KNOWLEDGE SHARING AND TEAMWORK IN GLOBAL ENGINEERING PROJECTS

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ABSTRACT

One of the biggest trends global organisations face today is to break the silos between their different locations and act as a single company. By overcoming this challenge, organisations are able to gain competitive advantage in this continuous changing world and make full use of their competences in an intelligent, effective and profitable way.

The company to which this work is intended is a global consulting and engineering company that offers their clients project services through all the different phases of the whole investment. Concerning companies that focus their business in delivering projects globally to their customers, the above mentioned challenges are increased. Project work deals not only with technology and products, but especially with people and their interaction. The success of a project can be measured by the level of collaboration between the people involved: the best solutions are delivered from the exchanging of knowledge.

The objective of this work is to provide suggestions for improvements to foster collaboration and knowledge sharing between the members of engineering project teams despite their global locations. The theoretical framework comprises two chapters with the concepts of Knowledge Management and teamwork with a focus on project and virtual teams. The empirical part of this research is based on two case studies and the methods used were qualitative. The suggestions were developed based on the findings gathered with the studied cases and show the necessary infrastructure to enhance collaboration, which is the enabler of knowledge sharing. The results of this research present innovative suggestions concerning Knowledge Management in engineering projects.

Keywords   Knowledge Management, Teamwork, Virtual Teams, Collaboration, Knowledge Sharing

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1   INTRODUCTION

One of the biggest trends in today's global organisations is to break the silos between their different locations and act as a single organisation. Only in this way, organisations are able to be competitive in this continuous changing market and world, making full use of their competences in an intelligent, effective and profitable way. Common processes, rules and ways of working are essential to reach a high level of efficiency as well as to ensure the quality of the deliveries. Strong and open communication channels that support organised information and knowledge flow are the fundamental factors to conquer this achievement; furthermore, it is the path to innovation. (Strack et al. 2013, 7.)

Concerning companies that focus their business in delivering projects globally to their customers, the above mentioned challenges are even greater. Project work deals not only with technology and products, but with services and especially with people and their interaction. In fact, the success of a project can be measured by the level of cooperation between the people involved: the best solutions are delivered from the exchanging of knowledge. Correspondently, the more knowledge is restricted or not shared, the higher is the risk of errors and delays in the project. Therefore, a high level cooperation requires a good, open and systematic communication and knowledge sharing within the project team members.

Sharing best practices across regions, functions and business helps global companies to be competitive by reducing inefficient overlap of work and consequently, brings more effectiveness and efficiency to their work processes. However, simply sharing information is not enough to get results. It is the know-how to transform information into knowledge with the purpose of development, creation and innovation through sharing and collaboration that will promote competitive advantage. Knowledge management is thus a key element to increase competitiveness and the ability to provide the best solutions to an organisation's clients. (Ichijo & Nonaka 2007, 3-5.)

Peter Senge (2006, 270–271) stresses that sharing knowledge is far more complex than sharing information, which is the simple act of giving and/or retrieving a certain data. According to him, sharing knowledge needs the involvement of people and their will to build something new or better upon one another's knowledge. It is thus a learning process, where collaboration is the opening key to the process.

The company to which this work is intended is a global consulting and engineering company that offers their clients project services through all

the different phases of the whole investment, from market studies to engineering and project implementation. The company is deep client oriented and provides services of excellence in the sectors of energy, industry and infrastructure. This work is in complete compliance with the company's vision and strategy and furthermore, supports them.

The main focus of this thesis remains in knowledge management and knowledge sharing with a focus on larger and global engineering projects of which engineering work is split into different office locations around the world. For this reason, digitalisation will have an important role during this research. The intention with this work is to provide suggestions for improvements of how knowledge sharing and collaboration can be fostered or enabled among the members of global project teams of the organisation.

1.1 Objectives and Research Questions

In recent years, many changes have happened in the company. Changes that have been directly affecting the way projects are implemented. One of these changes is the split of different engineering disciplines or project parts to different offices around the world. Not so many years ago, a typical project work was mostly performed by a single office location. In this way, the whole project team was physically centralised in one place making communication easier and the needed documentation, information or knowledge available and shared from a single location.

Today projects, especially those of larger sizes, are often performed by a cooperation of several offices distributed in different locations around the world. Even though this dramatically increases the competitiveness of the company, on the other hand, it generates difficulties and challenges in project performance and management, especially in terms of communication and sharing of information and knowledge as well as document quality control. For this reason, a well-structured communication, teamwork and knowledge sharing plan is crucial for the success of a project.

The objective of this work is thus to indicate suggestions of improvements which would facilitate and systematise collaboration and knowledge sharing between project team members despites their global locations. The development of a Knowledge Management process that is suitable for larger and global engineering projects supports this systematisation. Consequently, this would not only increase the possibility of knowledge creation and building within the team, but also the efficiency of teamwork and/or work performance.

Considering the above statements, the main research question of this work is "How to enable or foster knowledge sharing between global members of a project team?". The answer will consequently lead to

increased efficiency in team work performance. To answer this question it is crucial to understand the importance of teamwork and how to break the boundaries between different locations. Those understandings are, therefore, considered fundamental sub-questions.

This thesis will focus on larger and global engineering projects where the contribution from several offices in different countries is used. This research will additionally be concentrated in the company's own project team. Knowledge sharing between all project parties, such as clients, suppliers and even competitors are important and current items that are here suggested as further improvements.

1.2 Theoretical Framework

The theoretical framework was used to promote prove and liability of the research study as well as to guide in finding the solutions for the development. Additionally, the literature used supported the understanding of the problem or point of development as well as indicated the items of and challenges for future developments. The framework is divided into two chapters containing the four key concepts that help in answering the main question and fundamental sub-questions. The understanding of the key concepts covers the requirements to find the correct suggestions of improvement.

The main literature used concerns knowledge management with especial focus on knowledge sharing. The theory considered the importance of knowledge management and its contribution towards a learning organisation and leadership. In this sense, this work treats knowledge management as a continuous development process. Besides knowledge management and sharing, the framework will also cover the necessary topics and concepts to answer the fundamental sub-questions. Such topics are teamwork and project teams as well as management of virtual teams. The key concepts in use are described in more details in Item 1.4 below. Change management, digitalisation and leadership, even though not studied as individual concepts, all three topics were considered and included during all the stages of this research.

1.3 Research Methods and Analysis

The empirical part of this research is based on two case studies. The cases are projects in the industrial field that were or are being carried out by the company. The industrial fields might differ from one another; however, since this study is not focused on particular industrial fields, but rather on how knowledge was or has been managed and shared as well as on the projects' teamwork performance, these differences do not affect the research, the analysis or the findings. Both project cases were similar in size and phase; however the main factor for the selection was

focused on the project organisations of which either disciplines or parts of the engineering were split and performed in different global locations.

The research omits any information regarding the clients and their investments due to confidentiality agreements. In addition to that, this research omits the locations in which discipline or part of the engineering were performed by the company in question. However, such information is not necessary to carry out the research nor this omitted information compromises the liability of the analysis and finings. Additionally, both case studies provided the infrastructure and background to gather liable results.

The key feature of case studies is to have a narrowed focus in order to gather a deeper understanding about the research object and for this reason this method gives a good infrastructure to support the findings and development part of this research. In addition to that, this research study involves and considers social and cultural issues that have an impact on teamwork and collaboration, and case studies provide a good foundation to explore the related processes, procedures and structures. (Lähdesmäki et al. 2010.)

The intention with the case studies approach was to gather a deep understanding about the current procedures used within global project teams, which are partially virtual and partially co-located. The case studies were analysed individually focusing on gathering information about the factors that hinders collaboration and knowledge sharing. The case studies contained a great amount of information that was not considered in this research. The used information was focused on the topics of this research, i.e. the company's processes used in the project concerning internal communication, knowledge management and sharing and teamwork.

After the individual analyses of each case, the findings were compared and analysed to one another with the intention of learning the positive and negative actions and procedures, what can be done better and the common challenges and points of improvements. The compared findings together with the theoretical part of this work were used as basis for the development part of this research, which consists of suggestions for improvements and the development of a Knowledge Management model suitable for engineering project work. As having the opportunity of working closely with the project teams of both case studies, my observations also contributed to the findings.

The research methods used to perform this work were qualitative. The analysis and findings of the first case study were made based on a lessons learnt evaluation that was performed with the project team after the ending of the project. The findings of the second case study was analysed by the results gained in an internal audit which brought rich and

liable contribution to this research as well as by informal discussions with project members. As I had the opportunity of working closely with the project teams of both case studies, my own observations also contributed to the findings.

Even though quantitative methods for analysing case studies can be used, the research methods selected to the gathering of information and analyses were qualitative. The reason for this selection was because of the focus qualitative methods give on quality, providing a deeper understanding about the topic. Additionally, this type of method is more used in and adequate to humanism field researches, as it emphasises viewpoints concerning the study object's backgrounds considering human and cultural issues. Even though this research contains an important part devoted to technology and its development, the fundamental focus still remains on human behaviour and people's interaction and collaboration in order to share and build knowledge. (Lähdesmäki et al. 2010.)

