Knowledge Management Maturity Model

The Case Study of a Portuguese Technology Enterprise

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Abbreviations and Acronyms

CBPP – Construction Best Practice Program

CKO – Chief Knowledge Officer

COP – Community of Practice

EC – External Context

IC – Internal Context

IT – Information Technology

KM^3 – Knowledge Management Maturity Model

KMCA – Knowledge Management Capability Assessment

KPA – Key Process Area

KPQM – Knowledge Process Quality Model

QM – Quality Management

R&D – Research & Development

SECI – Socialization, Externalization, Combination and Internalization

STEPS – Start-up, Take-off, Expand, Progress and Sustain

ABSTRACT

In today scenario, Knowledge Management plays an important role in the competitiveness and performance of the Organizations in general. Through an efficient KM implementation organizations can tap the real benefits of knowledge generation and usage, which leads to a boost in the innovation processes and subsequently in performance.

A KM Maturity Model can help organizations identify the progress of Knowledge Management and improvements to be made. Then with the current state-of-the-art assessed it becomes almost natural to find the path to the next higher level of KM Maturity.

This research adds to the body of knowledge by its literature review on Knowledge Management and KM Maturity Models. But above all this research contributes with the application of one of those models in a Portuguese IT Organization. The objective is to answer the question: "What is the Knowledge Management Maturity Level of an organization?"

The data for the selected model was collected by an instrument proposed in the chosen model in the form of a survey. Interviews with key players in the Organization were conducted and secondary data was also considered. All this information was treated and a conclusion about the Knowledge Management Maturity Level of the company is given at the end.

Key Words

Knowledge Management; Knowledge Management Maturity Model; IT Consulting; Case Study

RESUMO

No cenário de hoje a Gestão do Conhecimento desempenha um papel importante na competitividade e performance das organizações em geral. Através da aplicação eficiente da Gestão do Conhecimento(GC) as organizações conseguem aproveitar os reais benefícios da geração e utilização do conhecimento, o que leva a um estimuto nos processos de inovação.

Um modelo de maturidade de GC pode auxiliar as organizações a identificarem o andamento da gestão do conhecimento e melhorias a serem realizadas. Depois, com o actual estado-da-arte avaliado torna-se quase natural encontrar o caminho para o próximo nível de maturidade de Gestão do Conhecimento.

Esta investigação contribui para o conjunto de conhecimento pela sua revisão da literatura sobre Gestão do Conhecimento e Modelos de Maturidade de GC. Mas acima de tudo, esta investigação contribui com a aplicação de um desses modelos em uma organização Portuguesa de TI. O objetivo é responder à pergunta: "Qual é o Nível de Maturidade da Gestão do Conhecimento de uma organização?"

Os dados para o modelo seleccionado foram recolhidos por um instrumento proposto no modelo escolhido e sob a forma de um inquérito. Entrevistas com key-players da Organização foram realizadas e dados secundários também foram considerados. Toda esta informação foi tratada e uma conclusão sobre o Nível de Maturidade da Gestão do Conhecimento da empresa é dado no final.

Palavras Chave

Gestão do Conhecimento; Modelos de Maturidade da GC; Consultoria em TI; Caso de Estudo

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1. INTRODUCTION

In the last 30 years of the 20th century we have seen an increasing rhythm of globalization in the world, most driven by the developments in technology, communications and trade liberalization. This rapid globalization led to the increase in the power of multinational corporations, financial markets and non-government organizations. Competition scenarios also changed, organizations now have to worry with competitors from the entire globe.

Nowadays responsiveness to market opportunities and threats is critical and must be fast. Developments in technologies led to the abundance of information. With this overwhelm of information and because corporate attention is scarce, some questions have to be taken into account. What part of all this information is really useful? How do we manage the useful information? How to transform this information in knowledge and in competitive leverage?

From questions like these emerged the concept of Knowledge as a high value resource of an organization. There has been a shift from shareholder to stakeholder economy and there has been an increase in interest by the intangible assets of an organization, one of those assets is knowledge. Managers started to view its companies in a different perspective, instead of considering only the resources of the organization they started to consider knowledge as a powerful weapon for competitiveness. Researchers from different areas have agreed that the focus shifted, knowledge became the main concern of managers and for many industries is even the basis of competition.

But for an enterprise to start using knowledge in an effective way, so that knowledge becomes a value added asset, first it must assess the maturity stage of its Knowledge Management (KM) to know what the path to take and what strategies have to be delineated. In this context, knowledge management maturity models that are capable of doing such an assessment are of the most importance.

In this paper an analysis is done on some of those models. This research also tries to answer the following research question with a case study in a Portuguese technology consulting enterprise:

> *"What is the Knowledge Management Maturity Level of an organization?"*

A theoretical background is studied in the subject of Knowledge Management and Knowledge Management Maturity Models. A comparative study is made between the models. This paper adopts a model proposed by Oliveira et al. (2011). The instrument developed at the time was applied in the referred company and the results are discussed in this research.

This paper is organized in five chapters; the first two chapters are this introduction and the literature review. In the third chapter there is an explanation of the methodology adopted for the development of the research. The fourth chapter develops the case study and a discussion of the

results of this research carried out in the chosen organization. At last there is the conclusions and future research in the chapter five.

2. LITERATURE REVIEW

2.1. KNOWLEDGE

Over the years many authors have tried to define the meaning of knowledge. Alavi and Leidner (2001) say that the interest in knowledge as an organizational resource has been growing. Lee and Kim (2001) even say that knowledge emerged as the primary strategic resource of organizations in the 21st century. By 2010 that interest was still growing and the successful cases have multiplied. Khatibian et al. (2010) say that Knowledge Management has become one of the most searched capabilities by organizations in general. In fact:

> *"Documented cases of organizations that have achieved success through KM have served not only as a demonstration of the potential of KM but have also urged more bystanders to leap on the KM bandwagon" (Khatibian et al., 2010, p.54)*

This interest has led to multiple definitions. Because the objective of this research is not to study knowledge by itself or to make an exhaustive list of these definitions, next there is the definition found in the studied literature that in our understanding best describes knowledge for the context of this paper.

> *"Knowledge has the highest value, the most human contribution, the greatest relevance to decisions and actions, and the greatest dependence on a specific situation or context. It is also the most difficult of content types to manage, because it originates and is applied in the minds of human beings" (Grover and Davenport, 2001, p.6).*

Plato and Aristotle dedicated attention do define the nature of Knowledge and to distinguish knowledge from belief (Coakes, 2004). A large majority of the literature considers the division of knowledge in two natures: Explicit Knowledge and Tacit Knowledge (Alavi and Leidner, 2001; Coakes, 2004; Grover and Davenport, 2001; Nonaka and Takeuchi, 2008).

Nonaka and Takeuchi (2008) believe that knowledge is not explicit, but it is not tacit as well, it is an aggregation of the two. For these authors knowledge is paradoxical because it is composed by these two opposed concepts. Next there are some characteristics of the two types of knowledge that all these authors mentioned.

Explicit Knowledge characteristics:

- Explicit knowledge may be expressed in words, numbers or sounds and can be shared (Nonaka and Takeuchi, 2008)

- Explicit knowledge tends to be considered as anything that can be documented, archived or codified. It can be contained within artefacts such as paper or technology, (Coakes, 2004).

Tacit Knowledge characteristics:

- Tacit knowledge is highly personal and difficult to formalize (Nonaka and Takeuchi, 2008).
- Tacit knowledge is grounded by actions, experiences, ideals, values or emotions of individuals (Nonaka and Takeuchi, 2008).
- Tacit knowledge is more difficult to qualify. Tacit knowledge is retained by people in their head, it is the product of their minds experiences and learning (Coakes, 2004).
- Tacit knowledge is developed through our multiple intelligences: logical, linguistic, interpersonal, intrapersonal, musical, spatial, or kinaesthetic (Coakes, 2004).
- Mostly it is shared through story-telling and in conversations (Coakes, 2004).
- Other way to share it is by learning by experience (Coakes, 2004).
- Information possessed in the mind of individuals: it is personalized information (Alavi and Leidner, 2001).

Coakes (2004) also gives another terminology for these two kinds of knowledge, but their meaning is similar. These kinds of knowledge are fluid and sticky. Fluid is the kind of knowledge that is easily transferred throughout the organization and can be also easily replaced. As for the sticky knowledge, this kind is inseparable from the individual and the work carried out. This second kind of knowledge is also influenced by the individual experiences and inner context of whom possesses it. This leads to other affirmation put forward by Coakes (2004, p.408) when he says: "one can manage the human being but not the knowledge that they contain."

For Grover and Davenport (2001), information by itself it is not a competitive advantage in part because the supporting architecture of this information is becoming more open and omnipresent. In the other hand, knowledge is difficult to grasp because is a recursive, expanding and often discontinuous process. These authors even give an example of this:

> "The invention of the laser, arguably one of the most versatile technologies of the twentieth century was initially not even patented by Bell Labs on the grounds that such an innovation had no possible relevance to the telecommunications industry. No one had considered the possibility of fibre optics!" (Grover and Davenport, 2001, p.8)
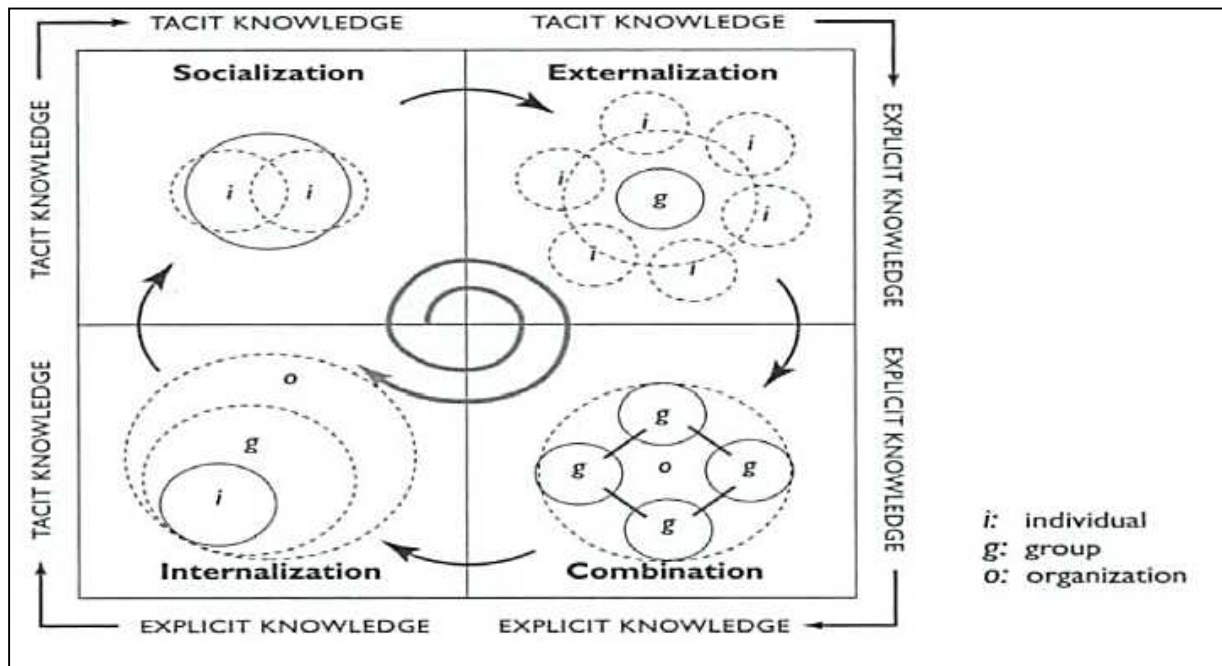
Figure 1 – SECI Model (Source: Nonaka and Takeuchi (2008, p.96) – adapted)

As figure 1 show: socialization occurs from (i)ndividual to (i)ndividual; externalization – from (i)ndividual to (g)roup; Combination – from (g)roup to (o)rganization; and internalization – from (o)rganization to (i)ndividual. We will discuss the applications of these conversion processes in the chapter "Knowledge Management Applications".

For Nonaka and Takeuchi (2008), an organization generates and uses knowledge by converting tacit knowledge in to explicit and vice-versa. They identified four processes through knowledge is converted (1) socialization – tacit to tacit; (2) externalization – tacit to explicit; (3) combination – explicit to explicit; and (4) internalization – explicit to tacit. This spiral process is known in the literature by SECI (Socialization, Externalization, Combination and Internalization) model. The knowledge creation starts by socialization, passes through these four processes and it increases in each conversion process. Some examples of applications that explore each of these four processes will be seen later on chapter "Knowledge Management Applications". The previous figure summarizes this knowledge spiral and conversion processes.

According to Coakes (2004), knowledge is socially constructed and it is not a universal truth or static, it needs to be reviewed and renewed constantly. Therefore if knowledge is constructed socially then this implies that also is discovered in a social context. When we accumulate knowledge there is a conscious choice, or discard, of the knowledge of others. All this process of knowledge construction and utilization must be managed.

2.2. KNOWLEDGE MANAGEMENT

Knowledge Management could be defined as the processes that support business, such as the administration of utilization/distribution of knowledge, and the processes that support the organizational knowledge such as the administration of the new knowledge storage (Paulzen et al., 2002). Some authors refer to this organizational knowledge as the organizational memory.

