—aligning one's needs with those of the task and the group; and 3) group maintenance needs—fostering and maintaining a sense of unity within the group. These requirements were modeled by Adair as three overlapping circles. According to this concept, the demands of the task, the individual, and the group are interrelated. Fulfilling task requirements will also fulfill group and individual requirements. However, meeting task needs requires consideration of both individual and group needs. Meeting individual needs will also help to meet group needs, and vice versa. Leaders run the risk of becoming so task-focused that they neglect the requirements of both the individual and the team or group. Being overly concerned with the demands of the individual or group at the expense of the work is just as risky. The most effective leaders are those that satisfy and balance these three needs as required by the circumstances (Armstrong, 2014).

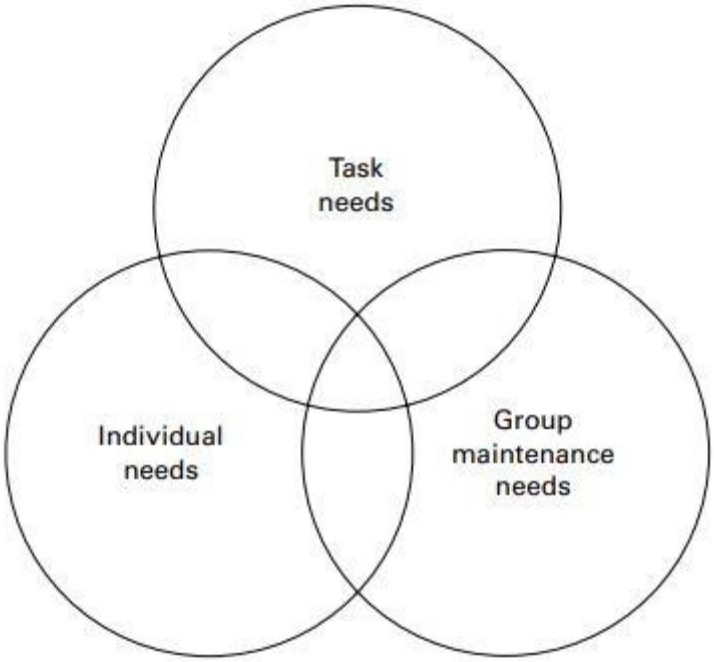

Figure 35. John Adair's model of Leadership (Armstrong, 2014).

Hansen et al. (1999) recognized the codification strategy and the personalization strategy as the two knowledge management strategies. The approach to codification Knowledge is meticulously defined and kept in databases so that everyone in the company can quickly access and use it. Knowledge is formalized explicitly utilizing the "people-to-document" method. Consequently, the strategy is document-driven. Knowledge is taken from the creator, created independent of the creator, and then utilized for different purposes. It lets users to search for and obtain codified knowledge without having to get in touch with the person who created it because it is preserved in an electronic repository for public use. In order to manage databases, this method heavily relies on information technology and the intranet. Personalization tactics Knowledge is transferred mostly through direct person-to-person interactions and is tightly linked to the person who generated it. This "person-to-person" method entails facilitating the transmission of tacit knowledge. By fostering networks and encouraging face-to-face interaction between individuals, the exchange is accomplished through unofficial conferences, seminars, communities of practice, brainstorming sessions, and one-on-one meetings. The choice of strategy, according to Hansen et al. (1999), should depend on the organization, including what it does and how it does it. Therefore, firms like Ernst & Young that use knowledge to solve recurring issues may rely on codification to make recorded solutions to related issues accessible. However, strategy consulting firms like McKinsey or Bains rely on a personalization strategy to enable them deal with the complex strategic issues that they are presented with and that necessitate the supply of original, meticulously researched recommendations. They must locate and nurture individuals who can employ a person-to-person knowledge-sharing technique in order to channel individual expertise. It is possible to locate experts who can be contacted via phone, email, or in person. According to the study by Hansen et al. (1999), businesses that effectively utilize knowledge employ one of the two strategies—personalization or codification—as their primary approach and complement it with the other. They noted that those who attempt to be outstanding at both techniques run the danger of failing at both (Armstrong, 2014).