1.3.1 Background Information about Case Study 1 Analysis

The analysis and findings of the first case studies were gathered based on evaluating the results of the lessons learnt done at the end of the project and by observations. The lessons learnt were collected by workshops sessions with the participation of the project key members, who were involved in the project for a long period of time if not during the whole implementation time of the project.

The main participants of the workshop sessions were discipline leaders and project management key responsible people of the project organisation: project time scheduler, project coordinator, project document manager and project manager. Discipline is here and further on understood as each engineering field needed to perform the project and included in the company's scope of delivery, such as mechanical, electrical and process engineering among others.

The workshop sessions were performed in face-to-face meetings with the duration of two working days (around 16 hours). The participation of the members was considered very active. During the workshops, situations of conflicts and misunderstandings were in place, however with a positive and constructive meaning and with an overall environment of respect. The findings and results of the workshop were collected, analysed, documented and shared and are, therefore, considered as a part of the organisation memory.

1.3.2   Background Information about Case Study 2 Analysis

The findings of the second study was analysed based on a report with the results of the company's internal audit conducted to the project, informal discussions with several team members and, as previously mentioned, my own observation. The audit report brought rich and liable insights and contribution to this research. This case study is a project that has not been finalised yet and therefore the suggestions for improvement can contribute for actions of correction to this particular case. However, the idea with this research is to give suggestions of improvements and insights for future projects. For this case, this research is limited to the results of this internal audit and does not consider the possible improvements or actions of correction occurred after the audit findings were reported and shared.

The results of the internal audit were reached by conducted face-to-face interviews with the project team's key members from all disciplines (discipline leaders and site personnel) and the project management team (project manager, project assistant and document control manager). The interviews were held in separate sessions for each discipline. The interview sessions for project management team were two, the first with the project manager only and the second with the project assistant and the document control manager with focus on document management. The duration of each interview session was about one hour. All interviews were held within four working days. The report of the audit was additionally considered as lessons learnt defining the immediate actions to be taken as well as the recommendations for long term improvements.

1.4   Key Concepts

The main concept studied concerns Knowledge Management with a focus on knowledge sharing. It is important to stress that Knowledge Management in this research is considered to be a process and as such the idea of continuous improvement is essential to gather a sustainable process. The theoretical approach to this concept was an attempt to understand the concept of Knowledge Management as a whole, what knowledge is and why both have become so important to companies in today's business world. How the fast development of technology has influenced the need of managing knowledge and provided new opportunities to deal with such big amount of information could not be left behind. Creativeness and innovations, doing things smartly, are the key factors to increase competitive advantage of organisations and cannot be achieved without collaboration. These and other important items related to Knowledge Management are covered in Chapter 2.

Projects are carried out and accomplished by project teams. The understanding of teamwork and the pre-requisites of team creation as well as the influencing factors of teamwork and team performance are

critical to guarantee the efficiency of the team and diminish the risks of team malfunctioning. Teams in organisations are of different types and purposes, some are more long-terms and others end when a task is completed. Project teams need special attention and faces different challenges when compared with other teams. Globalisation together with the fast development of technology, especially concerning communication and collaboration technology, as well as the pressure organisations are facing in increasing effectiveness and working intelligently have influenced the increasing number of virtual work. Virtual teams have become important contributors in gathering competitive advantage. On the other hand, the challenges organisations are facing today with this change are substantial, especially regarding leadership and management of virtual teams. Chapter 3 covers the concepts of team, teamwork and project team as well as virtual team together with its challenges and how to cope with them.

Collaboration is thus the most important word or concept that will be used through all this research, not only in text but also as the foundation to the results. Collaboration is the fundamental element of knowledge sharing and the bridge that connects all the other concepts studied in this research. Knowledge sharing and teamwork do not occur without collaboration. Furthermore, collaboration is the key element to innovation, because it is the only way to seeing wholes.

1.5   Definitions of Terms, Abbreviations and Acronyms

Even though attempts were made in the writing of this research to avoid terms, abbreviations and acronyms that might cause confusions, misunderstandings or difficulties in the flow of the reading, the following ones were possibly used in the text:

- AI = Artificial Intelligence
- CoPs = Communities of Practice
- Discipline(s) = engineering field such as mechanical, electrical and process engineering among others
- DMS = Document Management System
- HR = Human Resources
- HRM = Human Resource Management
- KM = Knowledge Management
- KMS = Knowledge Management System
- Main office = main office is defined in this research as the office with contractual responsibilities
- PM = Project Manager
- PMG = Project Management Guidelines
- PMO = Project Management Office

2   KNOWLEDGE MANAGEMENT

2.1   Knowledge as a Key Factor to an Intelligent Organisation

Knowledge has become one of the most valuable assets of any organisation and the key to increasing effectiveness and competitiveness in this ever changing world. For this reason the concept of Knowledge Management has been more and more valued and, consequently, increased and developed in modern companies and organisations. On the other hand, the concept of managing knowledge is not that clear and contains a tremendous challenge, once it is completely related to people and human behaviour.

The fast development of technology together with the internet and digitalisation plays an important role in KM and its development. Terms, such as Big Data, have been integrated into almost all organisations' strategy. One reason for this is the enormous amount of data that today is available and that this amount increases all the time. The question remains in what to do with such data, how to make use of such data and how to manage it. The term Big Data, together with other terms with the same background idea, such as Business Intelligence and Data Analysis, is used to measure the ability of making sense of this increasing amount of data. The most important thing, however, is that today there is already enough technology to allow the collection, storage and analysis of big amount of data and that this technology is developing all the time. Because of this, Big Data has been influencing and changing most businesses, industries and principally people's lives. (Ruciman & Gordon 2014, 1.; see also Marr, n.d.)

All of this data can be considered knowledge after it has been transformed to add value to organisations, groups or individuals. On the other hand, knowledge is much more than simply data. The most critical challenge in organisations is how to gather the knowledge that stays in people's mind, the knowledge that is born with experience and sometimes not so easy to be stored, written down or even shared. All will deeply depend on how well people are willing to share their experiences, to be open and to collaborate. This sharing will occur only when a proper environment of trust is in place, giving the support, motivation and reason to make individuals share their knowledge. Harold Jarche (2015) points out that an intelligent or learning organisation is based on simplicity and through this simplicity is able to solve complex situations. The solutions come from individuals that are continuously learning by their work and by sharing their knowledge. For this, organisations must support an open environment that enables this sharing of knowledge, which will lead to creativeness, effectiveness and innovation, increasing in this way competitiveness. (Jarche 2015.)

It is the constant stress to cope with and fast react to the continue changes in today's business world that makes companies pay especial attention to their competences, once people are the most important source of knowledge an organisation has. Today, more than ever, companies must do more with less in order to get advantage upon their competitors. Managing people and their relationship within a group and an organisation are therefore crucial to Knowledge Management. Knowledge is usually created within organisations of which members have the trust on one another and are capable of sharing their experiences and understandings. (Anumba, Egbu & Carrille 2008, 16.)

In fact, the world today is in the era of a knowledge economy. This creates a need to change the way businesses are performing; organisations are becoming less hierarchical and going towards a more linear ones to support the so needed collaboration. The sustainability or long live of a company depends on what it knows, how they use their knowledge and how they are able to build and innovate with this knowledge. In other words, the long term success of a company depends on how collaborative their members are. In this era of knowledge, a successful company is one that is able to learn, reuse their knowledge and react based upon the constructive and continuous increased knowledge that the company has. And this is the basis of a learning organisation. (Dalkir 2005, 1-7.)

Sydänmaalakka (2003, 73–74) emphasizes that an intelligent organisation must be "efficient, capable of learning and sensitive to the well-being of its personnel". According to him, such organisation is capable of continuously renewing itself, of foreseeing possible changes and fast learning. Among other features, the following are essential elements that such organisations have:

– Culture and values which encourage continuous learning
– Continuous improvement policy is in place
– Human resources are seen as the most important and valuable resource
– Clear processes in place and is re-engineering them all the time
– Performance management is working efficiently
– Competence management is used systematically
– Knowledge is shared with everybody
– True leadership is considered very important

Continuous learning is thus the key to becoming an intelligent organisation capable of achieving their goals. Such organisation sees their human resources as their most important assets and wills to create a trustful environment characterized by constructiveness, fairness and respect. Sharing knowledge is key element of learning; it is the door to seeing wholes and the path to creativeness and innovation.

2.2 Tacit Knowledge vs. Explicit Knowledge

Before going deeper into Knowledge Management, it is important to understand what knowledge is and where to find it. In a general way, there are two major types of knowledge. The first type, called explicit knowledge, is tangible and can be easily reachable, it is a knowledge that has been somehow stored, written down or documented or that can be accessed by certain means, e.g. by records, pictures, videos, etc. The second type, called tacit knowledge, is that kind of knowledge that is not so easily reachable and that is often only inside people's mind, under the control of its knower. The table below shows a comparison between the properties of tacit and explicit knowledge. (Dalkir 2005, 8.)