For Oliveira et al. (2010) Knowledge Management is the processes that have the objective of generate, store, disseminate and use knowledge by the integration of people, processes and technologies, aligned with the business objectives, and considering internal and external knowledge sources. Implementing KM mean important changes in the process, substructure and culture of the organization (Khatibian et al., 2010).

The biggest difficulty for organizations to adopt knowledge management, according to Robinson et al. (2006), is that knowledge management is often ad-hoc and it does not exist a roadmap for its implementation.

Coakes (2004) defends that the adoption of KM should begin with the establishment of the "whom", "what" and "why". The "how" is then supported posteriorly by technology. He continues by saying that one of the most common obstacle for the success of Knowledge Management Programs is the employees buy in. Also according to Coakes (2004), the national culture must be taken in consideration too, because what works in a western culture might not work in an organization in the Far East.

Grover and Davenport (2001) specify that in western organizations the knowledge management efforts involve the implementation of some sort of repository. For these authors knowledge process can be divided in sub processes. They are: (1) knowledge generation – the acquisition and development of knowledge; (2) knowledge codification – conversion of knowledge in accessible formats; (3) knowledge transfer. They also give another perspective on knowledge management, the vision of knowledge management as markets where the workers that generate and possess knowledge are the sellers and who needs the knowledge are the buyers. In this case the process of knowledge management consists of managing the market efficiency. In either cases Grover and Davenport (2001) say that knowledge management requires efforts in many fronts and offers fertile ground for research.

According to Alavi and Leidner (2001), the problems locating and applying knowledge have led to systematic attempts to manage knowledge. These authors also cite Krogh when he says that knowledge management has the objective to leverage the collective knowledge of the organization, hence increasing its competitiveness.

2.2.1. Knowledge Management Applications

In light of the Nonaka and Takeuchi (2008) definition for the knowledge spiral, in this section the applications are grouped according with the conversion processes existing in the SECI model.

Oliveira et al. (2010) enumerate several examples of initiatives for each conversion process identified in SECI model. For socialization they identified: lessons learned reunions, adoption of support technologies, interaction among individuals, directories to identify specialists, reunions with clients and partners and communities of practice. For externalization: documentation of lessons learned, mapping knowledge, knowledge storage and storytelling. In the case of combination: resolution of conflicting knowledge, lessons learned from different groups, adoption of support technology and knowledge storage. Finally in internalization processes: recovery and use of knowledge and training.

Other examples:

- Socialization (tacit to tacit) – occurs from individual to individual: Communities of Practice (COP) (Coakes, 2004), creation of knowledge networks (Alavi and Leidner, 2001), "For instance, at 3M, employees can set aside 15% of their work time to pursue personal research interests" (Alavi and Leidner, 2001)
- Externalization (tacit to explicit) – from individual to group: storytelling (Oliveira et al., 2010)
- Combination (explicit to explicit) – from group to organization: corporate knowledge directories (yellow pages) (Alavi and Leidner, 2001) ,
- Internalization (explicit to tacit) – from organization to individual: the coding and sharing of best practices (Alavi and Leidner, 2001),

A Community of practice is supported by the need to share problems, experiences, insights, templates, tools and best practices (Coakes, 2004). The knowledge flows best in a network of people that might not be close, but share the same interest (Grover and Davenport, 2001). COPs best practices may be shared with other groups by means of group memory, the knowledge is transferred from group memory to group memory (Alavi and Leidner, 2001).

A concrete example of knowledge management activity is what it has been made in the construction sector of United Kingdom, with the Construction Best Practice Program (CBPP) and the movement for innovation (Robinson et al., 2006).

2.2.2. Knowledge Management Benefits and Disadvantages

Knowledge Management is no longer an obligation, organizations and managers are aware of its benefits (North and Hornung, 2003). Benefits of knowledge management are perceived in five perspectives: Business Process, Employee Satisfaction, Customer Satisfaction, Financial Results and Learn & Growth (North and Hornung, 2003).

Benefits in the business processes can be perceived in acceleration of processes, better transparency of knowledge, reduction of errors, avoidance of redundancies, timesaving in doing routine work and better re-use of internal knowledge (North and Hornung, 2003).

In terms of customer satisfaction benefits are perceived in better response time for customer enquiries, improvement in product/service quality, better customer satisfaction and retention (North and Hornung, 2003).

In the perspective of employee satisfaction benefits appear in the form of improved team work, increased motivation, shorter training periods, development of competence, increase in personal market value and in personal knowledge (North and Hornung, 2003).

For Learn and Growth benefits are: improve in Research and Development (R&D), utilization of new technologies, new business fields and new products (North and Hornung, 2003).

Finally in the financial results perspective the benefits listed by North and Hornung (2003) are: higher market shares, increasing sales, better analysis of risk and reduction of administration costs.

For Robinson et al. (2006) knowledge management promotes continuous improvement, facilitates innovation and enhances stakeholder relationship management.

2.2.3. Errors and success factors in Knowledge Management adoption

Fahey and Prusak (1998) made an enumeration of the eleven most common mistakes when adopting a Knowledge Management Program in an organization:

Error 1 – Not Developing a Working Definition of Knowledge. A clear distinction must be made between data, information and knowledge.

Error 2 – Emphasizing knowledge stock instead of knowledge flow. Knowledge is not an object that can be captured, stored and separated from the individuals.

Error 3 – "Viewing Knowledge as Existing Predominantly Outside the Heads of Individuals" (p. 267).

Error 4 – Not understanding that when knowledge is managed, a company is creating a shared context of its internal and external worlds. This context will probably change over time.

Error 5 – Paying little attention to the importance of tacit knowledge, because explicit knowledge is easier to manage.

Error 6 – Disconnect knowledge from its uses. "Knowledge is inseparable from thinking and acting" (p. 269).

Error 7 – Underestimate thinking and reasoning.

Error 8 – "Focusing on the Past and the Present and Not the Future" (p. 271). Knowledge must be used in decision making, so its aim should be the future.

Error 9 – Not giving enough importance to experimentation. Many companies are not pruned to take the risk of doing things on a trial-and-error basis.

Error 10 – "Substituting Technological Contact for Human Interface" (p. 273). "…technological contact is equated with face-to-face dialogue…" (p. 273).

Error 11 – Developing direct measures of Knowledge. Knowledge should not be measured strictly by direct measures, the outcomes and consequences should be considered too.

In contrast, Davenport et al. (1998) identified eight characteristics in knowledge management projects that lead to their success:

- "Link to economic performance or industry value" – the success of a knowledge management project is tied to the economic performance of the company; it can be measured indirectly by money saved or earned.
- "Technical and Organizational Infrastructure" – projects of this nature are more likely to succeed if they use the infrastructure of the organization.
- "Standard, Flexible Knowledge Structure" – Knowledge structures have to be flexible to accommodate every pieces of knowledge.
- "Knowledge-Friendly Culture" – Is one of the most important factors yet one of the most difficult to achieve. People are oriented to knowledge, are not afraid to share knowledge and the knowledge project fits with the existing culture.
- "Clear Purpose and Language" – The terminology associated with knowledge management projects has to be clear. Terms like "Knowledge" or "information" can be interpreted in different ways.
- "Change in Motivational Practices" – As knowledge is bounded to the people, the motivation for the employees to create, share and use knowledge is an important success factor.
- "Multiple Channels for Knowledge Transfer" – Knowledge must be transferred through various channels because they complement each other.
- "Senior Management Support" – senior management should: send messages to the company that knowledge management is crucial, provide funds to the projects and clarify what type of knowledge is more important to the organization.

If top management is trying to establish successful KM programs they must support knowledge acquisition, conversion, application and protection (Lin, 2007). Knowledge acquisition is important to help solve problems more efficiently and promote innovation. Knowledge conversion helps with the catalogue of knowledge and this way provides a quicker access to solutions, this catalogue is also known as the organizational memory (Lin, 2007). Finally

knowledge protection is important because if the organizations are not protective with knowledge than their competitive advantage will decrease and eventually disappear (Lin, 2007).

2.3. KNOWLEDGE MANAGEMENT MODELS

According to Kruger and Snyman (2009), the gap that exists between the theoretical world and the practicality of everyday life of an organization is making managers lose their faith in the strategic benefits of Knowledge Management. Oliveira et al. (2010) studied 14 Frameworks of Knowledge Management and concluded that they do not address in depth the conversion between tacit and explicit knowledge and how to accomplish this in practical terms. To shorten the gap between these two worlds several model where created to assess the maturity level of Knowledge Management in the organizations.

> *"One maturity model is made up of some maturation levels that can be obtained step by step by an organization over a period of time"* (Khatibian et al., 2010, p.55).

Oliveira et al. (2011) propose the Knowledge Management Maturity Model (KM^3) based on the understanding that knowledge management occurs in stages and is based on the lifecycle theory principles. It presents enough detail on how to apply it and considers the internal as well as the external context of the organization. In the literature there is a lack of models that are complete, whether in the technical aspects of its implementation or in the theory behind it.

The KM^3 model considers the following stages (Oliveira et al., 2011):

- Stage 0 (Unawareness) – in this stage the organization does not recognizes the value of KM in the performance of the organization. There are no objectives for KM in this stage because its value has not been recognized.
- Stage 1 (Planning) – KM initiatives have not started yet, but are being planned in the enterprise. The objective for this stage is to recognize the value of KM and prepare the organization for its implementation.
- Stage 2 (Initiation) – Internally the KM initiatives begin in this stage, but will have to be tweaked. The objective is to start these initiatives.
- Stage 3 (Evaluation) – Initiatives started in stage 2 are now improved and evaluated with indicators. The objective for this stage is to improve KM internally.
- Stage 4 (Integration) – KM initiatives are developed internally as well as externally to the company. In this case the objective is to generate a knowledge network internally and externally.

In each stage a group of factors are studied and as the stage increases the factors are cumulative with those of the previous stage. This way an enterprise is only in one maturity stage when met all of the previous stage requirements. These factors (Table 1) are classified in four dimensions (Internal Context, Content, Process and External Context).

Table 1 – Factors considered in KM[3] and the corresponding dimension

Factors	Dimension
Top Management support	Internal Context
Organizational culture	
Organizational structure	
Critical Knowledge	Content
Alignment with the business objectives	
Benefits	
Objectives	
Tacit Knowledge	
Explicit Knowledge	
Budget	Process
Communication	
Knowledge Generation phase	
Knowledge Storage phase	
Knowledge Dissemination phase	
Technology	
Time	
Training	
Reward System	
Recruitment	
Suppliers	External Context
Competitors	
Clients	
Partners	
Legislation	

Developed by the outhor based on (Oliveira et al., 2011)

The construction of the model proposed in Oliveira et al. (2011) is also based on a set of other knowledge management models that we discuss next.

Kruger and Snyman (2009) proposed a model for evaluate the current level of knowledge management maturity in the organizations. This model gives the managers a useful tool to assess this level. This tool is a questionnaire of six sections and 101 questions that allows the managers to do this assessment in an empirical way. This model is composed by seven levels. In the first level before any KM activity initiates, Knowledge Management is supported by Information and Communications Technology. The second level the organization realizes the importance of Knowledge Management. The third level requires a conscious embrace of KM endeavours specially from managers (Kruger and Snyman, 2009). In the level four the organization is able to assimilate and disseminate knowledge through the organization. In level five the organization goes beyond and has Knowledge Management processes and procedures streamlined. The sixth level is dominated by the ability of the organization to share knowledge with all stakeholders and take KM to all the value chain. The last level must be a perspective of the future of KM in the organization.

North and Hornung (2003) distinguish four stages of knowledge management maturity: (1) IT-centred approach, (2) KM solutions applied to specific problem areas, (3) professional knowledge management and (4) integrated knowledge based management. In a first stage managers invest in tools to transfer information. Then solutions to problematic areas inside the organizations are implemented. In the next stage IT infrastructure is developed in order to secure flow of information and to keep knowledge inside the company. By the last phase knowledge management is integrated in all processes of the company. Finally North and Hornung (2003) comments that in order to successfully adopt knowledge management it is necessary to continuously measure the effect of KM initiatives.

For Ehms and Langen (2002) the first thing that need to be done before embrace new KM initiatives is to assess the initial maturity of Knowledge Management, but metrics only based on scorecards indicators only measure some aspects and could be manipulated. These metrics also lead to a controlling effect that can be counterproductive (Ehms and Langen, 2002). The model proposed by Ehms and Langen (2002) is composed of 5 levels: (1) initial – processes are not controlled consciously; (2) repeatable – recognition of KM importance and pilot projects begin; (3) defined – there is stable and practiced activities of KM; (4) managed – common strategy and standard approach to KM; (5) optimizing – the company can adapt easily to new requirements of KM. In this same model factors were studied in 8 key areas. They are: strategy, knowledge goals; environment, partnerships; people, competencies; collaboration, culture; leadership, support; knowledge structures, knowledge forms; technology, infrastructure; and processes, roles, organization.