When it comes to infrastructure and Knowledge Management Systems, the following steps should be followed (Armstrong, 2014) at the starting implementation phase:

- Creating an intranet.
- Creating ‘data warehouses’.
- Using decision support systems.

● Using ‘groupware’, i.e. information communication technologies such as e-mail or discussion bases.

● Creating networks or communities of practice or interest of knowledge workers.

The role of HR in knowledge management: HR may play a significant role in knowledge management simply because people exchange information; it is not merely a matter of using IT to capture explicit knowledge. HR's responsibility is to ensure that the organization has the necessary intellectual capital. According to Cappelli and Crocker-Hefter (1996), the resource-based view of the company places emphasis on the idea that "distinctive human resource practices help to build unique competences that differentiate products and services and, in turn, promote competitiveness." HR may help by offering guidance on cultural management, organization design and development, and by setting up processes and programs for learning and communication. There are ten methods (Armstrong, 2014) to do this:

1. Assist in creating a culture that is open and emphasizes the significance of knowledge exchange.

2. Encourage a spirit of loyalty and confidence.

3. Provide guidance on the creation and growth of organizations that support knowledge exchange through networks, collaboration, and communities of practice.

4. Offer guidance on hiring practices and resourcing services to guarantee that highly valued workers who can contribute to knowledge development and sharing are attracted to and kept on board.

5. Offer suggestions for how to encourage knowledge sharing and recognize those who do so.

6. Assist in the creation of knowledge-development and knowledge-sharing-focused performance management procedures.

7. Create organizational and individual learning mechanisms that will produce knowledge and aid in its dissemination.

8. Create and plan workshops, conferences, seminars, communities of practice, and symposia that allow for the interpersonal sharing of information.

9. Create methods for capturing and, to the extent practicable, codifying explicit and tacit knowledge in cooperation with IT.

10. In general, advance knowledge management among top managers to persuade them to take the initiative and support knowledge management programs.

According to the APQC, the American Productivity and Quality Center, founded in 1977 and one of the world's foremost authority in benchmarking, best practices, process and performance improvement, and knowledge management, measurement has always been contentious in knowledge management. Some knowledge managers claim that anecdotal evidence is more persuasive than data and that it would be wiser to invest the time required to calculate KM's business impact in enhancing the organization's KM services. But APQC strongly advises in favor of it despite the difficulties involved in quantifying something as intangible as KM. Some of the explanations are as follows:

- By being truthful about the objectives an organization seeks to achieve, measurement reminds managers of what's most crucial and stops them from deviating from the broad vision outlined in the KM business case.

- Prior to measurable results being apparent, measures show progress throughout the early phases of a KM deployment.

- Data helps managers recognize problems and course – correct when a KM tool or approach is not working as planned.

- Less involved groups are revealed through analysis, allowing managers to create focused tactics to raise awareness and spur involvement.

- The KM program will be better protected amid upcoming organizational changes or cost-cutting initiatives if a KM manager can provide evidence of KM's impact on the business.

The knowledge management metric that APQC uses shows a variety of evaluation methods. Most businesses use leaders' and users' feedback, success stories, and other anecdotal evidence to show how KM benefits the organization. To establish whether their target audiences are being reached and

their goals are being achieved, the majority of people evaluate KM's performance using activity and satisfaction measures. Business impact and ROI indicators are less popular.