Table 1. Comparison of Properties of Tacit vs. Explicit Knowledge - Adapted from Dalkir (2005, 8.)

Tacit Knowledge	Explicit Knowledge
Ability to adapt, to deal with new and exceptional situations	Ability to disseminate, to reproduce, to access, and to reapply throughout the organization
Expertise, know-how, know-why and care-why	Ability to teach, to train
Ability to collaborate, to share a vision, to transmit a culture	Ability to organise, to systemise; to translate a vision into a mission statement, into operational guidelines
Coaching and mentoring to transfer experiential knowledge on a one-to-one, face-to-face basis	Transfer of knowledge via products, services and documented processes.

Based on these properties, tacit knowledge can be considered to be the most valuable one, since it is the know-how required to achieve a result or a solution, while explicit knowledge is the final product. In fact, the more tacit knowledge is the more valuable it will be. (Dalkir 2005, 8.)

The focus remains then on how to make tacit knowledge achievable and translated to such language that makes it understandable and possible to be used and applied. The solution does not rely on the attempt of transforming such knowledge into a more explicit one, however, by adding value to this knowledge, by adding value to the source of this knowledge. Focusing on valuing the knowledge and showing the importance such knowledge is to individuals, to a group or to the whole organisation is the way of motivating knowledge sharing. Everyone wants to make a difference, to feel important and valuable. Companies that value the inputs of their employees and show the importance of their contributions are one step forward to success. This is because such companies are creating an environment of trust and respect, diminishing

the fear of making mistakes and at the same time increasing the motivation to speak, to listen, to share ideas and to build innovations by making use of knowledge. This is the path to become a learning organisation.

Tacit knowledge is thus more shared in such environments where there is a comprehension and cooperation between the people involved, where there is mutual understanding and respect. By taking a symphony as example, in order to play harmonically, all individual players must work together and continuously learn from one another in order to reach the perfect harmony. Even though the players do not know how to play other instrument than their owns, it is the continuous practice, learning and working together that will make each instrument complement one another, creating perfect and harmonic music. Communities of Practices (CoPs) consist of people who share work experiences and learning opportunities, in other words, CoPs consist of people that form a social learning system and share common goals, rules, routines and processes. (Anumba, Egbu & Carrille 2008, 21-24.)

In successful CoPs the members experience strong trust and respect among them, increasing the level of commitment to achieve the common goal. It is all about teamwork, all about increasing one another's knowledge by learning from one another and building together.
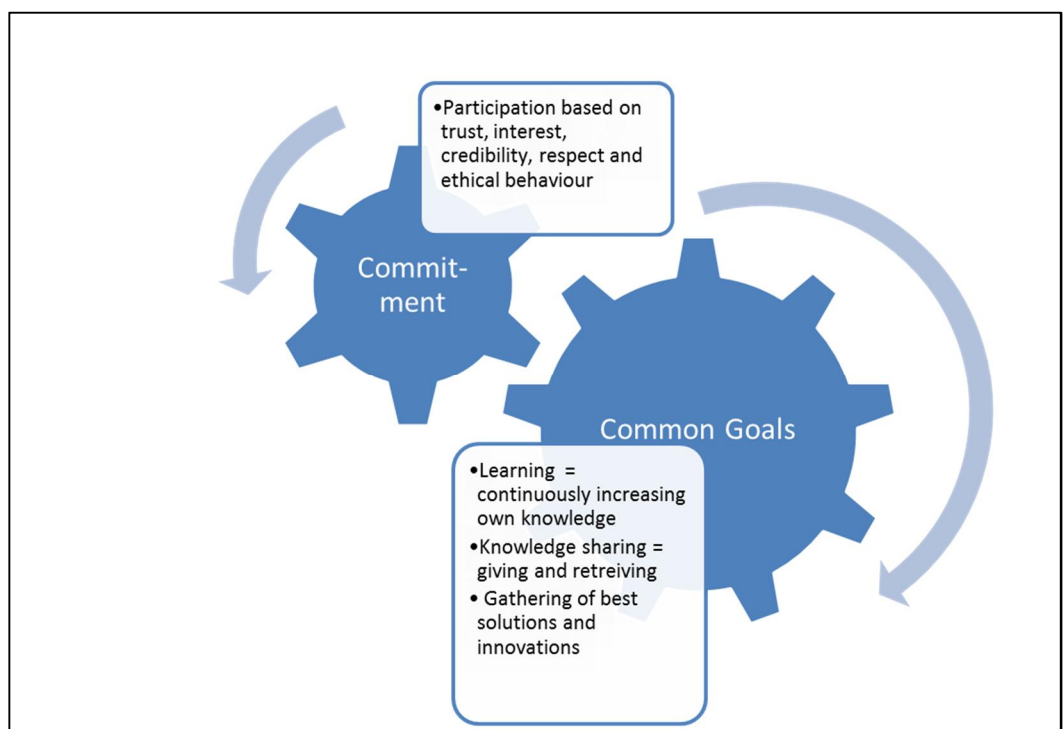

Figure 1.   The Characteristics of CoPs - Adapted from Dalkir's
        "Common Characteristics of CoPs" (2005, 122).

2.3   Defining Knowledge Management

One of the main characteristics of modern successful companies is the high level of efficiency. As previously mentioned, today, more than ever, companies must do more with less effort. To reach a high level of efficiency, companies must know how to avoid repetitive mistakes and errors which has a direct impact in efficiency. Learning from previous mistakes and attempting not to make the same mistakes all over again means efficiency increase. Managing this king of knowledge, in a systematic way and making sure that such valuable knowledge is accessible and used inside an organisation is the main idea of Knowledge Management. It is an approach to ensure that the knowledge that an organisation possesses are available and in use, and most importantly that this knowledge is increased all the time with new ideas and thoughts to create an even more effective organisation. (Dalkir 2005, 1-7.)

In terms of companies of which core business is project services, most of the repeated mistakes of projects are due to a lack or poor knowledge management, which does not have a continuance and appliance of the lessons learnt. Ignoring the importance of knowledge management might cause the risk of continuously making the same mistakes, and consequently closing the door for improvements. On the other hand, when knowledge is well and continuously managed, the opportunities for development and innovation are considerably increased. (Anumba, Egbu & Carrille 2008, ix.)

In fact, defining Knowledge Management is an extremely difficult task. This is because the concept of Knowledge Management is extremely complex and contains different perspectives. Some are more devoted to business perspectives, others focus on cognitive attributes and there are still those with simply technological and process approaches.

From a business perspective, Knowledge Management is taken as a business activity that is connected with the business strategy, policies and practices. Such activity is inherent at all levels of the organisation and is what links and coordinates the organisation's explicit and tacit intellectual assets. The coordination of the intellectual assets (people and people's know-how, technology, processes and the organisation structure) add value by reusing the achieved knowledge to gain effectiveness and contribute to innovation. Knowledge Management is also seen as a continuous process that is frequent updated in response to new input, ideas and innovations that has been created, valuing the continuous learning. (Dalkir 2005, 1-7.)

The cognitive (or knowledge science) perspective focuses on "what knowledge is, how it is used, created, and exchanged by individuals and organisations, and which forms it takes under different circumstances and for different uses (i.e., how it is manifested) (Wiig 1993, 32)."

According to this perspective, knowledge is the key factor that allows individuals, organisations and societies to act intelligently. When such knowledge is transformed into manifests (documents, technologies, best practices and even traditions) the result of this transformation is expertise that when properly used and shared increases efficiency. Improved knowledge gives a wider understanding of what and how an organisation should do in order to get competitive advantage; at the same time it also shows the reason why the organisation acts as it does and shows the gaps where improvements are needed. These comply and explain the main reason of managing knowledge. (Wiig 1993, 37-39.)

The technological perspective is more focused on the practical side of Knowledge Management, i.e. which are the tools and methods that facilitates and supports the management of knowledge (Wiig 1993, 37). As previously mentioned, the fast development of technology together with the increased influence of the internet affects the enormous amount of information we have today, and this amount increases all the time in a matter of seconds. How to manage all this information, how to transform this information into valuable knowledge and how to make this knowledge accessible and understandable are the questions that this technological perspective focuses on. From this perspective, Knowledge Management can be defined as the concept where information is transformed into valuable knowledge and that this knowledge is easily available to those who will apply it (Dalkir 2005, 5).

Despite the different perspectives of Knowledge Management which makes it difficult to define the concept in simple words, all different perspectives brings a common understanding about the importance of knowledge in today's organisations. In order to understand the concept and make it useful, it is important to understand its complexity and multidisciplinary feature. In establishing their strategies, organisations should value the most important assets of knowledge, i.e. people, and create and support an environment where trust, transparence, openness and ethics are the foundations of the organisation's culture.