As for Lee and Kim (2001), they present a model also based on stages, in this case 4 stages: initiation, propagation, integration and networking. The model is based in the life cycle theory and teleology. In the initiation stage organizations are still recognizing KM value and prepares for the first KM initiatives (Lee and Kim, 2001). The propagation stage is when everything really begins, organization is ready for the efforts (it prepared itself in the previous stage) hence the KM initiatives begin and the infrastructures are prepared (Lee and Kim, 2001). In the integration phase, KM activities are institutionalized, the familiarity of such activities in the organization leads to the highest level of knowledge accumulation (Lee and Kim, 2001). The last level of maturity, the networking stage, is when the company shares the knowledge with external entities in its value chain, entities like: suppliers, customers, research firms and universities. The knowledge Management objective is to take knowledge to and from the outside of the company. Each of these stages can be identified by its objectives and management activities (Lee and Kim, 2001).

Kulkarni and Freeze (2004) defined a model named Knowledge Management Capability Assessment (KMCA). This model has knowledge capability areas and metrics to measure

da capability of each area. The areas that were defined are expertise, lessons learned, knowledge documents and data. In this model the higher levels are more difficult to achieve and are built on top of the lower levels, which means that the factors studied in the higher levels are cumulative (Kulkarni and Freeze, 2004).
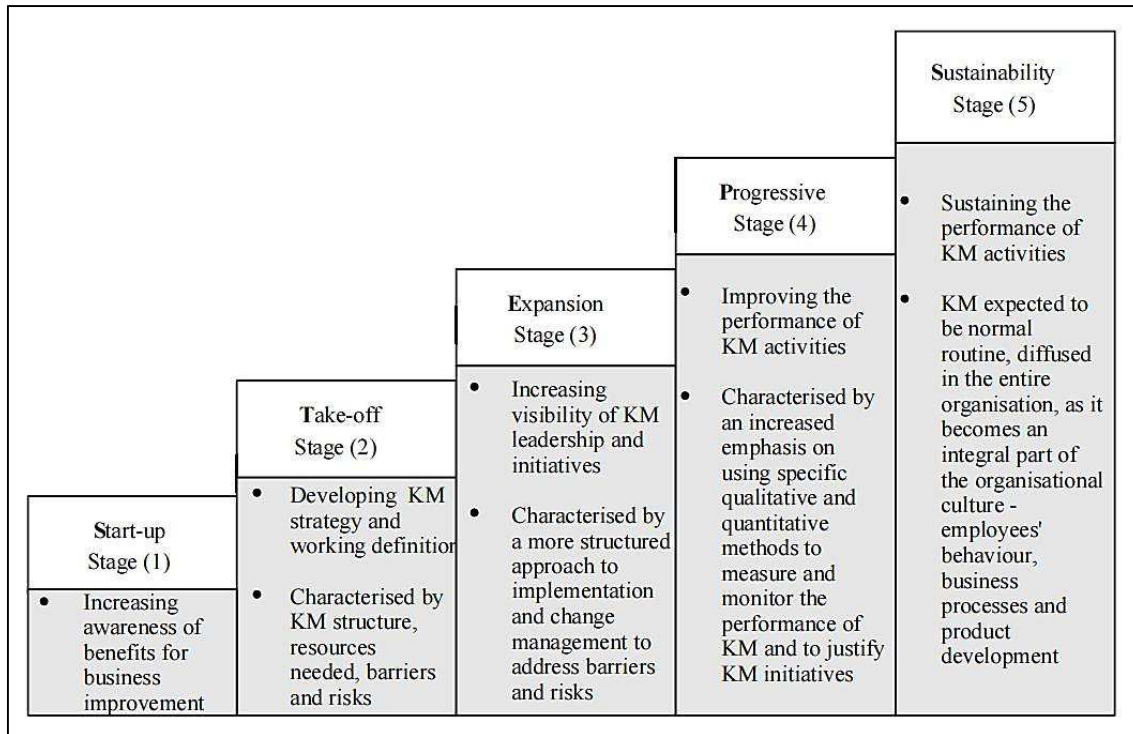
Figure 2 – STEPS model (Source: (Robinson et al., 2006, p. 803))

As shown in Figure 2, Robinson et al. (2006) use a different perspective and relates knowledge management with sustainability. The model presented is named STEPS (Start-up, Take-off, Expand, Progress and Sustain). Robinson et al. (2006) is part of a research about the relationship between KM and business performance in the construction sector. The final goal is to reach sustainability through KM. an interesting finding of this paper is that large international companies have a greater need to implement KM systems because the knowledge is more diverse and is scattered through different geographies. In figure 2 there is an explanation of each stage of this model.

Khatibian et al. (2010) propose a model of 5 levels of maturity that are: (1) initial – implementation is irregular and undefined; (2) managed – some units are test subjects of KM implementation and primary structures are implemented to support KM; (3) defined – the process is described and understood and the focus is in strategy and human resources; (4) quantitatively managed – organization must begin to measure KM objectives, coordination and

cooperation among teams/groups; (5) optimizing – organization uses its knowledge to improve its processes continuously.

Knowledge Management initiatives, as well as their maturity evolve during time. At a first stage, KM initiatives of a company lack in infrastructure and experience. In time the organization become ready and plan for KM, then the organization realizes that the infrastructure can increase effectiveness of the KM effort. Finally the KM processes are integrated in its daily activities and the information external to the company is considered (Lin, 2007). These three stages of evolution were considered by Lin (2007) in its model. The stages are: initiation, development and mature. In the initiation stage firms have to consider questions like "Why implement KM?", "How to evaluate KM usefulness" and specify shared visions and goals for KM. In the development stage firms start to invest in the support infrastructure for KM. these infrastructures includes knowledge strategy, organizational culture and structure and human resource policies. Top management become more involved in KM activities and the role of Chief Knowledge Officer (CKO) might be created. Finally in the mature stage the organization channels its KM capabilities not only inside the company but to create synergies with the outside environment (Clients, suppliers, partners), consequently making its competitiveness depend with the relationship with other firms.

The model proposed by Teah et al. (2006) is composed of three components: levels of maturity, key process areas (KPA) and common characteristics. This model defines five levels of maturity: initial, aware, defined, managed and optimizing. Interesting in that research is that the authors state that a company can apply processes from higher levels of KM maturity but this can be counter-productive because much like the other models, the bottom levels serve as the foundation for the upper levels. In the initial stage the employees of the organization are not aware of the need to manage knowledge, there is no formal process to manage knowledge and there is no infrastructure. In the aware stage the company starts to become aware to the need of KM and has intention to manage it. KM projects are initiated, but not necessarily by top management. The defined stage is characterized by the basic infrastructure and strategy. Training and roles associated with KM are created, some enterprise-level projects are created and metrics for measure increase in productivity are developed. In the managed stage, KM is even more embraced by the organization. KM is incorporated in the enterprise strategy, KM processes are standard and measured quantitatively and there is a seamless integration between technology and content infrastructures. The last stage is the final objective, as its name indicates; in this stage everything is optimized and almost automatic. KM is automatically a part of the processes of the enterprise, there is a culture of sharing, KM

processes and its infrastructure are constantly revised and changed to improve the productivity.

Paulzen et al. (2002) proposed a model that was in part inspired by quality management (QM) concepts. According to them "Adopting the established QM concepts for the relatively new theory of KM could therefore give valuable insights for further developments" (Paulzen et al., 2002, p.4). This model, adopts very similar stages like the model proposed by Teah et al. (2006).

Table 2 – Knowledge Process Quality Model (KPQM)

Maturity stage	Description
1 – Initial	The quality of knowledge processes is not planned and changes randomly. This state can be best described as one of chaotic processes.
2 – Aware	Awareness for knowledge processes has been gained. First structures are implemented to ensure a higher process quality.
3 – Established	This stage focuses on the systematic structure and definition of knowledge processes. Processes are tailored to react to special requirements.
4 – Quantitatively Managed	To enhance the systematic process management, measures of performance are used to plan and track processes.
5 – Optimising	The focus of this stage lies on establishing structures for continuous improvement and self-optimisation.

Source: (Paulzen et al., 2002, p. 5)

As seen in Table 1, Oliveira et al. (2011) studied 24 factors of relevance to assess the knowledge Management Maturity level distributed by four dimensions: External Context, Internal Context, Content and Process. Having a closer look at the study made in that article we can present the following table and charts.

Table 3 – Factors covered by KM Maturity Models

Dimension	Factors	Mehta, Oswald and Mehta (2007)	Lee and Kim (2001)	Paulzen and Doumi (2002)	Ehms and Langen (2002)	North and Homung (2003)	Kulkarni and Freeze (2004)	Teah, Pee and Kankanhalli (2006)	Robinson et al. (2006)	Kruger and Snyman (2007)	Lin (2007)	Khatibian, Hasan and Jafari (2010)	Total Factors
External Context	Clients		X	X	X					X	X		13
	Suppliers		X		X					X			
	Partners		X		X					X			
	Competitors		X							X			
	Legislation												
Internal Context	Culture	X			X		X	X	X	X	X	X	15
	Structure		X		X							X	
	Top Management Support				X		X				X	X	
Content	Alignment with Business Objectives	X			X		X	X	X			X	26
	KM Objectives	X	X		X		X		X	X	X	X	
	Benefits							X	X	X	X		
	Tacit Knowledge	X					X			X			
	Explicit Knowledge						X		X	X			
	Critical Knowledge									X		X	
Process	Technology	X		X	X	X	X	X		X	X	X	45
	KM Leader							X	X		X		
	Reward System	X		X			X	X	X		X	X	
	Time												
	Training	X					X	X			X	X	
	Process phases	X		X	X	X	X	X	X	X	X	X	
	Communication		X		X		X		X		X	X	
	Budget		X		X			X	X		X		
Total Factors		8	8	4	12	2	10	9	10	13	12	11	

This Table 3 compares the models considered in Oliveira et al. (2011) regarding the factors covered in each model. These factors correspond to the factors listed by Oliveira et al. (2011). In those models there is a clear preference by factors related to the KM process and only five of

them study the external factors considered by Oliveira et al. (2011). The totals introduced in the table and in the following chart (Figure 3) made clear that the models that are most close of covering the same factors covered by Oliveira et al. (2011) are the ones defined by Kruger and Snyman (2009) followed closely by Ehms and Langen (2002) and Lin (2007). At the other end of the spectrum appears the model proposed by North and Hornung (2003) that is the farthest apart from KM[3] covering only two factors in common. The next figure (Figure 3) has these tendencies in a more graphical manner.
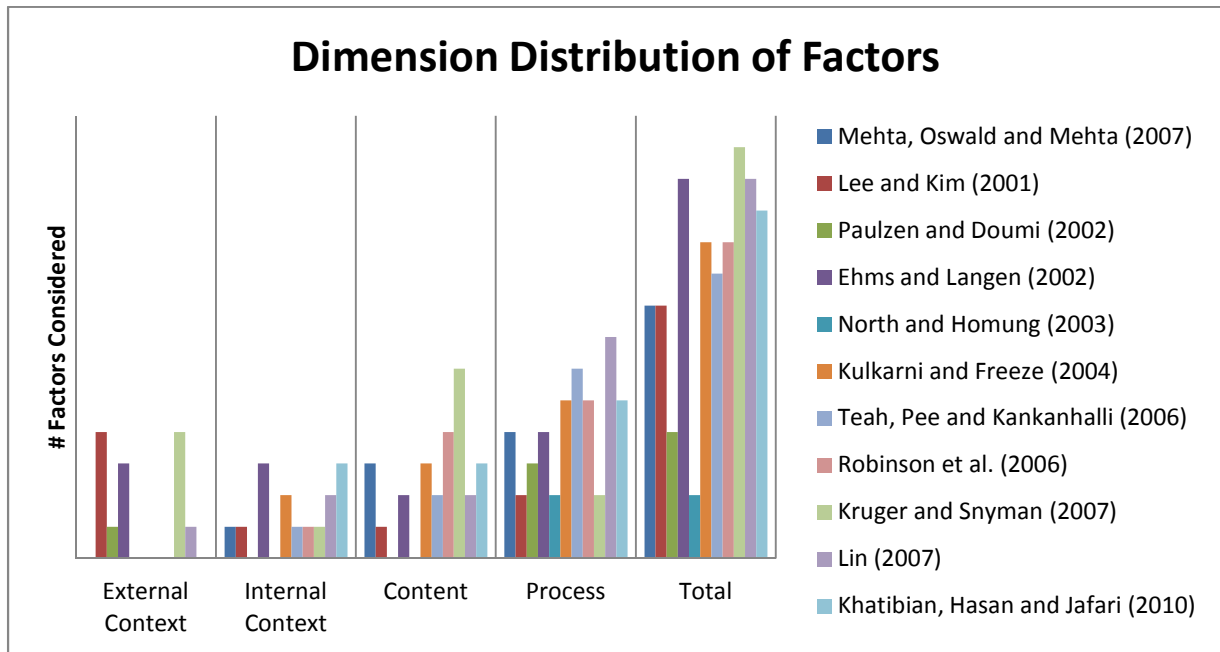
Figure 3 – Distribution of factors by dimensions (Based on: Oliveira et al. (2011))

It is observable that the majority of those models are focused on the process factors; the model from (North and Hornung, 2003) does not consider any factor from other dimensions. Also the legislation and time factors are not considered in any of the models presented. Also in the Figure 3 its visible that despite the fact that the model from Kruger and Snyman (2009) is the one that covers more factors covered by Oliveira et al. (2011) it is also the model that gives less importance to the process factors and the one that gives more importance to the content factors.