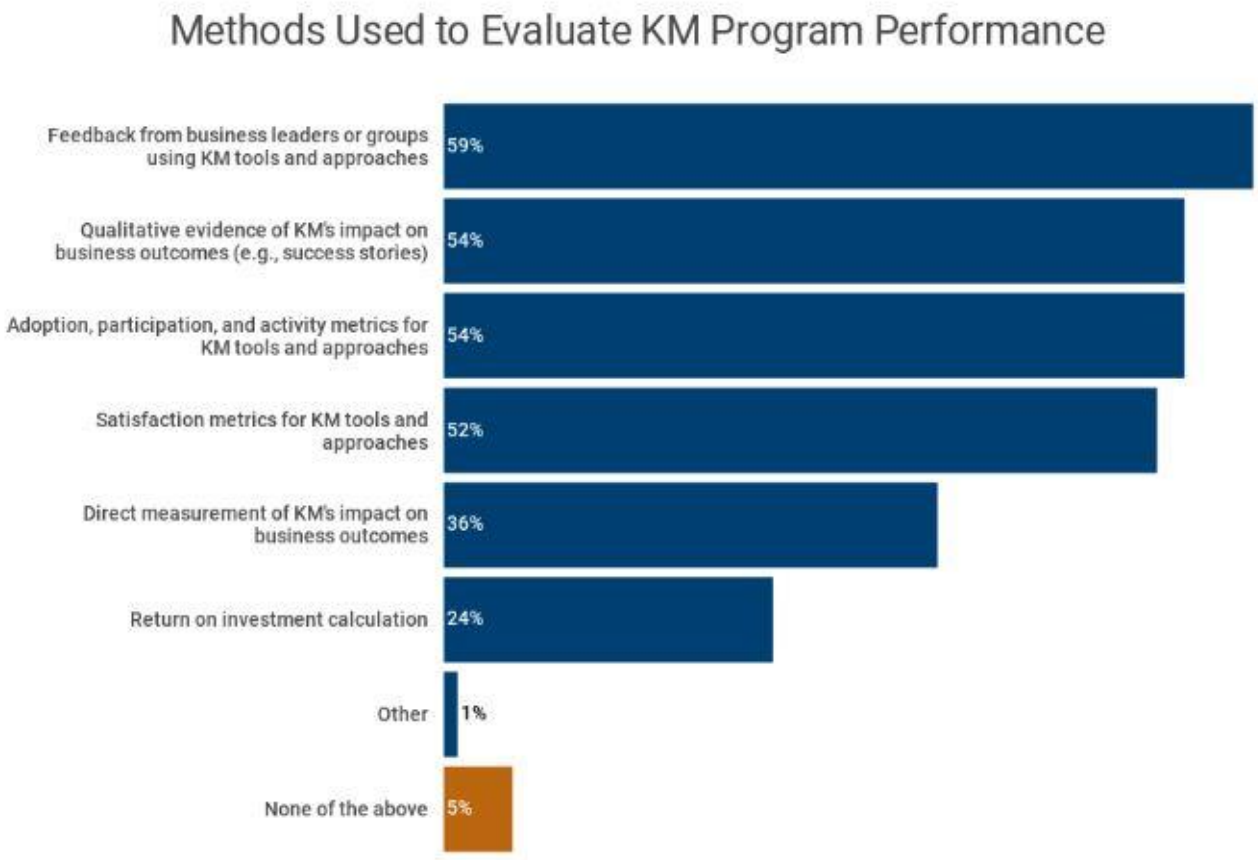

Figure 36. Methods used to evaluate KM program Performance, source : APQC

While business value and impact metrics are less common than other types of evaluation, KM programs that employ these techniques frequently receive higher evaluations from decision-makers and more substantial financial support. Decision-makers tend to give KM initiatives that employ these techniques higher ratings and stronger financial backing.

It should come as no surprise that KM teams who directly link knowledge sharing and reuse to the bottom line find it simplest to secure the funding required to maintain and grow their programs. Programs that assess cost savings via KM are more likely to anticipate having their next budget approved easily or very easily among KM initiatives that track business value indicators. Similar to this, KM initiatives that link KM efforts to rising sales are more likely to anticipate an easy budget approval.