2.4   The Objectives of Knowledge Management

As previously stated, knowledge is the most valuable weapon an organisation has in order to be competitive in the challenging business world of today. How to manage this intellectual capital has, therefore, become one of the most important items in the agenda of any organisation willing to succeed. In fact, organisations face several challenges in this regards. Perhaps, the most critical ones are: not knowing what they actually know; what they really need to know and how to make knowledge available to those that need it in an effective way. Knowledge Management is the key factor to achieve the solutions to the above mentioned challenges, a tool to make the knowledge an organisation has visible, accessible and organised in order to increase

effectiveness. Knowledge Management also facilitates organisations to focus on their capabilities as it shows both their strengths and weaknesses, consequently, opening doors for improvements. (Sydänmaanlakka 2012, 175-176.)

As also previously stated, the most powerful knowledge has tacit characteristics and is therefore crusted into people's minds and if not well captured and shared, such knowledge will go nowhere. For this reason, it is important to organisations to understand that knowledge of such kind is always under high risks of being lost. Among others, the reasons for this loss are retirements and the loss of key competences and expertise. Considering the former, most frequently such losses are caused by a lack of motivation of employees towards their workplace, which, in its turn, is the consequence of an untrusted and not open work environment, of unsuccessful or poor human resources management and principally the result a of poor and/or unethical leadership. One of the main objectives of Knowledge Management is to make sure that such knowledge stays in the organisation and can be shared, used, reused as well as improved for the good of the organisation. (Dalkir 2005, 1-7.)

Knowledge is extremely important and adds competitive advantage to organisations. On the other hand, the overflow of knowledge is a critical challenge that organisations face. In fact, without systematically managing their knowledge, organisations and their members will spend a large amount of time in searching for the knowledge they need and redoing things that has already been done. In this sense, knowledge can only be considered valued if it has meaning to someone, to a group or to the whole organisation and if it can be used. Giving meaning to knowledge and assuring that it is applied to practice is an additional objective of Knowledge Management. (Sydänmaanlakka 2012, 176.)

Considering the above, the main objectives of Knowledge Management are to: (Dalkir,2005, 1-7).
−   Guarantee an effective transference of knowledge from leaving competences to their followers as well as minimize the risks of losing knowledge.
−   Identify the knowledge the organisation has and has not in order to understand its strengths and weakness. In this way, focus on what and why to do is facilitated as well as decision making.
−   Create methods that promote the sharing of knowledge, which is to be used, reused and continuously increased at all levels of the organisations, by individuals, groups and the whole organisation.
−   Avoid overflow of knowledge by giving certain meaning to it as well as putting it into practice and continuous development.

Knowledge Management will only succeed when its framework is in place and all parts support one another, as shown in Figure 2. From the viewpoint of the organisation, everything starts from its strategy and

goals to where the importance of knowledge must be on focus. Furthermore, the organisation must provide supportive learning systems and tools as well as consider the fast development of technology that will facilitate the management of knowledge. From the viewpoint of individuals and teams, they must carry both the ability and will to learn, to change, to share and retrieve knowledge as well as to have the capability of adapting the knowledge, putting it in practice as contribute for knowledge updating and further development. At last, from the organisation's cultural viewpoint, its values must support the management of knowledge; such values are creating an environment of trust, openness and respect that will lead to an environment of continuous learning. (Sydänmaanlakka 2012, 176-177)
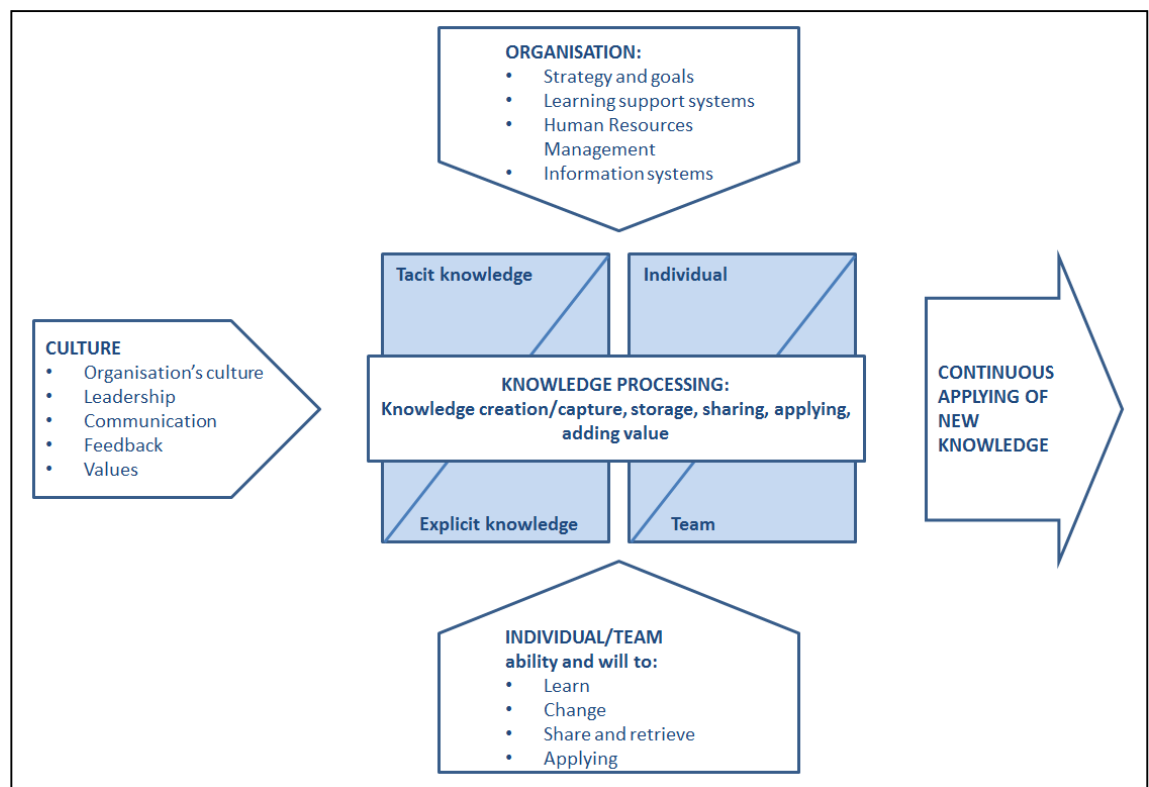
Figure 2.   Knowledge Management Framework - Adapted and translated from Sydänmaanlakka (2012, 177).

As a conclusion, in order to reach success in the management of knowledge, the input of all three levels or dimensions (Organisation, Culture and Individual/Team) must be equally considered and jointly applied. If the contribution of any of the parts is in contradiction to the framework, it will make substantial impact to the obtained results. The so important statement of seeing wholes instead of parts is thus the driver to Knowledge Management. As Peter Senge (2006, 69) so well described: "All are concerned with a shift of mind from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their realities, from reacting to the present to creating the future".

2.5   The Importance of Knowledge Management in Today's Business World

More than ever before, globalisation has dramatically been affecting the way companies do their business. The fast development of technology together with the impact it makes on global connectivity has a major effect on how businesses are driven. In order to be competitive, businesses must do much more with much less, in other words, run their businesses intelligently. Reinventing and simplifying processes, optimizing ways of working and searching for leaner ways of doing things by taking away all the possible wastes are only few steps organisations have to do in order to have or keep their position in the market. Organisations need to cope with changes occurring all the time, therefore the organisations' capability of and flexibility to adapting themselves to such changes are the measurement of their possibilities to survive. Concerning knowledge, the amount available today is almost impossible to put in numbers; and most importantly, this amount increases every fracture of second.

Wiig (1993, 36-37) emphasised three fundamental elements organisations must have in order to run their businesses: customers and products that will fulfil the customers' needs; resources (such as people, capital and facilities) and the capability to act. In order to be competitive, organisations need to constantly deliver good products or services that will fulfil the customers' needs as well as increase customers' retention and, consequently acquisition. Acting intelligently and fast reacting to the changes and requirements of the market are thus the keys to guarantee competitiveness and the condition to being beyond their competitors. The path to intelligent acting is knowledge.

Knowledge Management plays a key role in helping businesses in acting intelligently and coping with all the challenges above. As the most important asset organisations have is people, they must be provided with the weapon of knowledge in order to enter the battlefield. The understanding that every person's contribution is an important part of the whole and giving people the empowerment of feed the organisation with knowledge as well as let be fed by knowledge is the most important, and perhaps the only way organisations can act intelligently. For this reason, how much the members of an organisation are committed to and capable of learning are the measurements of how sustainable an organisation is. (Wiig 1993, 36-37.)

The fundamental drivers that have affected the intense increase of interest in the discipline are the need organisations have in dealing with globalisation, transformation to leaner organisations, corporate amnesia and the technological advantages already available together with its fast development. (Dalkir 2005, 1-7.)

2.5.1   Globalisation

Today organisations are more global, i.e. multilingual and multicultural. This creates the risk of having isolated organisations acting by different rules and processes as well as not sharing their knowledge and achievements and their failures and difficulties. Consequently, this leads to restrict sales opportunities and/or local market competitiveness that would otherwise be possible when the collaboration within offices is successfully in place.