> *"The 14 KM frameworks have analysed the guiding principles for implementation. However, they do not address the deep conversion modes. Six of them drives the need to include tacit and explicit, but without describing how." (Oliveira et al., 2010, p.173)*

Exists a variety of models for assessing KM maturity, however, in order for them to reflect reality they must not be used as a tool for management to punish and penalize under-performing units (Teah et al., 2006).

3. METODOLOGY

This research is qualitative because it does not attempt to measure variables or look to potential relationships between variables. This research consists of applying an instrument associated with the model proposed in Oliveira et al. (2011) in a real world organization in order to determine the maturity level of that organization regarding knowledge management.

Because of the practicality of this research and its application in the real life this study is described in the form of a case study.

> *"A Case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when boundaries between phenomenon and context are not clearly evident. In other words, you would use the case study method because you deliberately wanted to cover contextual conditions" (Yin, 2003, p.13)*

A case study involves collecting data from multiple sources they may be qualitative or quantitative

> *"Case studies need not be limited to a single source of evidence. In fact most of the better case studies rely on a variety of sources" (Yin, 2003, p.93)*

In this research 4 sources of evidence were considered: (1) survey, (2) interviews, (3) secondary data and (4) participant observation. The survey was the instrument proposed in KM^3, the interviews were conducted to key players in the organization, secondary data was needed for the history and description of the studied company and the participant observation with the observation of the routines and everyday processes used in the organization.

The following figure (Figure 4) has the research design adopted for this research.

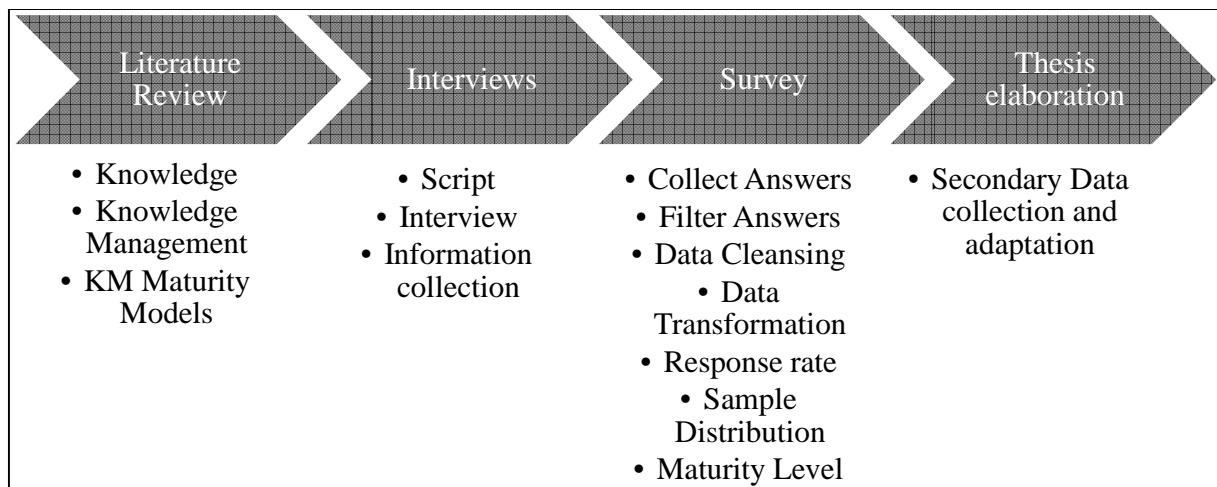| Literature Review	Interviews	Survey	Thesis elaboration
• Knowledge • Knowledge Management • KM Maturity Models	• Script • Interview • Information collection	• Collect Answers • Filter Answers • Data Cleansing • Data Transformation • Response rate • Sample Distribution • Maturity Level	• Secondary Data collection and adaptation

Figure 4 – Research Design (Developed by the author)

First the theoretical base for this study was constructed through a literature review that explored concepts like knowledge, knowledge management and finally knowledge management maturity model. Those models were compared by the factors and dimensions they cover for assessing the KM maturity. The next step was to distribute an electronic survey based on the instrument from the model proposed by Oliveira et al. (2011). The survey was adapted to accommodate the context of the company and the country (Portugal) because it was originally developed in Brazil and for Brazilian companies. The questions in this survey are in the appendix A. The collection of answers was done in 10 days and a reminder was sent 2 days before the deadline. This survey was sent to 545 workers of the studied organization.

Meanwhile, two key employees in the knowledge management initiative of this company were interviewed. These interviews were semi-structured to give the interviewed liberty to wonder through the themes of knowledge management in the studied organization. They were done in the work environment, had the duration of approximately 45 minutes and were conducted in the beginning of June 2012. These interviews had the objective of enrich the case study, more accurately the description of the company and the state-of-the-art in the organization regarding Knowledge Management. The interviewed employees were chosen because they were two of the main facilitators for the KM endeavour in the organization.

Despite having been given some freedom to the interviewees, a script was used to conduct the interviews. These were the considered questions in the interviews:

1. How did this Knowledge Base System appear? How did this need emerge?
2. Do you know if the top management supports KM in Omega?
3. Do you think that Omega has an organizational culture of sharing knowledge?
4. Do you know if Omega implements initiatives to share knowledge with clients, partners, suppliers or even competitors?
5. And what other KM initiatives Omega implements?
6. What is the actual KM Maturity level of Omega to your knowledge?
7. How do you see the future of KM in this company? Or even what is the ideal future of KM in Omega for you?
8. Do you have something to add?

After having all the answers collected for the surveys some filtering was needed. This survey had 24 questions corresponding to the 24 factors studied; witch led to 120 linkert type questions. In the end was added a question about the knowledge management maturity level in general and some demographic questions. A video was produced to clarify some concepts related to knowledge and KM. Only two questions were mandatory: "Company Unit" and "Hierarchy Level". The entire survey from the employees that had not answered the question "Company Unit?" was not considered.

After this initial filtering it was done a data cleansing to the data where some of the demographic answers were cleaned. The surveys with invalid answer to the question "Company Unit" was also filtered out. Because the questions "Company Unit", "Hierarchy Level" and "Years employed" was of free answer, they had to be treated. In the case of the question "Years employed" the answers were also aggregated in time intervals. These time intervals were (expressed in years): [0, 2[; [2, 5[; [5, 10[; [10, ∞[.

Indicial calculations were done with the data already filtered and cleaned. The response rate and the sample distribution were calculated. After this phase the maturity level was calculated based on the average of the answers. Each factor was represented in the survey by 5 affirmations; each question was representative of one KM maturity stage. According to the level of agreement to each affirmation the maturity level is determined. A pivot table was created to determine the maturity level according with the demographic variables, this way it is possible to determine the KM maturity level by Unit, level or seniority. These calculations and results are presented in the results section and in the appendix B.

A report will be developed with the main findings to be presented to the company studied.

4. CASE STUDY & RESULTS

Even though the ideas described earlier without a doubt adds to the body of knowledge, little has been studied about how to put these ideas in to practice. This study adds to the body of knowledge by validating one of the models studied previously in a case study in the real world. This case study has qualitative data with interviews conducted with key players in the Organization Knowledge Management endeavour, and quantitative data carried out with the execution of a survey.

4.1. CASE STUDY

As of this moment and because of confidentiality issues the enterprise studied in this research will be called Omega. The following history and description of the company were collected from the site of the organization.

Omega was born in the 1980s as a software-house. In the 1990s, become one of the first Portuguese companies to be certified by the Portuguese Institute for the Quality, according to standard NP EN ISO 9001. During the second half of the 1990s, Omega positioned as a System Integrator, increasing its offer, building a specialist enterprises network, each of them in a certain system class. Over its history, Omega has become the Portuguese leader in IT. Propelled by growth in Portugal and around the world, the company has been listed on Euronext Lisbon. Omega has operated in 33 countries on 5 continents and now has over 2,000 employees. The company currently has offices in Portugal, Spain, Germany, France, the Middle East and Angola.

Omega has specialized products and services in all major industries: Telecoms & Media, Financial Services, Government & Healthcare, Energy & Utilities, Aerospace & Transportation and Manufacturing & Services sectors.

The financial services and consultancy industries have extremely high need for good information flow, because knowledge is what they sell (North and Hornung, 2003). In the case of Omega, this finding is of most importance because the organization in question works in consulting sector.

Omega has gone through a restructuring process; two years ago even changed its brand and made a facelift to its image. In the last three years a new internal platform was released to the general population of the employees. This platform included solutions for knowledge sharing, knowledge base, collaboration tools, yellow pages, blog, wiki, communities and a sort of an internal social network.

According to an executive of Omega this platform appeared because a manager/unit started to think of such solutions to sell to the clients. This manager realized that there were not much of these solutions in the market, so this became a dry test inside the organization. This was a customization of a known web-development framework and the enterprise got a European Union funding to develop such solution.

In the beginning it took some extra effort to this tool to be accepted but nowadays some employees or even units cannot go without it. Coincidently a group of project managers wanted to create a community of project management and this new platform/ idea was presented to them which accepted and started to advertise the solution inside the company. Later the facilitators and the development team came up with the idea to use also the collaborative and social part of the base framework.

For another senior manager, in the previous knowledge base solution the poor user interface raised a barrier between the users and the system, access was only given to a restricted number of employees. People only produced strictly the mandatory knowledge. These were other reasons that also were pointed for the appearance of the new platform and the failure of the previous one.

Although there is no formal support for knowledge management, a few employees were responsible for boosting this initiative. Because there was an external funding the costs were not a problem.

The executive of believes that this kind of tools is needed in the organizations in general and that the produced knowledge must always have an owner, because the alternative is to have too much information that becomes many times unusable. He also believes that this collaborative way of working increases productivity.

His opinion is that there has to be a systematic process included in the everyday work for produce and consume knowledge and the platform implemented is not that initiative. That platform started as a knowledge base and these tools are good for supporting the real KM process, but there is no KM strategy in place in the organization. This opinion is shared by the senior manager who thinks that the platform is just a knowledge repository, even though this platform tries to include other KM nuances like communities, sharing of experiences or even the social and collaborative tools.

The interviewed shared the opinion that the culture of the organization has to play an important role in the Knowledge Management process. The employees already feel the necessity to search knowledge, but many times there is no culture of knowledge sharing with others and sometimes there is no culture of consuming knowledge too.

When the executive was asked if he thinks that people have fear to share knowledge he said that most of the time what people have is laziness. In these days people should realize that knowledge costs nothing, if someone needs a piece of knowledge they can find it over the internet, social networks and other means. So there is no point in hang on to the knowledge and not share it. People have not realized yet that is by sharing their work and knowledge that they can be recognized in the future.

From the interviews conducted the general idea is that Omega has some KM interaction with partners, competitors or clients but in an ad hoc basis. There is no systematic process to include this outside sources in the KM process.

As Kruger and Snyman (2009) specified in his model, the last stage of KM maturity must consider the future of KM in the organization. With this in mind a question about the future of KM in Omega was posed to the interviewed.

In the future these KM facilitators both think that KM should not be something mandatory, there should not exist a mandatory process controlled by someone. This method will not motivate people to create, share and consume knowledge. Nevertheless this is a system that has a year and half of existence and it should have more time to consolidate. Right now there is an average of 350 to 400 daily accesses to the KM system which is considerable given the total Omega population. Their vision for KM and the role of this system is that in the future there should be a group of base initiatives to develop KM, because those are the initiatives that have more success in attracting collaboration and not the top-down initiatives that are generated in top management. Nevertheless it should be embraced by top management. Also because Omega is a consulting company and is project oriented, a vision of the senior manager is that a sort of specialist should follow the projects processes of knowledge sharing with the entire organization and judge what could be shared and what should not and even instigate the employees associated with the project to search and consume knowledge before going to the actual project development.

At the moment of the elaboration of this study KM initiatives at Omega are still in a phase where the users are being incited to use the system and to share and consume knowledge, it will take some more time for the employees to adapt to this platform. For the senior manager the ideal vision of KM is:

- From the standpoint of skills is to have a repository with the current state of skills in the company, this way it is easy to know the actions and training initiatives you need to do in order to meet the skill requirements;
- From the standpoint of documents, is to have a repository where one can easily find pieces of software and documentation, in this way it is possible to significantly expedite the development time. But this requires a change in the behaviour of employees.

At the present these interviewed KM facilitators think that KM maturity level at Omega is still initial, but in the future they see that this situation could advance to higher levels of KM maturity. When comparing with the industry they think that Omega is in good shape, already have a group of tools to support KM, but still has a KM path to walk through.

4.2. RESULTS

In this section is presented the results of the quantitative part of this study. The following table (Table 4) has the summary of the participation percentage.

Table 4 – Participation percentage

	N	%
Population	545	100,00%
Started the survey	177	32,48%
Finished the survey	104	19,08%

Developed by the author

This survey was obtained from the Knowledge Management Maturity Model proposed in the KM^3 model. Some adaptations were made to transform the survey to the Portuguese context, costumes and culture. This web-based survey was sent to a Universe of 545 employees of all categories and units from Omega enterprise, this way a homogeneous distribution of category and units was achieved. Of those 545 employees, 177 started the survey (32,48% of the population); of which 104 reach the end of the questions (19,08% of the population). This means that 104 employees identified a valid unit and hierarchical level, which represents a 58,76% of those that started the survey. For further detailed analysis of the demographic distribution of the

employees that answered to the survey, next is a table (Table 5) with the demographic distribution of the population.