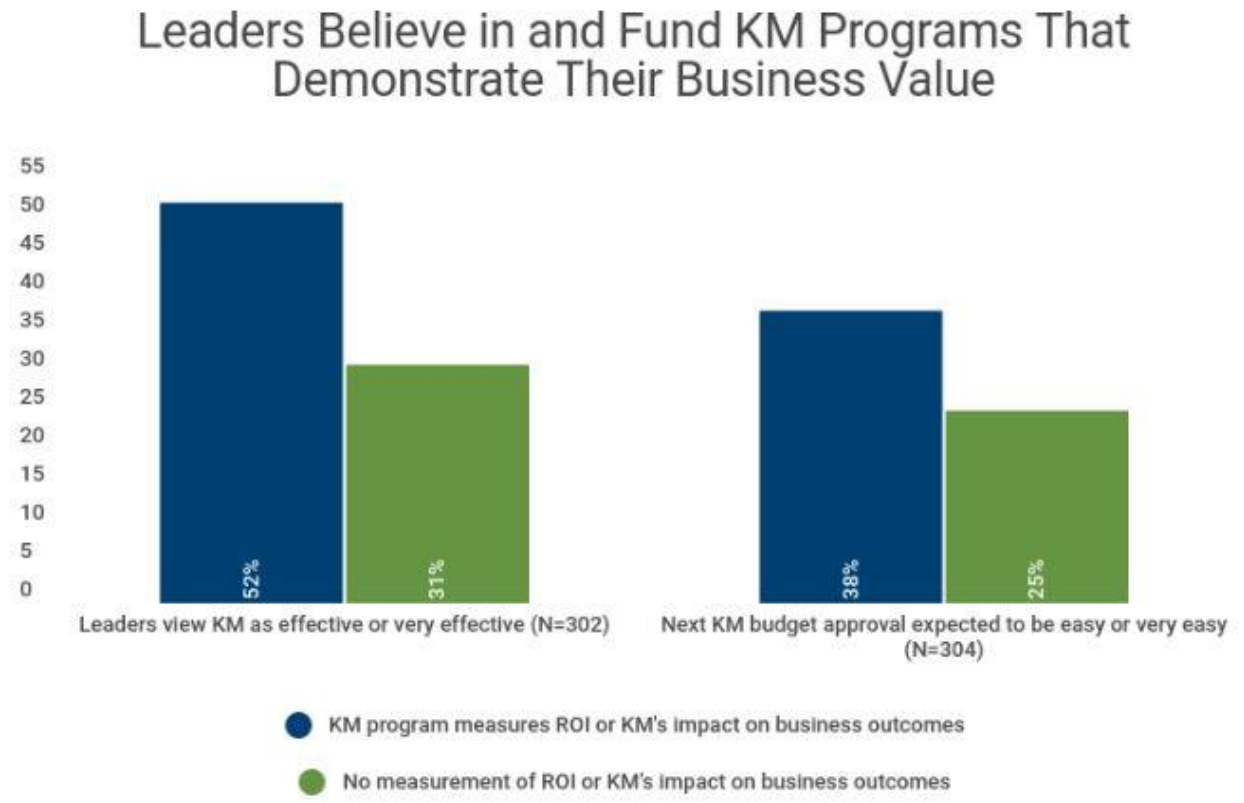

Figure 37. Leaders funding KM programs decision, source: APQC.

Figure 38. Where leaders believe KM is effective/ more effective, source: APQC

But non-financial metrics of business effect, such as cycle time reductions, time saves, and quality enhancements, seem to be equally important in boosting executives' faith in KM and persuading them that it is serving the intended purpose. Leaders are far more likely to rate as effective KM programs when compared to KM programs that analyze no business value measures.

Based on the previous observations, the basis of the proposed model assessment methodology is that the overall maturity level of an organization, will be an overall total of weighted averages, in the sense of metrics. Within this measurement system, Leadership, will be the one and only Constant, and its relationship with all other measured factors will always be integrated in the measurement process. People, Process and Technology are the factors that carry the gravest weight in the metrics. And most importantly, the metrics will not measure absolute factors, but the relationship between them. The relationships formed, will be the proposed KPIs for the KM maturity assessment model.