One aspect of Knowledge Management is to increase collaboration, making knowledge available at all levels and to everyone, facilitating the establishment and announcement of common rules, best practices and lessons learnt spread throughout the whole organisation. In addition to that, this collaboration has a direct impact on the organisation's acknowledgement of their competences and know-how, which consequently opens doors for new sales or other development opportunities that would, otherwise, be impossible to realise. Furthermore, collaboration and knowledge sharing are the doors to innovation.

Innovation is the key aspect for organisations to increase competitiveness as well as their capability of doing and delivering better sustainable solutions. Innovation can be seen as a development process of transforming a certain idea into something better. This something might be a product, a service or a process among others, however, whatever this something is it must have a purpose behind, an attempt to do something in a smarter and/or more sustainable way. The basis of innovation is creativity, which, in its turn, is achieved from people's knowledge and experiences. (Lindfors 2011, 21.; Ness & Søreide,2014, 2.)

In the concept of innovation, diversification is considered to be of utmost advantage to achieve better results. For this reason, global organisations have a strong competitive advantage when focusing on Knowledge Management. The gathering of different opinions, viewpoints and ideas from people with different cultural and organisational backgrounds gives a much wider vision about what needs to be improved at the same time that increases the chances of reaching the best solutions (Seppälä 2016). Sharing knowledge is the path to seeing wholes, to truth and to understanding that everything is connected to one another. When organisations succeed in constructing a global and common culture based on a knowledge sharing environment, they will be one step forward against their competitors, since they will be able to adapt themselves and fast react to changes through creativeness and innovations. (Senge 2006, 68-69.)

2.5.2 Leaner Organisations

As already mentioned in previous chapters, to gain competitive advantage organisations must be able to increase effectiveness by running their businesses intelligently and efficiently. Well structured, clear and common processes are the support key to fulfil this need. The constant pressure to do more with less has forced companies to seek for savings and improvements in order to be successful. To cope with such pressure, it is necessary for organisations to constantly update and simplify their working processes concerning all their activities, being it administrative or operational.

To reach the targeted simplicity in an organisation's processes, all possible wastes within the processes need to be eliminated. Whenever an activity can be removed from a process without causing any harm to the whole system, such activity should be removed simplifying, in this way, the process as a whole. Unnecessary process activities and unused procedures create loss of time and money and lead to inefficient ways of doing business. Eliminating such wastes is the fundamental idea of lean thinking. (Berman 2014, 11-21.)

The main objectives of Knowledge Management rely on lean thinking and are focused on facilitating the share of knowledge in order to promote smart working and diminishing the risks of redoing the same mistakes over and over again. Furthermore, it stands for continuous development and opens the doors for creativeness and innovations.

2.5.3 Corporate Amnesia

The term Corporate Amnesia can be described as a loss of an organisation's memory, in other words, the loss of valuable knowledge that was not or was not able to be transferred or documented due to downsizing, layoffs, or poor human resource management among other reasons. (BusinessDictionary n.d.)

Globalisation together with the fast development of technology has been strongly affecting also work life. People's behaviour and their expectations towards workplaces are becoming more demanding all the time, making employees' retention one of the biggest trends in today's business world. As already studied in previous chapters, the most important asset a company has is knowledge and the most valuable knowledge is tacit, the one that is most frequently inside people's mind and usually difficult to transfer. For this reason, organisations are today under pressure to redefining their human engagement strategy, changing the viewpoint of "keeping" to "attracting" people to the workplace. This attraction can only be possible by providing an environment based on ethical principles such as trust, respect, openness and motivation by compensation. (Schwartz, Bersin & Pelster 2014, 7-8.)

In addition to that, work life is getting more complex than ever. People are supposed to be achievable all the time, the number of information one receive per day is uncountable while the time to analyse, retrieve, access and apply the essential knowledge is shrinking. This challenge of overflow of information generates a high level of risk that important knowledge is lost, misunderstood or not shared. (Dalkir 2005, 1-7.)

The intention with Knowledge Management is to find the solutions to deal with those complex challenges. In fact, Knowledge Management is considered and categorized as a science of complexity, especially because it must consider all the things that influences knowledge at all levels and dimensions, from human behaviour to technology, from the inside and the outside changes and drivers that affects the wellbeing of an organisation as well as all the in-between. (Dalkir 2005, 1-7.)

2.5.4   Technological Advantages

The internet revolution has been affecting everyone's and every business' ways of living. The world is more connected, what not so many years ago seemed to be apart, distant or even impossible to reach, today can be found in a matter of seconds or even less. Different cultures are changing their thoughts and experiences and new knowledge is created all the time. The consciousness of what is happening all the time and everywhere is increasing as is the possibility of interfering, of creating, of sharing and of learning. The opportunities brought with the internet (and digitalisation as a whole) are numbered; on the other hand, the number of challenges is equal.

One of the biggest challenges this connectivity has brought to business is the faster and continuous input of data occurring today. Businesses are dealing with an overflow of information and the problem just gets bigger due to the amount of data that increases dramatically in a matter of seconds. The question remains in what to do with such data, how to make sense and use of such data and how to manage it in order to get competitive advantage. It was based on this idea of data analysis that new terms were risen into business dictionaries, such as Big Data and Business Intelligence. Such terms have been considered as one of the most important items of businesses strategies' agendas. (Ruciman & Gordon 2014, 1.)

One reason to have Big Data or other similar terms as important items of businesses strategies is that today's technology has already allowed the possibility of analysing such large amount of data as well as of transforming it into knowledge or value. The evolution of technology has a high impact to businesses, where data must be used to reveal important information about customers and competitors as well as in decision making that should be done based on the whole picture and not

only on a single factor. The ability to enhance information and especially transforming information into valuable knowledge is critical to increase competitiveness. The key factor for businesses is their understanding that whatever information they have, it must be managed and well translated into valuable insights, it is thus important to know what kind of information or data needs to be analysed. (Hurwitz, Nugent, Halper & Kaufman 2013, 1-2.; Lamont, 2012.)

Big Data can be then the term used to measure the ability of making sense of this increasing amount of data. As previously mentioned, several other terms have been risen with the same meaning behind, such as Business Intelligence, Data Analysis and Data Management among others. The most important thing, however, is that today there is already enough technology knowledge to allow the collection, storage and analysis of big amount of data and that this technology is developing all the time. Because of this, Big Data has been influencing and changing most businesses, industries and principally people's lives. (Advanced Performance Institute n.d.)

When analysing data not only the volume of it is considered important, but also its type and the speed of which data is generated, codified and applied. Considering this, Big Data (the making sense of data) can be the combination of the following components: (Ruciman & Gordon 2014, 4-5.; see also Advanced Performance Institute, n.d.; see also Lamont, 2012.)

– Volume: large amount of data to be stored and analysed
– Variety: data can be of different types and from several sources. Not so long ago, only structured data was considered of value and less structured data was ignored, e.g. photos and videos. Nowadays, it is already possible to analyse unstructured data and consequently its value has increased
– Velocity: the speed at which new data is generated and used
– Value: perceived data, i.e. data that gives value to a certain individual, group or organisation
– Veracity: correct data that can be evaluated

Data involves complexity, as it consists of different types with different attributes and meanings. In addition to the traditional structured data and the unstructured data, organisations have also to work with the data generated from different sources, such as social media and click-stream (interaction between several websites). To cope with all this data and make use of it is the actual trend and what will make the difference in adding value to businesses. (Hurwitz, Nugent, Halper & Kaufman 2013, 9-10.)

Knowledge Management adds thus great value to business in understanding and organising the kind of data an organisation needs in order to increase competitive advantage. In this context, Knowledge

Management focuses on the transformation of data and information into valuable knowledge that can be used, shared, applied and continuously developed to the benefit of individuals, groups and/or the whole organisation. (Dalkir 2005, 1-7.)

2.5.5 The Benefits of Knowledge Management

As a conclusion, the appliance of Knowledge Management can bring substantial benefits to businesses when well-structured and with the correct infrastructure supported by the business strategy and environment. When well implemented, such benefits are visible at all levels of the organisation, for individuals, CoPs and for the whole organisation. For this reason, successful knowledge Management has to consider what gives value to each of these levels and find the balance to not make it too big or too small. The benefits Knowledge management can be limitless, in brief some of the benefits are as follows:

For individuals:
– Facilitates working by saving time with best practices, common processes and lessons learnt among others
– Facilitates decision making
– Connects the individual to groups engaging them to CoPs
– Provides people with the latest information, making the individual up-to-date
– Promotes a sharing and learning environment, to which individuals' inputs are considered important and valued

For CoPs:
– Develops professional skills and competences
– Allows peer-to-peer mentoring, minimizing the risk of losing knowledge
– Increases networking and collaboration
– Creates common rules and codes of ethics that members follow bringing an environment of trust and respect
– Develops a common language, procedures and rules, which will help in saving time
– Provides continuous learning by sharing
– Increases creativeness and innovation

For the organisation:
– Facilitates strategic vision and mission
– Helps in decision making, since it shows what, why and how improvements should be done by giving the whole picture
– Increases efficiency in solving problems
– Spreads best practices and lessons learnt
– Improves the gathering of tacit knowledge

- − Increase the sharing of knowledge facilitating creativeness and innovation
- − Creates an ethical work environment that leads to employees' retention
- − Increases competitive advantage
- − Prevents corporate amnesia

2.6 Knowledge Management as a Process

Knowledge Management is considered a process where knowledge is created or acquired, stored and organised, shared, applied, sustained and renewed. Any process consists of a set of independent activities or sub-processes, inputs and outputs, which are connected to one another with the purpose of reaching the defined goal. A reason for the process must then be in place, knowing what value it will provide to the wellbeing of the organisation is thus fundamental for its development and implementation. As a process, the concept of continuous improvements must be in place. (Berman 2014, 11-21.)