Table 5 – Demographic distribution

		N	%
Universe		104	100%
Unit Distribution			
Business Intelligence		33	31,73%
Development		27	25,96%
Solutions		14	13,46%
Content & Processes		8	7,69%
Integration		8	7,69%
Customers		6	5,77%
Testing		4	3,85%
Intranets		3	2,88%
Financial Services		1	0,96%
Hierarchy Distribution			
Middle Management	Level 7	1	0,96%
	Level 6	2	1,92%
	Level 5	8	7,69%
Operating Levels	Level 4	33	31,73%
	Level 3	29	27,88%
	Level 2	13	12,50%
	Level 1	17	16,35%
Invalid Answer		1	0,96%
Seniority Distribution			
[10, ∞[		19	18,27%
[5, 10[		20	19,23%
[2, 5[		27	25,96%
[0, 2[		22	21,15%
Invalid Answer		16	15,38%
Education			
Do not have Superior Course		6	5,77%
Degree (pre-bologna)		38	36,54%
Degree (post-bologna)		15	14,42%
Masters (pre-bologna)		2	1,92%
Masters (post-bologna)		31	29,81%
Post-Graduate		7	6,73%
PhD		0	0,00%
Invalid Answer		5	4,81%

Developed by the author

All the real unit names and hierarchy levels in the previous table were changed because of confidentiality reasons. Regarding unit distribution there is more participation in units: Business Intelligence, Development and Solutions summing 71,15% of the valid answers received. This

might be justifiable by the difference in the size of each of the company units, its culture or even its employees. Taking into account what was found with the interviews, some units and employees are more aware of knowledge management issues than others, which leads to little predisposition of some people to answer the conducted survey. In the case of hierarchical levels, there was more participation among the lower hierarchical levels. Beyond the levels described in the Table 5 there are still some hierarchical levels, they correspond to the higher management levels, including top management.

For the seniority (number of years in the company), there was a homogeneous distribution of the answers which were grouped by time intervals that correspond roughly with the major career promotions in this organization. Here there was also a high level of invalid answers due to the fact that this question was not mandatory.

In the education answers it is important to point out that if the degrees "Degree (pre-bologna)" and "Masters (post-bologna)" were joined than they would be responsible for 66,35% of the answers. These two degrees separated could turn out to be interesting in future researches to assess if an employee have a different perception of its company KM maturity level, according to the time spent since that person finished its academic career and begun the professional life.

Aggregating all perceptions of the surveyed subjects we can determine the perception of the company about its knowledge management maturity level. The next figure has these results.

Figure 5 – General organization perception of the KM maturity level (Radar Chart) (Developed by the author)

The previous figure shows the general perception of the studied organization in regard to the KM maturity stage according to the 24 factors identified in the KM^3 model. By this graphic we can conclude that this company is in the first maturity stage: Stage 0 - Unawareness. Because each stage in this model is cumulative, this means that for a company to reach a stage it has to meet all the requirements of the previous stage first. That is why this company is in the first level, the factors Benefits and Time were considered to be in this stage, despite the fact that all other factors are in a higher stage.

It is also of interest the fact that only one factor is considered to be quite advanced, this factor is "Technology". This fact could be justified with what was discussed in the interviews to the key facilitators of the present knowledge base system. This is a system that starts to have a high visibility within the firm and thus the high score regarding technology.
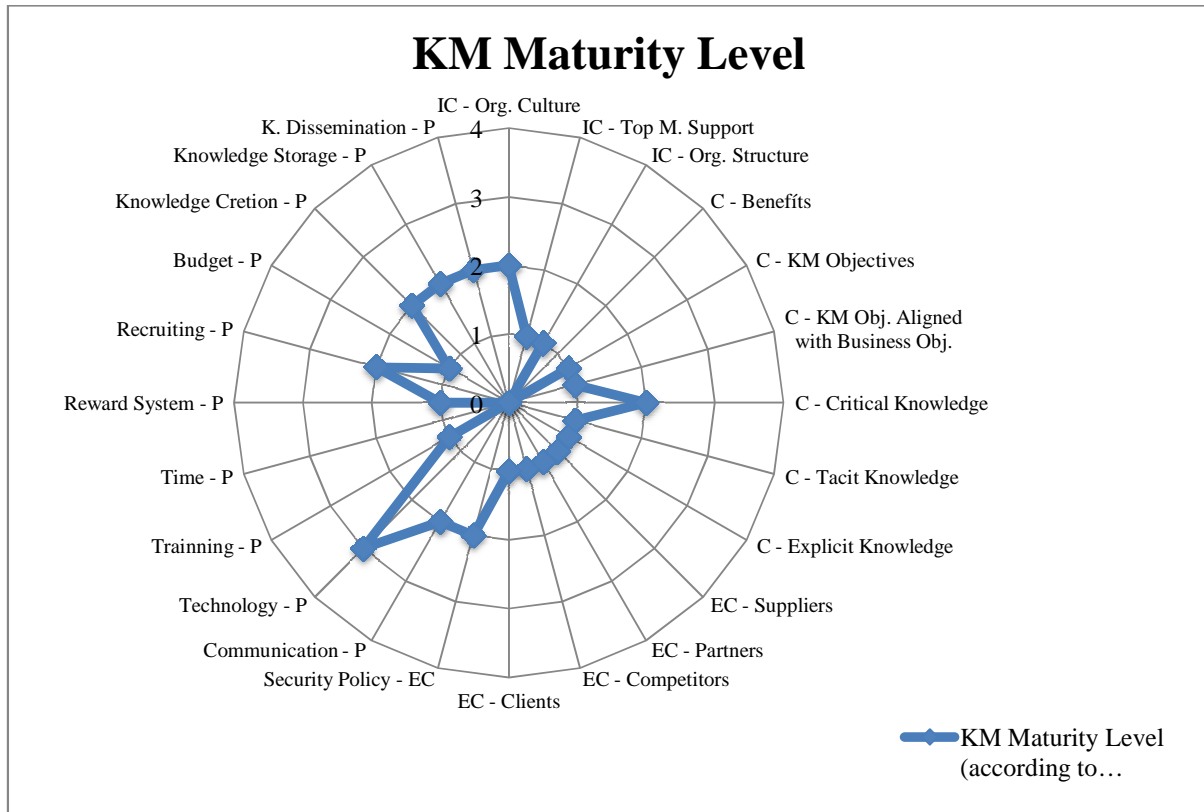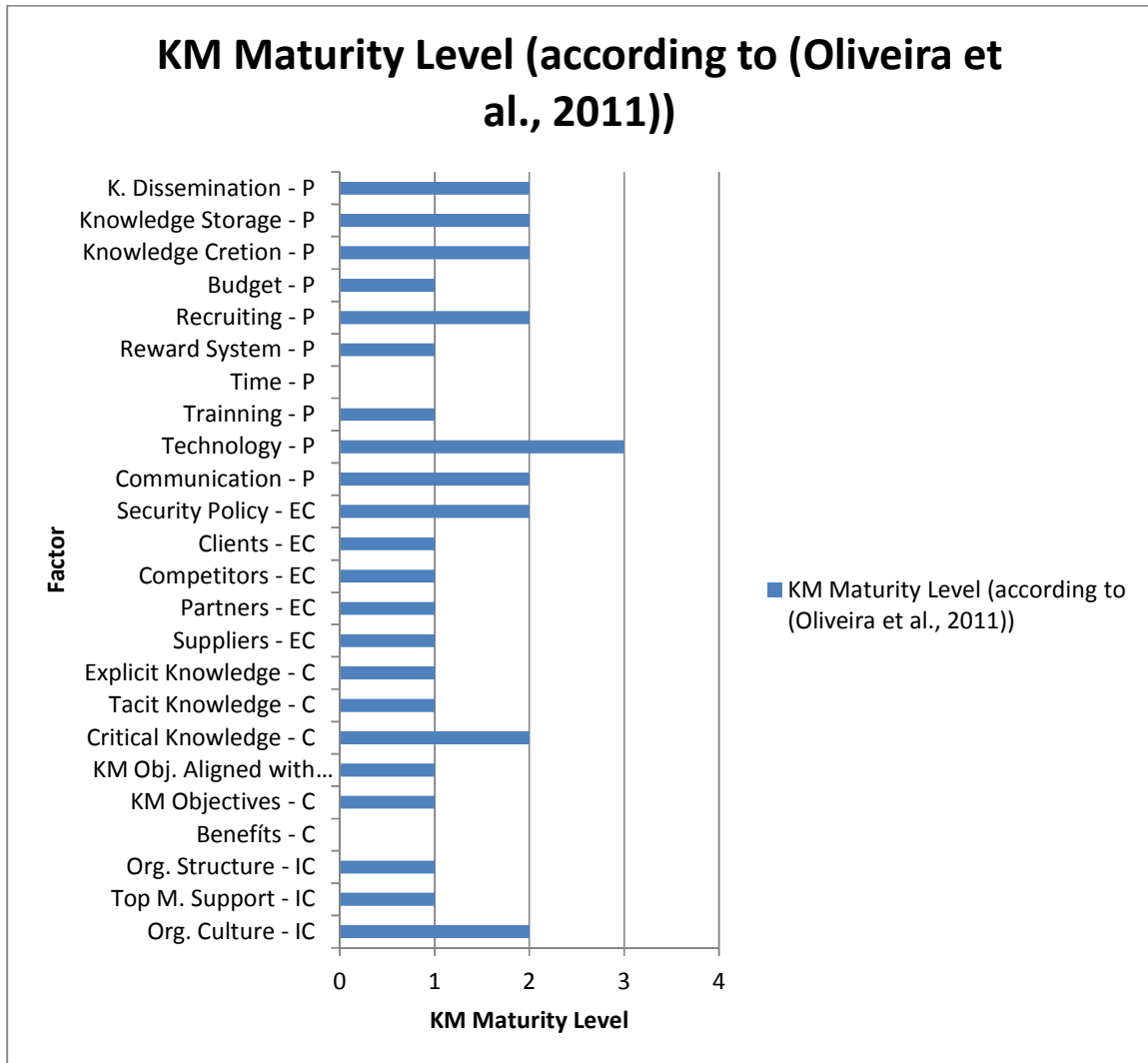
Figure 6 – General organization perception of the KM maturity level (Bar Chart) (Developed by the author)

In figure 6 one can see that the majority of the factors were perceived by the employees in the stage 1 – Planning (13 out of 24 – 54,2%). In second place is level 2 – Initiation (8 out of 24 – 33,3%). Next there are the two factors perceived to be in the stage 0 – Unawareness (2 out of 24 – 8,3%). Finally the stage 3 – Evaluation has one factor Technology (1 out of 24 – 4,2%). No factor was perceived to be in stage 4 – Integration. The results that were the basis for this previous analysis can be found in the appendix B.

More detailed analyses were developed taking into account the demographic variables to see if those variables have any influence in the perception of the KM maturity level. Analyses were made for Hierarchy Levels, Units and Seniority variables. These analyses are in the appendixes C, D and E respectively. Following are the main results about these analyses.

For the factors belonging to Internal Context dimension, the perception about its maturity level is the same between the operating levels and the middle management. In the three units that have more answers also the perception is the same between these units (Business Intelligence, Development, Solutions). In the four seniority interval considered ([0, 2[; [2, 5[; [5, 10[; [10,∞[) the only difference detected was about the top management support factor. The employees in the seniority interval [2, 5[considered this factor in a higher level than the rest of the intervals.

Regarding the factors belonging to External Context dimension, normally the middle management levels have the perception that these factors have a higher maturity level then the perception of the employees in operating levels. This could be justified by the familiarity with the processes related to the external context. At Omega, normally the more senior levels have more contact with suppliers, competitors, partners and customers. Also the Solutions unit systematically answered higher levels in these factors then the other two units. This fact could be explained by the different realities among units.

Looking to factors belonging to Content dimension, there are no significant divergences in the perception of operating levels and middle management about the maturity level. With respect to the other variables the analysis was inconclusive.

Regarding the factors that belong to the Process dimension, between Middle Management and the Operating Levels there are some big differences in perception about Reward System, Training and Time factors. Middle Management consistently has a higher perception of the KM maturity level in these factors. In the other variables the analyses were inconclusive.

5. CONCLUSION

This study contributes to the body of knowledge by testing an instrument to assess the Knowledge Management Maturity Level in an organization. Also contributes by the literature review made on Knowledge Management and KM Maturity Models.

This case study contributes specially to the instrument used, because is an IT company with many units that operates independently and thus its multiple results. It also assesses the validity of the instrument and helps to improve its generality. It is of high importance to the practitioners in the field of Knowledge Management and in particular in the IT industry.

In answer to the research question stated in the introduction chapter, the results of this research show that the chosen company is in the following Stage regarding the KM Maturity.

- Stage 0 (Unawareness) – in this stage the organization does not recognizes the value of KM in the performance of the organization. There are no objectives for KM in this stage because its value has not been recognized.

In this case the value of knowledge is not totally unrecognized and although most of the factors studied are in a higher stage and because the levels are cumulative, this organization is in the Stage 0. An organization can only be considered in one stage if all factors of the lower stages are met and two factors were considered in Stage 0: Benefits and Time.