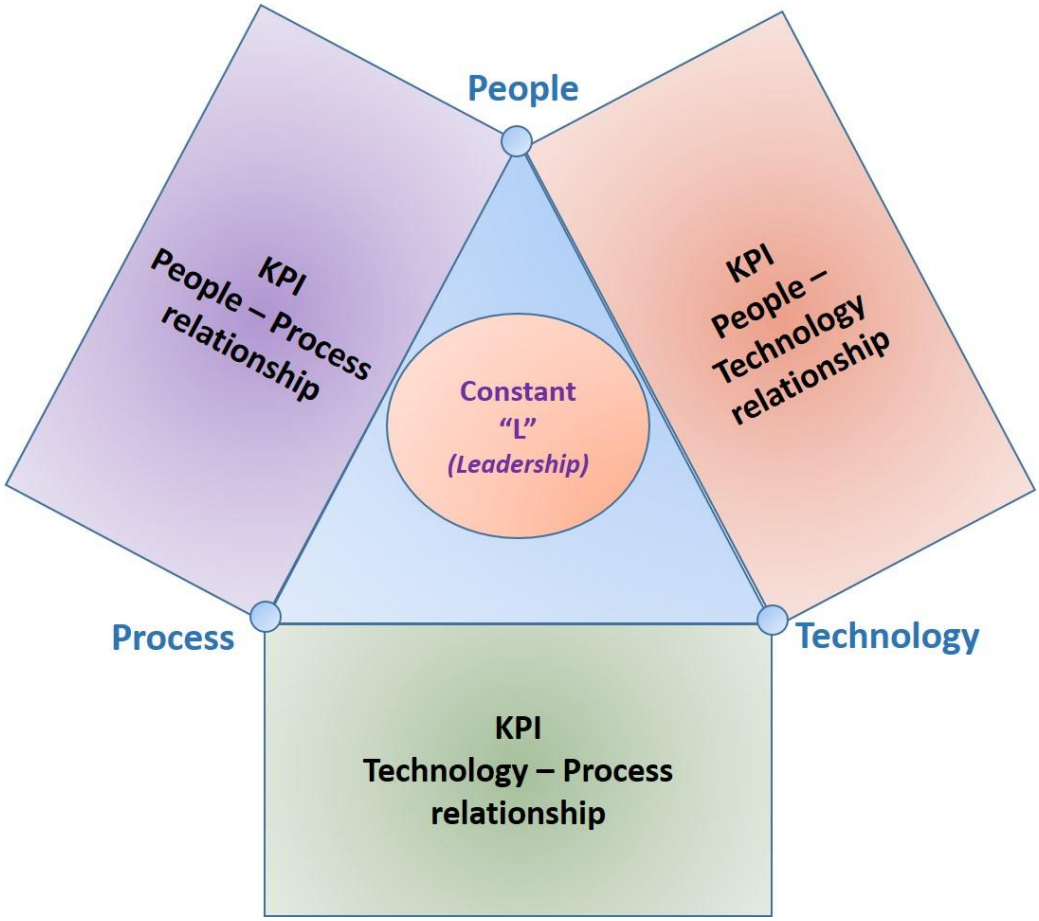

Figure 39. The proposed model's assessment methodology approach.

In that sense, the most weighted 3 relationships, are the:

- People – Process relationship ("PP")
- People – Technology relationship ("PT")
- Technology – Process relationship ("TP")

The relationships of the Constant "Leadership" that need to be established and measured are:

- People – Leadership ("L1")
- Process – Leadership ("L2")
- Technology – Leadership ("L3")

The proposed KPIs to measure the performance of the 3 crucial assessment relationships are formed as follows, attributing a weighing factor of "2" to the Grades regarding People, Process and Technology:

1. KPI (1) = "People – Process" = {2 x (PP)} x CL1, *where*

   CL1 = "People – Leadership" + "Process – Leadership" = L1 + L2
2. KPI (2) = "Technology – Process" = {2 x (TP)} x CL2, *where*

   CL2 = "Technology – Leadership" + "Process – Leadership" = L3 + L2
3. KPI (3) = "People – Technology" = {2 x (PT)} x CL3, *where*

   CL3 = "People – Leadership" + "Technology – Leadership" = L1 + L3

An Index Table for these relationships is provided below:

	People	**Process**	**Technology**	**Leadership**
People	*x*	*PP*	*PT*	*L1*
Process	*PP*	*x*	*TP*	*L2*
Technology	*PT*	*TP*	*x*	*L3*
Leadeship	*L1*	*L2*	*L3*	*x*

Table 5. Index Table for the Crucial KPIs of the proposed KMMM.

These aforementioned weighed relationships of CS factors (People – Process, People – Technology, Technology – Process), the Constant Relationships (People – Leadership, Process – Leadership, Technology – Leadership) form thus, the three most important Key Performance Indicators for the proposed Knowledge Management Maturity Assessment matrix.