Knowledge Management aims to create value by building and leveraging knowledge through the organisation and by providing an understanding throughout the stages of knowledge creation to its application and development. In this sense, Knowledge Management practices focuses on facilitating the access, use, and reuse of valuable knowledge (Evans, Dalkir & Bidian 2014). At this stage, however, it is important to notice that Knowledge Management is much wider than data, information or document management and those are considered to be only focused parts of the whole system.

There are several approaches to the life cycle models of Knowledge Management process and its sub-processes. Even though each one of them contains different focuses, their main objectives are similar and include the transformation of tacit knowledge into explicit, the understanding of what kind of knowledge will add value to an individual, a group or to the whole organisation as well as the creation and use of organisational memory. This Chapter will cover the major KM cycle models, which have contributed with new valuable inputs in the field of Knowledge Management. The models help in understanding the fundamental elements for the implementation of Knowledge Management; however its implementation depends on the infrastructure, specific needs and strategic approaches of the organisation in question. The definition of what is valued knowledge for an organisation and its members is then the crucial start point as is the commitment of the whole organisation. (Sydänmaanlakka 2012, 183-187.; Dalkir 2005, 32.)

2.6.1 Wiig KM Cycle Model (1993)

Wiig was one of the pioneers in showing the need and importance of developing a logical and practical framework for Knowledge Management. For Wiig, for an organisation reach success it needs to act intelligently. Knowing what, how and why to do something, i.e. making use of knowledge, is the way of reaching this goal, in other words, knowledge is what makes the difference (Wiig 1993, 37). The model was created by the identification and organisation of the knowledge processing phases. The approach was developed based on two factors: firstly the context that knowledge can be valuable only if it is organised and secondly the model must be both flexible and specific to match users' needs. The process model is divided into four major stages: build, hold, pool and apply; which are described below and shown in Figure 3. (Evans, Dalkir & Bidian 2014.; Dalkir 2005, 38-39.)
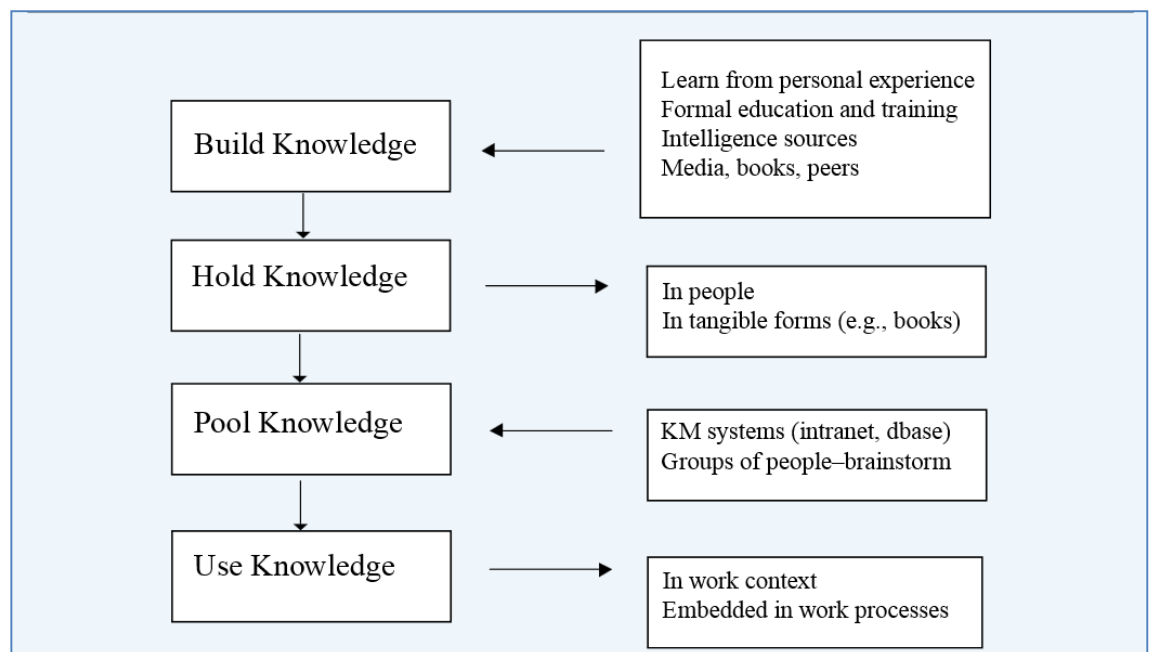
Figure 3.   Major Steps in the Wiig KM Cycle (Dalkir, 2005, 39).

It is important to notice that even though the stages are shown as independent and in sequence, the intention is to adapt and perform different functions and activities simultaneously. Additionally, previous performed functions and activities can re-enter the cycle with a different focus or a higher level of quality. Wiig cycle model is based on cooperation and continuous learning and in order to be successful, it needs the intellectual contribution from all parts and from difference sources. This is one important advantage of this approach, comprising knowledge from all the organisations levels (individual, group and the whole organisation) it is closer to truth. (Dalkir 2005, 39.)

First Stage: Build Knowledge

This phase is initiated with the input and contributions of knowledge workers which can be of different types and acquired form different sources, e.g. personal experiences, education or training and books among several others. This initiation phase, referred to as "obtain knowledge", is already a learning process itself, but building knowledge goes even further as a learning process when the contributions must to be analysed, reconstructed or synthesised, codified as well as organised. In this sense, this build stage is characterised by adding meaning and value to knowledge. (Evans, Dalkir& Bidian 2014.)

The purposes of analysing knowledge can be various, depending on the nature of the obtained knowledge and its source. Among other purposes, the processing involves extracting value knowledge from the obtained material, selection of concepts for further studies, abstracting of knowledge from a theory and verification of the liability of the obtained material. Knowledge reconstruction (or synthesis) means to generalise the already analysed material (or knowledge) with the intention of gain wider principles, e.g. by incorporating the new knowledge into existing one. The codification phase consists of actions related to how knowledge is understood, how to assemble it in understandable way and how to document in order to make knowledge posted to the knowledge repository in order to have it available for others. The final phase is simply to organise the added-value knowledge according with the organisation framework. (Dalkir 2005, 40.)

Second Stage: Hold Knowledge

The second phase involves the internalization of knowledge into people or transferring the knowledge to tangible forms, such as documents. This stage is characterised by: (Evans, Dalkir& Bidian 2014.; Dalkir 2005, 41.)

− Remembering knowledge: individual retaining, remembering or understanding that certain knowledge exists
− Accumulating knowledge: storing knowledge into the organisation memory
− Embedding knowledge: incorporating knowledge into business procedures
− Archiving knowledge: transferring the no longer in use knowledge to a separate repository.

Third Stage: Pool Knowledge

This phase refers to the coordination, assembling, access and retrieve of knowledge. Knowledge coordination is performed on collaborative basis, where teams are formed to work with certain contents with the purpose of creating specific knowledge networks. When contents and sources are

identified, they are then assembled with references with the intention of facilitating further access and retrieval. (Dalkir 2005, 41.)

Fourth and Final Stage: Use Knowledge

The fourth and final phase is the result of accessing the built knowledge for use and application, getting the benefits from it. Furthermore, it gives the possibility and motivation for further improvements (Dalkir 2005, 41.; Evans, Dalkir& Bidian 2014.)