Analysing this conclusion in light of the factors that contributed to the KM Maturity Stage we can see that the factor Technology has the highest Maturity Stage inside. This fact could be explained by the close relation of this factor to the company core business. After all this is an IT Consulting Enterprise. Other possible explanation was identified in the interviews. A new support system was implemented recently at Omega and this is a system that starts to have great visibility so the employees perceive technology as being in a higher maturity stage.

Looking at the Internal Context dimension, the Organizational Structure factor has a higher maturity level then the other factors of this dimension. Maybe because this organization works in a project oriented basis this sharing of knowledge is something more natural to the employees than the other factors.

The instrument applied at this company had some limitations that were identified in a feedback field included in the survey. The main limitations identified were the length of the survey, and the clarity of the questions. This could be an idea for a future research where the survey could be changed to become more user-friendly.

A report with the main findings of this research will be developed to deliver to the studied organization. After the application of this model to an enterprise, a future research could be done to answer the following question:

What are the steps an organization must take in order to reach the next KM Maturity Level?

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APPENDIX A – SURVEY

The aim of this study is to assess the degree of maturity in relation to Knowledge Management (KM) in your organization. Your cooperation is very important to help determine the level of maturity through the model KM3 - Knowledge Management Maturity Model.

For this research Knowledge Management (KM) means the set of processes, people and technology, aligned with the objectives of the organization, manage the creation, storage and dissemination of knowledge, from the internal and external standpoint to the organization. The organization may apply Knowledge Management without using this nomenclature. For example, communities of practice, coaching, lessons learned meetings or even talks/seminars/presentations are considered as mechanisms for knowledge management.

This survey will be answered by staff from various departments. There is no right or wrong answers. We ask you to respond spontaneously to questions presented below. It will thus help us ensure the quality of data collected. The data provided will not be used in any situation individually. It is the policy of our research group the strict confidentiality of data.

We invite you to watch the video below for clarification of some concepts covered in this survey. At the end you can start the survey by clicking "Next."

Thank you for your cooperation and attention. Thank you!

Internal Context

1 - knowledge Sharing	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CI01 - Knowledge sharing occurs among some employees.					
CI02 - Knowledge sharing occurs informally within teams/projects and internally to the company.					
CI03 - Knowledge sharing occurs formally within the teams/projects and internally to the company.					
CI04 - Knowledge sharing occurs formally between the teams/projects and internally to the company.					
CI05 - Knowledge sharing occurs formally inside and outside the company.					

Developed by the author

2 - Support from top management	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CI06 - The top management does not believe in the value of Knowledge Management.					
CI07 - The top management recognizes the value of knowledge management.					
CI08 - The top management supports the Knowledge Management activities.					
CI09 - The top management supports the Knowledge Management activities and is an example for employees.					
CI10 - The top management associates firm performance with Knowledge Management.					

Developed by the author

3 - Integration mechanisms	Totally disagree	Disagree	Neither disagree	Agree	Totally agree

			or agree		
CI11 - There are no formal integration mechanisms within teams/projects					
CI12 - There are formal integration mechanisms within teams/projects					
CI13 - There are informal integration mechanisms between the teams/projects					
CI14 - There are formal integration mechanisms between the teams/projects					
CI15 - There is integration between all levels of the organization					

Developed by the author

Content

4 - Benefits	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
C01 - The knowledge management benefits (financial and non-financial) are not defined.					
C02 - The knowledge management benefits (financial and non-financial) are defined.					
C03 - The knowledge management benefits (financial and non-financial) are communicated to employees.					
C04 - The knowledge management benefits (financial and non-financial) are evaluated internally.					
C05 - The knowledge management benefits (financial and non-financial) are evaluated internally and externally to the organization.					

Developed by the author

5 - Knowledge Management Objectives	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
C06 - The knowledge management objectives are not defined.					
C07 - The knowledge management objectives are defined.					
C08 - The knowledge management objectives are communicated to employees.					
C09 - The knowledge management objectives are evaluated internally.					
C10 - The knowledge management objectives are evaluated internally and externally to the organization.					

Developed by the author

6 - Knowledge Management Objectives aligned with Objectives of business	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
C11 - The knowledge management objectives are not defined according to business objectives.					
C12 - The Knowledge Management objectives are defined according to business objectives.					
C13 - The knowledge management objectives are communicated to employees associated with business objectives.					
C14 - The association between the knowledge management objectives and business objectives are evaluated internally.					
C15 - The association between the knowledge management objectives and business objectives are evaluated internally and externally to the organization.					

Developed by the author

7 - Critical knowledge (relevant to achieve the business objectives)	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
C16 - The critical knowledge is not defined.					

C17 - The critical knowledge is defined.					
C18 - Knowledge Management is used to support the critical knowledge.					
C19 - The critical knowledge is reviewed internally.					
C20 - The critical knowledge is reviewed internally and externally.					

<div align="right">**Developed by the author**</div>

8 - Tacit knowledge	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
C21 - Tacit knowledge is not considered.					
C22 - Tacit knowledge is informally considered.					
C23 - There is a formal and standard process to address the tacit knowledge.					
C24 - Tacit knowledge is integrated internally.					
C25 - Tacit knowledge is integrated internally and externally.					

<div align="right">**Developed by the author**</div>

9 - Explicit knowledge	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
C26 - Explicit knowledge is not considered.					
C27 - Explicit knowledge is informally considered.					
C28 - There is a formal and standard process to address the explicit knowledge.					
C29 - Explicit knowledge is integrated internally.					
C30 - Explicit knowledge is integrated internally and externally.					

<div align="right">**Developed by the author**</div>

External Context

10 - Suppliers	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CE01 - Information from suppliers are not considered in the Knowledge Management activities.					
CE02 - Information from suppliers are sometimes considered in the Knowledge Management activities.					
CE03 - Information from suppliers are always considered in the Knowledge Management activities.					
CE04 - Suppliers sometimes participate in the Knowledge Management activities.					
CE05 - Suppliers always participate in the Knowledge Management activities.					

<div align="right">**Developed by the author**</div>

11 - Partners	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CE06 - Information from partners are not considered in the Knowledge Management activities.					
CE07 - Information from partners are sometimes considered in the Knowledge Management activities.					
CE08 - Information from partners are always considered in the Knowledge Management activities.					
CE09 - Partners sometimes participate in the Knowledge Management activities.					
EC10 - Partners always participate in the Knowledge Management activities.					

<div align="right">**Developed by the author**</div>

12 - Competitors

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CE11 - Information from competitors are not considered in the Knowledge Management activities.					
CE12 - Information from competitors are sometimes considered in the Knowledge Management activities.					
CE13 - Information from competitors are always considered in the Knowledge Management activities.					
CE14 - Competitors sometimes participate in the Knowledge Management activities.					
CE15 - Competitors always participate in the Knowledge Management activities.					

Developed by the author

13 - Customers

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CE16 - Information from customers are not considered in the Knowledge Management activities.					
CE17 - Information from customers are sometimes considered in the Knowledge Management activities.					
CE18 - Information from customers are always considered in the Knowledge Management activities.					
CE19 - Customers sometimes participate in the Knowledge Management activities.					
CE20 - Customers always participate in the Knowledge Management activities.					

Developed by the author

14 - Organization's security policy

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
CE21 - There is no formal security policy in the company					
CE22 - There is no formal security policy related to Knowledge Management					
CE23 - There is a formal security policy related to Knowledge Management					
CE24 - Knowledge Management is aligned with the company's security policy					
CE25 - Knowledge Management is aligned with the company's security policy and the policy is evaluated periodically					

Developed by the author

Process

15 - Communication

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P01 – There is no communication related to Knowledge Management.					
P02 - Communication is about the relevance of Knowledge Management					
P03 - Communication is about the activities and importance of Knowledge Management					
P04 - Communication about Knowledge Management is incorporated in the routine of employees					
P05 - Communication about Knowledge Management occurs internally and externally					

Developed by the author

16 - Technology

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P06 - The technology to support knowledge management is not known.					
P07 - The technology to support knowledge management is mapped, but there is no standard.					
P08 - The technology to support knowledge management is standardized.					
P09 - The technology to support knowledge management is evaluated in relation to the requirements and integrated internally.					
P10 - The technology to support knowledge management is evaluated in relation to the requirements and integrated internally and externally.					

Developed by the author

17 - Training

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P11 - The training is not related to Knowledge Management.					
P12 - The training is informally related to Knowledge Management.					
P13 - The training is formally related to Knowledge Management and is not evaluated.					
P14 - The training is formally related to Knowledge Management and is evaluated internally.					
P15 - The training is formally related to Knowledge Management and is evaluated internally and externally.					

Developed by the author

18 - Time

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P16 - The time for the Knowledge Management activities is not recognized.					
P17 - The time for the Knowledge Management activities in the internal context is defined informally.					
P18 - The time for the Knowledge Management activities in the internal context is formally defined.					
P19 - The time for the Knowledge Management activities in the internal context is formally defined and evaluated.					
P20 - The time for the Knowledge Management activities in the internal and external context is planned and evaluated.					

Developed by the author

19 - Reward System

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P21 - There is no reward system in the company					
P22 - There is no reward system associated with Knowledge Management					
P23 - The reward system is used to ensure the employee's involvement in the Knowledge Management activities.					
P24 - The reward system associated with the Knowledge Management is regularly evaluated					
P25 - The performance evaluation of staff considers the Knowledge Management activities					

Developed by the author

20 - Recruiting

	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P26 - I do not remember how it was my recruiting process.					
P27 - The recruitment process does not address questions about knowledge sharing capabilities.					
P28 - The recruitment process includes indirect questions about knowledge					

sharing capabilities.					
P29 - The recruitment process includes direct questions about knowledge sharing capabilities.					
P30 - The recruitment process focuses explicitly on questions about knowledge sharing capabilities.					

21 - Budget	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P31 - There is no budget to support Knowledge Management.					
P32 - The budget to support Knowledge Management is planned and approved.					
P33 - The budget to support Knowledge Management is available.					
P34 - The budget to support Knowledge Management is regularly reviewed.					
P35 - The budget to support Knowledge Management is regularly reviewed in accordance with the benefits obtained.					

22 - Creation of knowledge	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P36 - There are no knowledge creation activities.					
P37 - The knowledge creation activities are informal.					
P38 - The knowledge creation activities are formal and standard.					
P39 - The knowledge creation activities are formal, standard, and process and outcome indicators are used.					
P40 - The knowledge creation activities are part of the company's performance management process.					

23 - Storage knowledge	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P41 – There is no knowledge storage activities.					
P42 - The knowledge storage activities are informal.					
P43 - The knowledge storage activities are formal and standard.					
P44 - The knowledge storage activities are formal and standard, and process and outcome indicators are used.					
P45 - The knowledge storage activities are part of the company's performance management process.					

24 - Dissemination of knowledge	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
P46 - There is no knowledge dissemination activities.					
P47 - The knowledge dissemination activities are informal.					
P48 - The knowledge dissemination activities are formal and standard.					
P49 - The knowledge dissemination activities are formal and standard, and process and outcome indicators are used.					
P50 - The knowledge dissemination activities are part of the company's performance management process.					

25 - In relation to Knowledge Management ...	Totally disagree	Disagree	Neither disagree or agree	Agree	Totally agree
Knowledge management is a mature process in the organization.					

Unit: [ ]

Hierarchical level: [ ]

How long with the Omega: [ ]

Academic Background:

	Do not have college degree
	Undergraduate pre-Bologna
	Graduate post-Bologna
	Master pre-Bologna
	Masters post-Bologna
	Post-Graduation
	PhD

If you have any difficulty in answering the questionnaire, please specify:

[ ]

APPENDIX B – DETAILED RESULTS

Table 6 – Results for the Internal Context Dimension

Internal Context Dimension	Average
knowledge Sharing	
CI01 - Knowledge sharing occurs among some employees.	3,88
CI02 - Knowledge sharing occurs informally within teams/projects and internally to the company.	**4,04**
CI03 - Knowledge sharing occurs formally within the teams/projects and internally to the company.	3,43
CI04 - Knowledge sharing occurs formally between the teams/projects and internally to the company.	3,09
CI05 - Knowledge sharing occurs formally inside and outside the company.	2,83
Support from top management	
CI06 - The top management does not believe in the value of Knowledge Management.	2,17
CI07 - The top management recognizes the value of knowledge management.	**3,82**
CI08 - The top management supports the Knowledge Management activities.	3,73
CI09 - The top management supports the Knowledge Management activities and is an example for employees.	3,26
CI10 - The top management associates firm performance with Knowledge Management.	3,26
Integration mechanisms	
CI11 - There are no formal integration mechanisms within teams/projects	2,59
CI12 - There are formal integration mechanisms within teams/projects	3,24
CI13 - There are informal integration mechanisms between the teams/projects	**3,60**
CI14 - There are formal integration mechanisms between the teams/projects	3,07
CI15 - There is integration between all levels of the organization	2,84