The matrix provides the remaining relationships that should be assessed during the Inward phase of the KM maturity assessment. Those relationships examine the integration of the remaining defined CSFs: Strategy, Communication, Customer focus, Change Management, Continuous Improvement and Performance Measurement:

- Strategy – People (“SP”)
- Strategy – Technology (“ST”)
- Communication – People (“CP”)
- Communication – Technology (“CT”)
- Customer Focus – Technology (“CFT”)
- Customer Focus– Process (“CFP”)
- Change Management – Process (“CMPr”)
- Change Management – People (“CMPe”)
- Continuous Improvement – Process (“CIPr”)
- Continuous Improvement – People (“CIPe”)
- Performance Measurement – Process (“PMPr”)
- Performance Measurement – People (“PMpe”)

The relationships of the Constant “Leadership” remain the same, as before:

- People – Leadership (“L1”)
- Process – Leadership (“L2”)
- Technology – Leadership (“L3”)

The proposed KPIs to measure the performance of these 12 secondary assessment relationships are formed as follows, attributing a weighing factor of “1” to the Grades regarding Strategy,

Communication, Customer focus, Change Management, Continuous Improvement and Performance Measurement:

1. KPI (4) = “Strategy - People” = (SP) x (L1)
2. KPI (5) = “Strategy - Technology” = (ST) x (L3)
3. KPI (6) = “Communication - People” = (CP) x (L1)
4. KPI (7) = “Communication - Technology” = (CT) x (L3)
5. KPI (8) = “Customer Focus - Technology” = (CFT) x (L3)
6. KPI (9) = “Customer Focus - Process” = (CFP) x (L2)
7. KPI (10) = “Change Management - Process” = (CMPr) x (L2)
8. KPI (11) = “Change Management - People” = (CMPe) x (L1)
9. KPI (12) = “Continuous Improvement - Process” = (CIPr) x (L2)
10. KPI (13) = “Continuous Improvement - People” = (CIPe) x (L1)
11. KPI (14) = “Performance Measurement - Process” = (PMPr) x (L2)
12. KPI (15) = “Performance Measurement - People” = (PMPe) x (L1)

An Index Table for these KPIs and their relationship to the crucial KPIs and Constants is provided below:

	People - Process "PP"	**People - Technology "PT"**	**Technology - Process "TP"**	**Leadership**	**KPI**
Strategy		SP, ST		L1, L3	*KPI (4), KPI (5)*
Communication		CP, CT		L1, L3	*KPI (6), KPI (7)*
Customer Focus			CFT, CFP	L2, L3	*KPI (8), KPI (9)*
Change Management	CMPr, CMPe			L1, L2	*KPI (10), KPI (11)*
Continuous Improvement	CIPr, CIPe			L1, L2	*KPI (12), KPI (13)*
Performance Measurement	PMPr, PMPe			L1, L2	*KPI (14), KPI (15)*

Table 6. Index Table for the secondary KPIs of the proposed KMMM.

The metrics spreadsheet for the early implementation stages of the proposed KM implementation and maturity assessment framework is presented below:

Aspect	Area	Metrics Indicator	Toolkit
People - Process "PP"	*Awareness*	1. Number of customized user profiles created 2. To what degree the management's goals have been made public	Internal audit
	Participation	1. Hours spent on KM meetings and events 2. Number of employees that participate within a year in KM approaches and activities	Log-in data Internal audit
	Sharing	1. Number of processes shared 2. To what degree employees feel comfortable in sharing their knowledge to help others	Log-in data Internal audit Survey
	Contribution	1. Number of new processes created and documented	Internal audit
	Performance	1. To what degree employees feel that they saved time in everyday routines	Survey
	Satisfaction	1. To what degree are the employees satisfied with new processes	Survey
CL1	*Leadership*	1. Hours of KM meetings and events 2. Number of new performance goals	Internal audit
People - Technology "PT"	*Involvement*	1. Hours spent using knowledge in KMSystems 2. To what degree employees feel that particiopation generates experience and contribution	Log-in data Survey
	Usability	1. Percentage change in time savings attributed to KM 2. To what degree the users consider knowledge in databases useful 3. To what degree the users re-use knowledge	Management data Survey
	Sharing	1. Number of returning users in databases 2. Errors reported by employees or detected during audit	Log-in data Survey Internal audit
	Efficiency	1. Percentage change in cycle time reduction from projects/ processes attributed to KM	Management data
	Training	1. Number of organized KMS workshops 2. Hours spent on KMS testing	Internal audit Log-in data
	Satisfaction	1. To what degree are the employees satisfied with new technologies	Survey
CL3	*Leadership*	1. Funds for KM meetings, trainings, events, and workshops 2. Number of new strategic goals	Management data Internal audit
Technology - Process "TP"	*Knowledge Structure*	1. Number of accesses in defined areas and processes 2. Number of returning users in databases	Log-in data
	Usability	1. To what degree employees experience saved time in finding information in databases	Survey
	Contribution	1. Number of new processes created and documented in KMS 2. Number of solutions created	KMS data
	Quality	1. Number of succes stories 2. Number of lessons learned	Log-in data Internal audit
	Efficiency	1. Average time of resolution	KMS data
	Improvement	1. Number of processes that were declared obsolote or updated	KMS data Internal audit
CL2	*Leadership*	1. Funding of KM applications, platforms and technologies 2. Number of new customer focus goals	Management data Internal audit

Table 7. The metrics spreadsheet for the proposed KMMM.

5. Conclusions

Knowledge is a complex notion and the task of Knowledge Management an even more complex.

The aim of this thesis study was to propose a holistic and integrated Knowledge Management Maturity Model. To reach this primary objective, a methodology comprised of steps, literature milestones and questions was designed.

In Sections 3.2. and 3.3., an extended literature survey on KM and KMMs was presented and analyzed. The literature survey of research in KM assessment frameworks and standards, as presented in the previous sections addressed a series of research questions associated with this study's research objective:

RQ1. What is the relationship between human resources and KM?

RQ2. What is the relationship between strategy and KM?

RQ3. What is the role of leadership in KM?

RQ4. What is the role of performance measurement in KM?

RQ5. What is the relationship between change management – continuous improvement and KM?

RQ6. What is the relationship between process and KM?

RQ7. What is the role of enablers in KM?

RQ8. Which are the required enablers for a successful KM?

The literature survey results and method research conclusions were also presented in Sections 3.2. and 3.3. As a result of this analysis, KM key points and KMMMs CSFs were identified and recorded. Section 3.4 is dedicated to the concept of standardization and its relation to KM, presenting known KM Standards and their core principles. Even though there is a large number of publications on KM, a literature gap was identified in publications regarding the field of KM Standards and corresponding case studies. This gap can be mainly explained by the fact that the ISO 30401:2018 is a recently published Standard which has just ran its 3-year pilot implementation cycle, as typically encountered with newly designed Standards.

Three more questions have arisen:

RQ9. What is the link between KM Standards and KM Maturity models?

RQ10. Can a KM maturity assessment framework be applied for the assessment of ISO 30401 implementation?

RQ11. Can a generic KM maturity assessment matrix be developed for ISO 30401 implementation?

The study's research objective was extended to accommodate and address these questions to: *the proposal of a holistic and integrated Knowledge Management Maturity Assessment framework encompassing the core guidelines of ISO 30401 in order to be used by both researchers and practitioners*.

In order to answer these questions, the GQC holistic QM model was referenced in Section 4.1 to examine the possibilities of its application to implement and assess KM Systems based on the guidelines of ISO 30401:2018. The results of this study were summarized in Section 4.2, concluding with the design of an integrated GQC KM web model encompassing known KM key principles as a proposal for testing in KM implementation and assessment future case studies. The proposal was then further analyzed, enriched with parameters, requirements and KPIs, presenting the approach and the methodology in designing the Knowledge Management Model.

The design for the proposed Model has as its core the concept of Leadership within an organization and as pillars the People, Process and Technology factors, taking thus into account, the Managerial and Organizational aspects, the Human Resources practices and the Technological enablers.

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