2.6.2   Meyer and Zack KM Cycle Model (1999)

The Meyer and Zack KM cycle model is the result of a work on the engineering and the development of information products carried out by the authors in 1996. Despites the fact that the model, shown in Figure 4 below, was designed with a focus on the physical products, it can be applied and extended to intellectual products as the basis for a Knowledge Management cycle model. However, the approach is more devoted to managing the explicit knowledge of an organisation. (Dalkir 2005, 26-28.; Zack 1999)
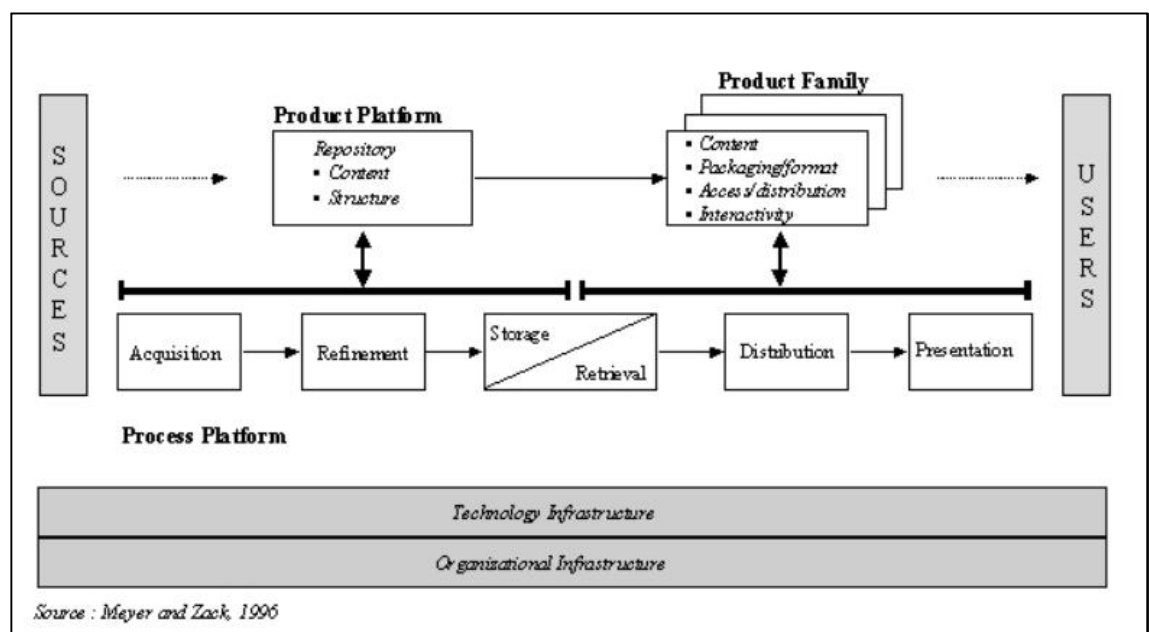
Figure 4.   The Architecture of Information Products (Zack 1999).

The cycle inducts that explicit knowledge is managed through four primary sources. Repositories (to where explicit knowledge is fed), refineries (where the knowledge is accumulated, processed and distributed), organisation roles (with the responsibility of execution and management of the refining process) and information technology (to support the process). (Zack 1999.)

This approach is based on two platforms, the product platform (repository) and an information process platform (refinery) where the knowledge is processed. The basic idea is to create higher-value knowledge products from the existing ones. The approach pays special attention to content, which can be seen as the "raw material", the initial input of the process. This attribute can be totally applied to explicit knowledge, on the other hand, when dealing with tacit knowledge, the management of the content requires a much more complex attention. (Dalkir 200528-29.)

The "refinery" of the cycle is the actual process where knowledge in the repository is created, processed and distributed. Such process consists of five main stages, which are described in Table 2 below. (Zack 1999.)

Table 2.   Zack & Meyer's KM Cycle Stages (Dalkir 2005, 28-29.; Zack 1999.)

Stage	Description
Acquisition	Data, information and knowledge are acquired from different sources, either internal or external. The source of the data must be analysed in order to guarantee its quality.
Refinement	The captured data, information or knowledge is refined before being added to repository. This stage is where value is added to qualified data by means of value-added processes such as cleansing, labelling and indexing. This value can be added either physically (e.g. data migration) or logically (e.g. restructure of data). This stage is additionally characterized by adding value to information by increasing readability and by flexibility to content storage for future use.
Storage/Retrieval	This stage is the link between previous stages to the following ones. Storages can be physical (e.g. folders) or digital.
Distribution	The means by which knowledge reaches the user, i.e. making data/knowledge accessible.
Presentation (or use)	The result of all stages. It success can be measured by how well the user is able to use the knowledge and how effectively.

As a process, the concept of continuous development is also important to consider. In this sense, renewal, revising and rethinking of the contents need to be added to the cycle. This action allows improvements and achievements of even higher quality contents and results.

2.6.3 Bukowitz and Williams KM Cycle Model (1999)

Bukowitz and Williams KM model gives a focus on building and maintaining quality knowledge of strategic value for the organisation and divesting not relevant ones. In this sense, this model emphasizes the "why" and "when" aspects in order to increase efficiency at all levels. This strategic focus is one of the strengths of the model together with the advanced divesting phase, which stresses the importance of placing quality over quantity. For the authors, knowledge repositories should contain only the knowledge that is important and potentially useful to the organisation and/or their members (Bukowitz & Williams 1999, 76). Bukowitz and William additionally introduced a cyclical sequence of the stages of knowledge processing, which is shown in Figure 5. (Evans, Dalkir & Bidian 2014.; see also Pasha, n.d.)
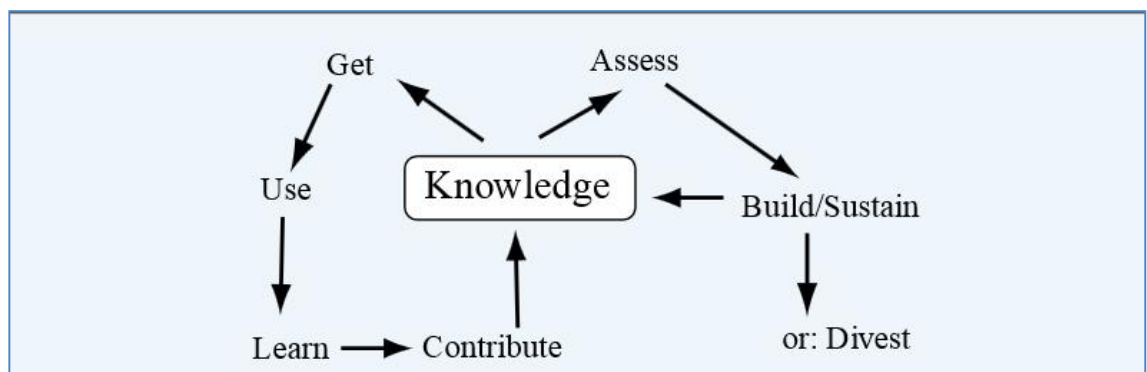
Figure 5.   The Bukowitz and Williams KM Cycle (Dalkir 2005, 32).

The model shows similarities of the phases with those of Meyer and Zack's as well as Wiig's, for example "Get" has the same behind thinking of "Build" and "Acquire", "Assess" is compactible to "Refine", "Build/Sustain" has the same idea of "Hold" or "Storage/Retrieval" and "Contribute" reminds "Use/Apply" and "Distribution". However, the authors made it to the next level by elevating innovation and the out-of-the-box thinking as the fundamental basis for applying knowledge to specific (and unexpected) situations. The intention is to make knowledge flow through the organisation as well as expose knowledge workers to different opportunities to wider the perspectives and viewpoints, the start point for learning. For this to be possible, the commitment and involvement of all members of the organisation are necessary. As equal importance are the organisation's infrastructure and culture, which must support and encourage an environment where collaboration, trust, respect and continuous learning are core values. From the technological viewpoint, collaborative tools are also needed in order to transform knowledge as an open and living asset that flows throughout the whole organisation. (Evans, Dalkir & Bidian 2014.)

The model shows important aspects of sustainability stressing that knowledge must remain valid and up-to-date and therefore liable for use. A main contribution is the learn phase, which promotes individual learning from experiences at the same time that increases contribution to the organisational memory. This step is reinforced with the "contribution" step, which emphasizes the value of everyone's input, increasing motivation and encouragement to sharing their knowledge and that their knowledge will be the input of others' learning processes. (Evans, Dalkir & Bidian 2014.)

First Stage: Get

This first step is the seeking of valuable information needed to solve a problem, make decisions or innovate. This seeking involves not only explicit content, most importantly tacit. In fact this is the point where Knowledge Management diverges from Information Management. In this sense, this model shows the necessity of user being connected not only to contents, but also to other people, where tacit knowledge exists. The technological tools and systems used to support the management of an organisation's knowledge needs thus to consider the linking of knowledge content to the people who actually knows the content. (Dalkir 2005, 32-33.)

Second Stage: Use

This second stage is the combination of different information and knowledge to promote innovation. (Dalkir 2005, 33.)

Third Stage: Learn

This stage concerns the process of learning from experiences at the same time that competitive advantage is created by the increase and development of organisational memory. The intention is to feed organisational memory by both successes (best practices) and failures (lessons learnt), which consequently increases organisational learning and adds competitive advantage. Learning is the key to get competitive advantage; it is the bridge between applying ideas and innovating. (Dalkir 2005, 33.; Evans, Dalkir & Bidian 2014.)