Developed by the author

Table 7 – Results for the Content Dimension

Content Dimension	Average
Benefits	
C01 - The knowledge management benefits (financial and non-financial) are not defined.	**3,14**
C02 - The knowledge management benefits (financial and non-financial) are defined.	2,88
C03 - The knowledge management benefits (financial and non-financial) are communicated to employees.	2,83
C04 - The knowledge management benefits (financial and non-financial) are evaluated internally.	2,99
C05 - The knowledge management benefits (financial and non-financial) are evaluated internally and externally to the organization.	2,57
Knowledge Management Objectives	
C06 - The knowledge management objectives are not defined.	2,95
C07 - The knowledge management objectives are defined.	**3,11**
C08 - The knowledge management objectives are communicated to employees.	3,03
C09 - The knowledge management objectives are evaluated internally.	2,97
C10 - The knowledge management objectives are evaluated internally and externally to the organization.	2,63
Knowledge Management Objectives aligned with Objectives of business	
C11 - The knowledge management objectives are not defined according to business objectives.	2,89
C12 - The Knowledge Management objectives are defined according to business objectives.	**3,13**
C13 - The knowledge management objectives are communicated to employees associated with business objectives.	2,88
C14 - The association between the knowledge management objectives and business objectives are evaluated internally.	2,88
C15 - The association between the knowledge management objectives and business objectives are evaluated internally and externally to the organization.	2,69
Critical knowledge (relevant to achieve the business objectives)	
C16 - The critical knowledge is not defined.	2,79
C17 - The critical knowledge is defined.	3,23
C18 - Knowledge Management is used to support the critical knowledge.	**3,26**
C19 - The critical knowledge is reviewed internally.	3,16
C20 - The critical knowledge is reviewed internally and externally.	2,79
Tacit knowledge	
C21 - Tacit knowledge is not considered.	2,33
C22 - Tacit knowledge is informally considered.	**3,76**
C23 - There is a formal and standard process to address the tacit knowledge.	2,63
C24 - Tacit knowledge is integrated internally.	3,13
C25 - Tacit knowledge is integrated internally and externally.	2,82
Explicit knowledge	
C26 - Explicit knowledge is not considered.	2,11
C27 - Explicit knowledge is informally considered.	**3,60**
C28 - There is a formal and standard process to address the explicit knowledge.	3,38
C29 - Explicit knowledge is integrated internally.	3,46
C30 - Explicit knowledge is integrated internally and externally.	3,10

Developed by the author

Table 8 – Results for the External Context Dimension

External Context Dimension	Average
Suppliers	

External Context Dimension	Average
CE01 - Information from suppliers are not considered in the Knowledge Management activities.	2,58
CE02 - Information from suppliers are sometimes considered in the Knowledge Management activities.	**3,31**
CE03 - Information from suppliers are always considered in the Knowledge Management activities.	2,97
CE04 - Suppliers sometimes participate in the Knowledge Management activities.	3,16
CE05 - Suppliers always participate in the Knowledge Management activities.	2,50
Partners	
CE06 - Information from partners are not considered in the Knowledge Management activities.	2,60
CE07 - Information from partners are sometimes considered in the Knowledge Management activities.	**3,38**
CE08 - Information from partners are always considered in the Knowledge Management activities.	2,83
CE09 - Partners sometimes participate in the Knowledge Management activities.	3,30
EC10 - Partners always participate in the Knowledge Management activities.	2,56
Competitors	
CE11 - Information from competitors are not considered in the Knowledge Management activities.	2,72
CE12 - Information from competitors are sometimes considered in the Knowledge Management activities.	**3,18**
CE13 - Information from competitors are always considered in the Knowledge Management activities.	2,81
CE14 - Competitors sometimes participate in the Knowledge Management activities.	2,77
CE15 - Competitors always participate in the Knowledge Management activities.	2,54
Customers	
CE16 - Information from customers are not considered in the Knowledge Management activities.	2,21
CE17 - Information from customers are sometimes considered in the Knowledge Management activities.	**3,40**
CE18 - Information from customers are always considered in the Knowledge Management activities.	3,10
CE19 - Customers sometimes participate in the Knowledge Management activities.	3,34
CE20 - Customers always participate in the Knowledge Management activities.	2,61
Organization's security policy	
CE21 - There is no formal security policy in the company	2,39
CE22 - There is no formal security policy related to Knowledge Management	2,80
CE23 - There is a formal security policy related to Knowledge Management	**3,23**
CE24 - Knowledge Management is aligned with the company's security policy	3,16
CE25 - Knowledge Management is aligned with the company's security policy and the policy is evaluated periodically	2,92

Developed by the author

Table 9 – Results for the Process Dimension

Process Dimension	Average
Communication	
P01 – There is no communication related to Knowledge Management.	2,36
P02 - Communication is about the relevance of Knowledge Management	3,23
P03 - Communication is about the activities and importance of Knowledge Management	**3,48**
P04 - Communication about Knowledge Management is incorporated in the routine of employees	2,98
P05 - Communication about Knowledge Management occurs internally and externally	2,96
Technology	
P06 - The technology to support knowledge management is not known.	2,41
P07 - The technology to support knowledge management is mapped, but there is no standard.	3,08
P08 - The technology to support knowledge management is standardized.	3,10

Process Dimension	Average
P09 - The technology to support knowledge management is evaluated in relation to the requirements and integrated internally.	**3,20**
P10 - The technology to support knowledge management is evaluated in relation to the requirements and integrated internally and externally.	2,91
Training	
P11 - The training is not related to Knowledge Management.	2,51
P12 - The training is informally related to Knowledge Management.	**3,20**
P13 - The training is formally related to Knowledge Management and is not evaluated.	2,93
P14 - The training is formally related to Knowledge Management and is evaluated internally.	3,16
P15 - The training is formally related to Knowledge Management and is evaluated internally and externally.	2,85
Time	
P16 - The time for the Knowledge Management activities is not recognized.	**3,13**
P17 - The time for the Knowledge Management activities in the internal context is defined informally.	3,07
P18 - The time for the Knowledge Management activities in the internal context is formally defined.	2,97
P19 - The time for the Knowledge Management activities in the internal context is formally defined and evaluated.	2,77
P20 - The time for the Knowledge Management activities in the internal and external context is planned and evaluated.	2,70
Reward System	
P21 - There is no reward system in the company	2,27
P22 - There is no reward system associated with Knowledge Management	**3,27**
P23 - The reward system is used to ensure the employee's involvement in the Knowledge Management activities.	2,69
P24 - The reward system associated with the Knowledge Management is regularly evaluated	2,69
P25 - The performance evaluation of staff considers the Knowledge Management activities	3,11
Recruiting	
P26 - I do not remember how it was my recruiting process.	1,74
P27 - The recruitment process does not address questions about knowledge sharing capabilities.	2,93
P28 - The recruitment process includes indirect questions about knowledge sharing capabilities.	**3,20**
P29 - The recruitment process includes direct questions about knowledge sharing capabilities.	2,83
P30 - The recruitment process focuses explicitly on questions about knowledge sharing capabilities.	2,50
Budget	
P31 - There is no budget to support Knowledge Management.	2,69
P32 - The budget to support Knowledge Management is planned and approved.	**3,18**
P33 - The budget to support Knowledge Management is available.	2,87
P34 - The budget to support Knowledge Management is regularly reviewed.	3,06
P35 - The budget to support Knowledge Management is regularly reviewed in accordance with the benefits obtained.	2,96
Creation of knowledge	
P36 - There are no knowledge creation activities.	2,19
P37 - The knowledge creation activities are informal.	3,28
P38 - The knowledge creation activities are formal and standard.	**3,32**
P39 - The knowledge creation activities are formal, standard, and process and outcome indicators are used.	3,04
P40 - The knowledge creation activities are part of the company's performance management process.	3,09
Storage knowledge	
P41 – There is no knowledge storage activities.	2,21
P42 - The knowledge storage activities are informal.	3,08

Process Dimension	Average
P43 - The knowledge storage activities are formal and standard.	**3,32**
P44 - The knowledge storage activities are formal and standard, and process and outcome indicators are used.	3,03
P45 - The knowledge storage activities are part of the company's performance management process.	3,01
Dissemination of knowledge	
P46 - There is no knowledge dissemination activities.	2,26
P47 - The knowledge dissemination activities are informal.	3,25
P48 - The knowledge dissemination activities are formal and standard.	**3,38**
P49 - The knowledge dissemination activities are formal and standard, and process and outcome indicators are used.	2,98
P50 - The knowledge dissemination activities are part of the company's performance management process.	2,94

Developed by the author

APPENDIX C – HIERARCHY LEVELS ANALYSIS
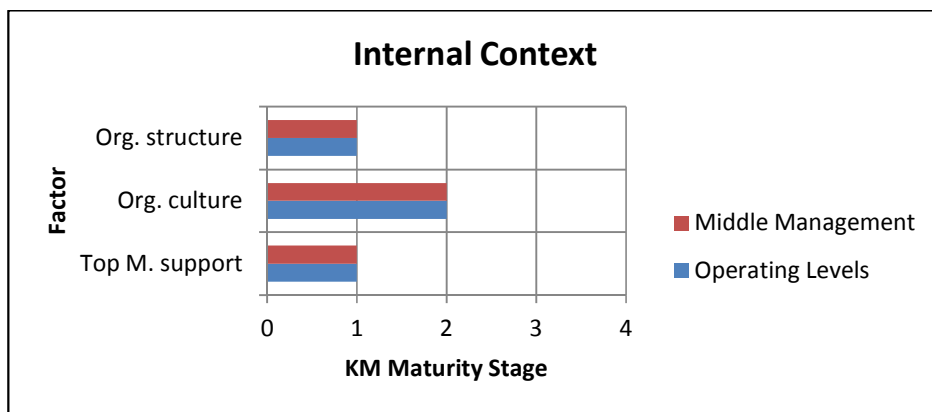
Figure 7 – KM Maturity Stage for Internal Context factors by Hierarchy Levels (Developed by the Author)
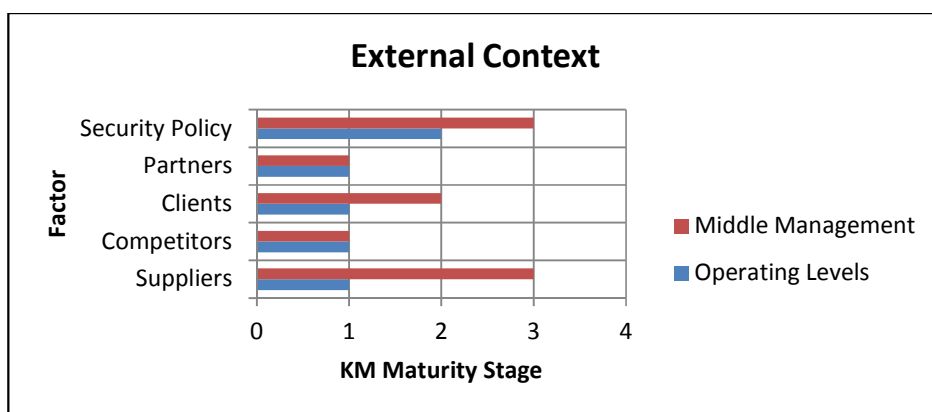
Figure 8– KM Maturity Stage for External Context factors by Hierarchy Levels (Developed by the Author)
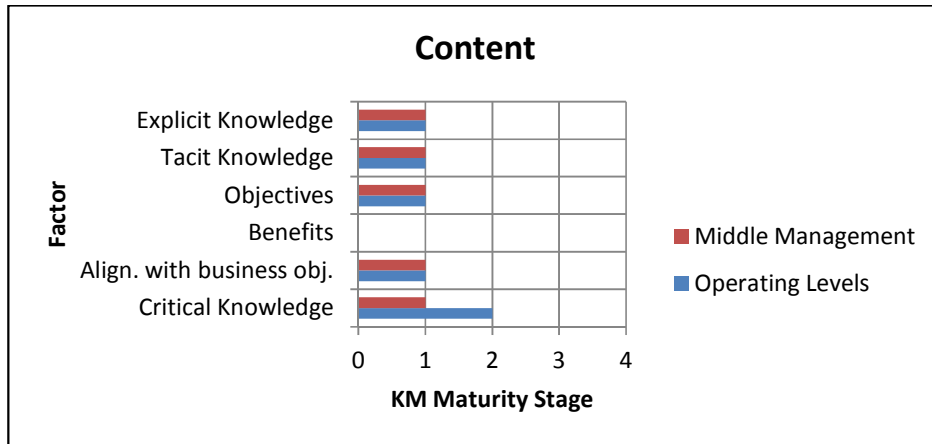
Figure 9 – KM Maturity Stage for Content factors by Hierarchy Levels (Developed by the Author)
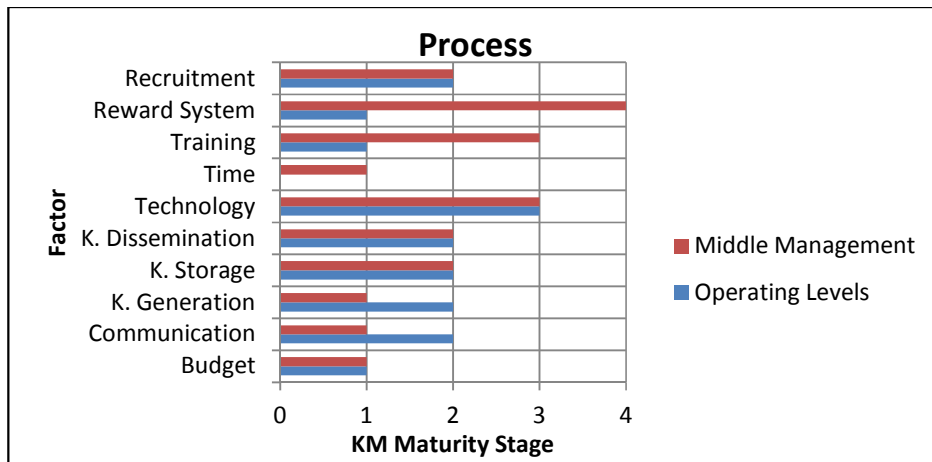
Figure 10 – KM Maturity Stage for Process factors by Hierarchy Levels (Developed by the Author)
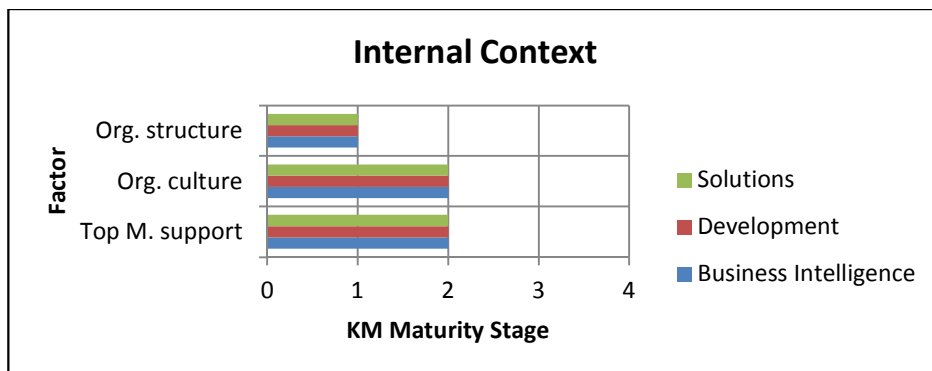
APPENDIX D – UNITS ANALYSIS

Figure 11 – KM Maturity Stage for Internal Context factors by Units (Developed by the Author)
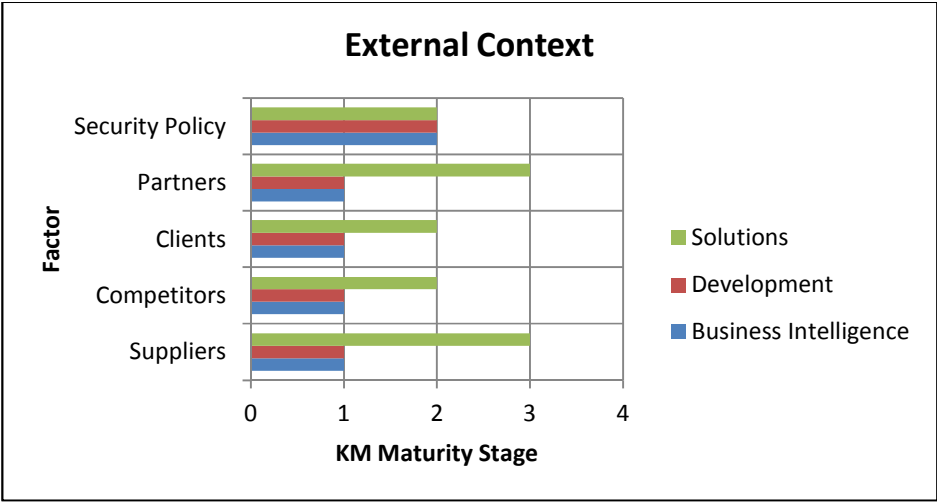
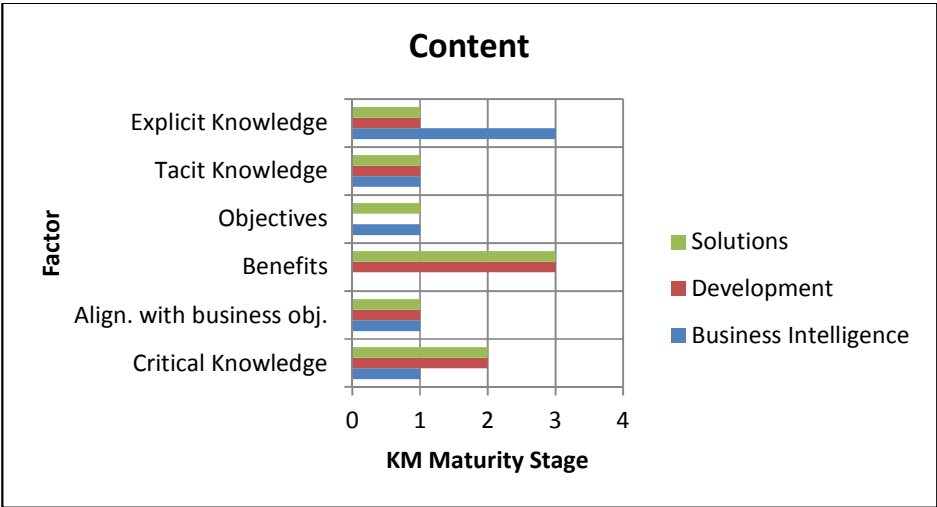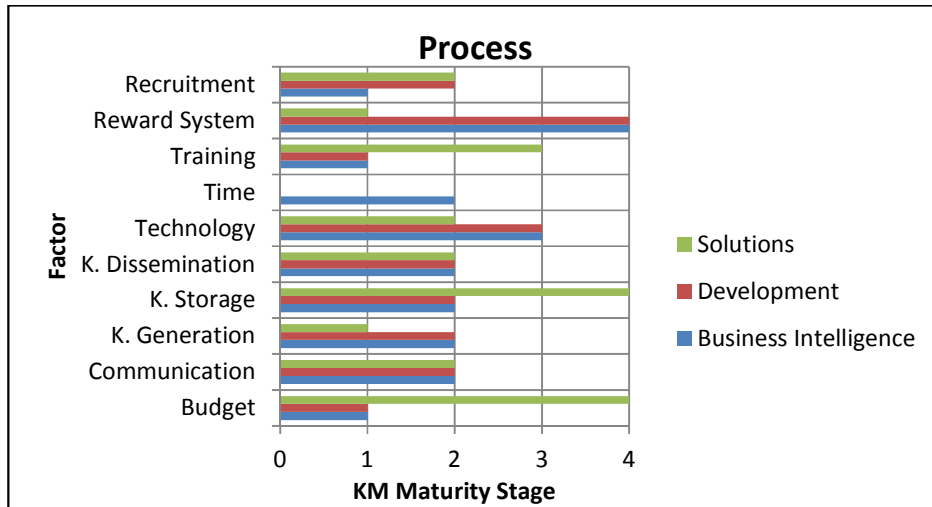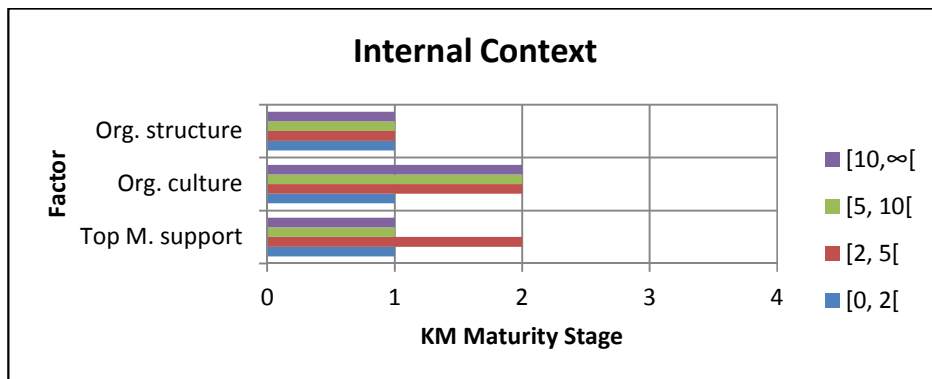**Figure 12 – KM Maturity Stage for External Context factors by Units (Developed by the Author)**

Figure 13 – KM Maturity Stage for Content factors by Units (Developed by the Author)

Figure 14 – KM Maturity Stage for Process factors by Units (Developed by the Author)

APPENDIX E – SENIORITY ANALYSIS

Figure 15 – KM Maturity Stage for Internal Context factors by Seniority (Developed by the Author)
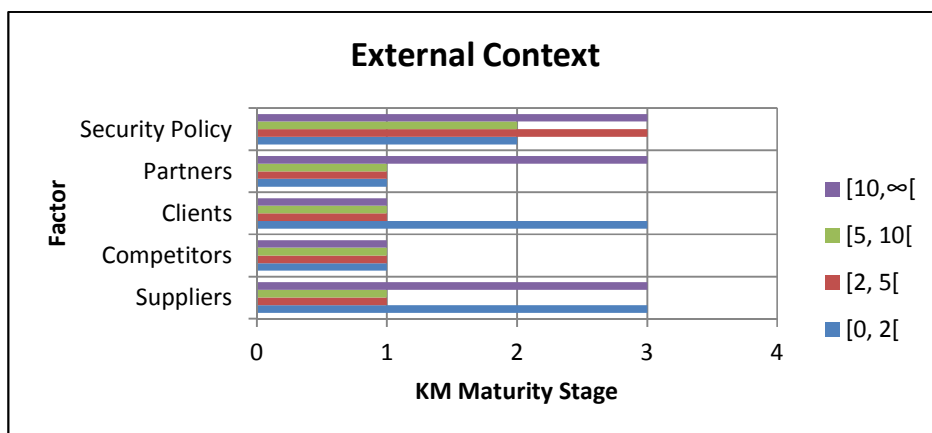

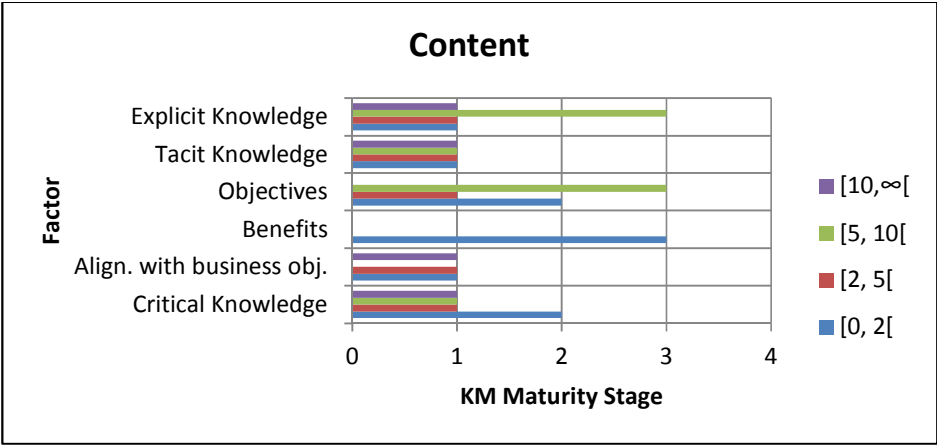**Figure 16 – KM Maturity Stage for External Context factors by Seniority (Developed by the Author)**

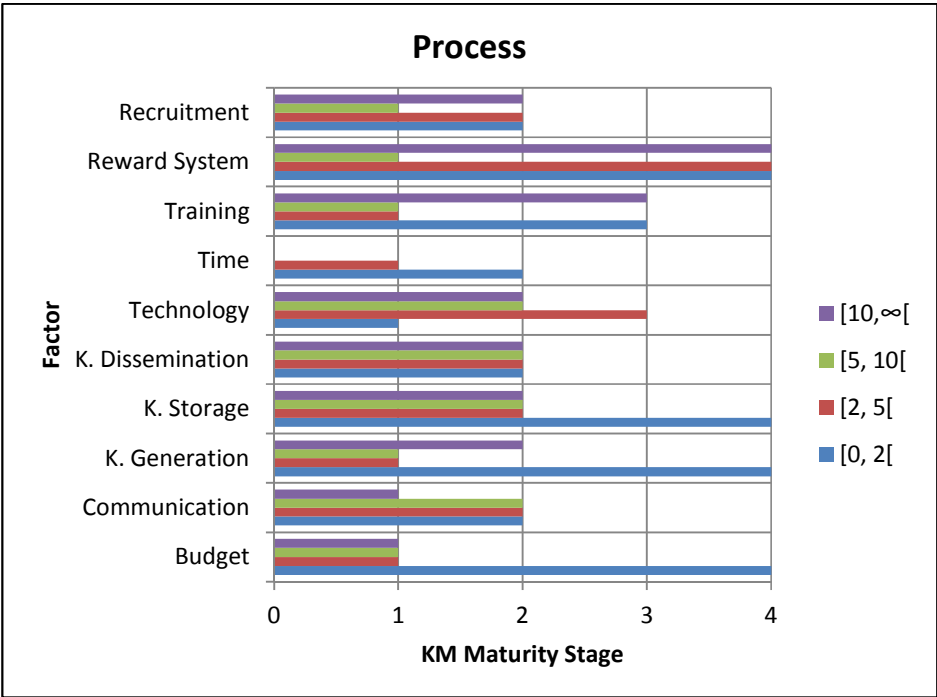**Figure 17 – KM Maturity Stage for Content factors by Seniority (Developed by the Author)**

Figure 18 – KM Maturity Stage for Process factors by Seniority (Developed by the Author)