Fourth Stage: Contribute

This stage is focused on encouraging everyone to contribute and input their knowledge, of what they have learnt to the common chosen knowledge base (knowledge repository). The intention is to increase tacit knowledge visible and reached. As already stated, in order to achieve success, the correct organisational environment and culture must support this initiative as well the motivation of the employees. This does not mean that everybody should add everything, but qualitative

information that can be useful to others or to the organisation. In other words, knowledge sharing requires that it is of benefit of both individuals and the organisation. Examples of these contributions are best practices and lessons learnt which will prevent the redoing of same mistakes. (Dalkir 2005, 33-34.)

Fifth Stage: Assess

This Asses stage is more devoted to group and organisational levels, since it concerns the evaluation of the current intellectual capital and the understanding of what kind of knowledge or intellectual capital the organisation has now and what it needs in the future in order to be competitive. The identification of significant assets must also be considered, such as human, customer and organisational (such as knowledge bases, business processes, technological infrastructure, values, culture, etc) capitals and the relationship between those, which is understood as intellectual capital. Metrics should be developed to measure, among other important facts, the impact of knowledge on organisational performance and the returns against intellectual capital investments. Another point of importance when considering the above assets is to focus on the conversion of knowledge into adding value to customers. (Dalkir 2005, 34.)

Sixth Stage: Build and Sustain

The objective with this stage is to assuring that the continuing improves of intellectual capital of the organisation will fully contribute to its competitive advantage. In this way, knowledge creation, updating and reinforce must be transformed as a routine at all levels of the organisation. (Dalkir 2005, 34-35.)

Seventh and Final Stage: Divest

Keeping assets, being them physical or intellectual, which are not in use or do not provide any benefits or values to the organisation means loss of time and money. The objective of this stage is to analyse the intellectual capital of the organisation in order to check its feasibility for the organisation in terms of maintenance and resources and make decision in whether to keep or divest some knowledge. Sometimes it is more valuable to relocate certain knowledge outside the organisation. The understanding of why, what, where and how the organisation is doing something is critical in the decision of what to divest and what to keep. Common examples of knowledge divestures are diffusions of companies, outsourcing works, layoffs, replacing technologies and ending partnerships. (Dalkir 2005, 35.)

2.6.4   McElroy KM Cycle Model (2003)

McElroy KM model especially focuses on processes of finding the knowledge contents that is important to the organisation and its members. The idea is that before being added to and considered as a part of organisational memory, knowledge must be evaluated and validated. In other words, decisions of whether or not knowledge is integrated to the organisational memory must be done in advance. In addition to that, McElroy took a step forward and added the importance of challenging and questioning the existing knowledge an organisation has, opening rooms for creation and innovation. In this way, knowledge is not anymore viewed as a collection of rules and procedures to be followed and apply in specific situations, rather it is questioned to verify and develop different alternatives to find the best solution as well as to keep organisational knowledge up-to-dated. This model thus emphasizes that learning, innovation and adaptation to changes must be recognised, at the same time that the automatic use of knowledge should be avoided, i.e. applying knowledge without questioning whether it is actually the one which will provide the most valuable solution. (Dalkir 2005, 38.; Evans, Dalkir & Bidian 2014.; MCElroy 2003, 1-3.)

The model, shown in Figure 6 below, consists of the processes of knowledge production and knowledge integration, which are affected by feedback loops to existing knowledge, beliefs and claims as well as the business process environment. In his model, McElroy emphasizes that knowledge must be processed both subjectively (in people's minds) and objectively (explicit forms) in order to comprise the organisational knowledge in use of the company. How and how often knowledge is used in the business process environment will have a great impact on the value of the knowledge: the more they match expectations the more existing knowledge will be reinforced; simultaneously, mismatches will lead to adjustments in business process behaviours ("feedback loop"). Consecutive mismatches generate doubts in the liability of existing knowledge causing its possible rejection, which shows the need of producing and integrating new knowledge ("feedback including the detection of problems"). (Dalkir 2005, 35-37.)
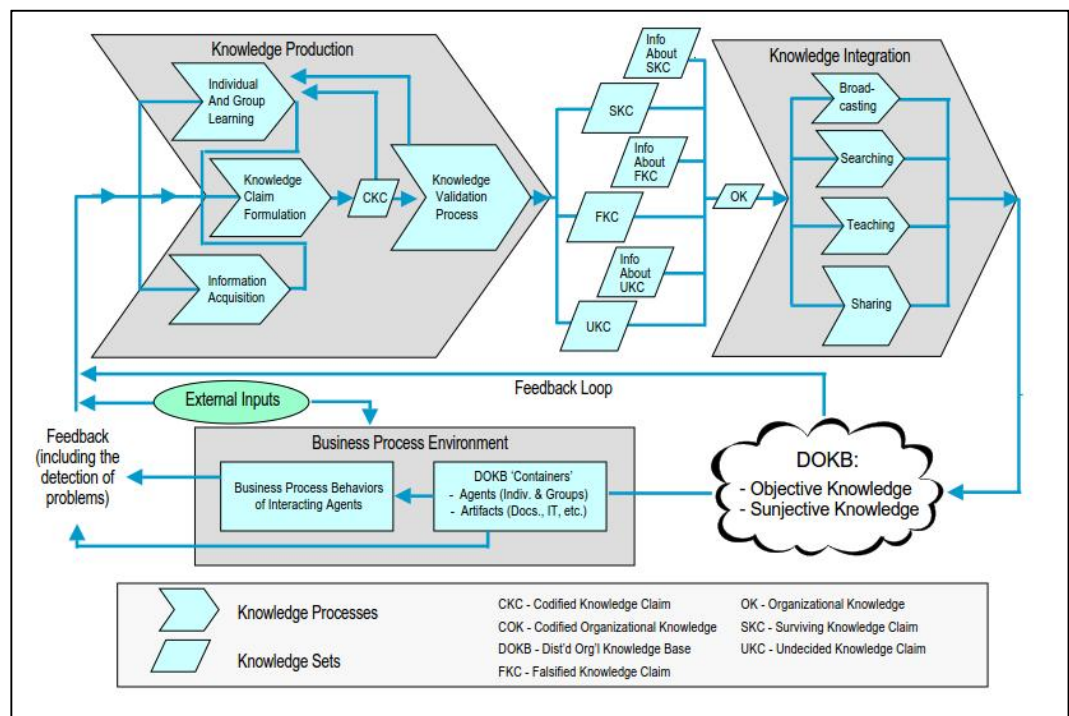
Figure 6.   The Knowledge Life Cycle (MCElroy 2003, 3).

Knowledge Production

The model starts with a knowledge claim that requires validation, i.e. knowledge claim evaluation. This stresses the idea that in order to be further processed, any knowledge must be of value or worthy. The knowledge claim is formulated and evaluated by information acquisition and individual and/or group learning. When claims are learnt to be valid, they are integrated as new organisational knowledge. During evaluation, knowledge can also be classified as either falsified, when it will be digested, or undecided, when there is not enough information to make decisions and further investigations are needed until decisions can be made. (Dalkir 2005, 37.; Evans, Dalkir & Bidian 2014.)

The idea of knowledge claim is based on the tendency people have to engage themselves in learning when they experiences gaps or too many complexity that either prevent or difficult them to achieve their goals. In other words, such gaps represent the lack of knowledge to make decisions or going further in achieving the goals. In this sense, the detection of a problem will lead to the necessity of learning, which, in its turn, will lead to the formulation of knowledge claims. McElroy (2003) describes knowledge claims as "conjectures, assertions, arguments, or theories about which potential actions might lead to desire outcomes, in ways that will close the gap between current and goal states" (MCElroy 2003). When individuals engage themselves in learning as they develop a new knowledge claim, they very often form groups where ideas are shared, studied and refined in order to have wider viewpoints to gather

better results. In this sense, knowledge here is being evaluated. Knowledge claim formulation and claim evaluation are the processes that comprise Knowledge Production. (MCEIroy 2003.)

Knowledge Integration

In the knowledge integration phase, knowledge is shared and spread through the organisation and available for use, in other words, knowledge is integrated to the organisational knowledge for use. Knowledge has already been evaluated as valued in the previous phase; however it will be in this phase that knowledge will be recognised, i.e. whether it will meet business expectations or not. It will be the experience retained from its use that will lead to possible new claims, restarting knowledge cycle. Knowledge integration can thus be considered as the process by which an organisation introduces a new knowledge to operation environment at the same time that old ones are put aside. This fortifies and stresses the path to continuous learning as the main key to gain competitive advantage. (Dalkir 2005, 37.; Evans, Dalkir & Bidian 2014.)

2.6.5   Dalkir's Integrated KM Cycle Model (2005)

Dalkir's Integrated KM cycle model was the result of a comparison research between the previous models shown above. The intention was to develop a simplified model that incorporated the key elements of the four models. The simplification was done by the combination of the stages and by the identification of the key activities to be linked to the major stages. The model consists of three main stages, shown in Figure 7 below: knowledge capture and/or creation; knowledge sharing and dissemination; and knowledge acquisition and application. The model is drawn as a cycle emphasizing the importance of sustainability and continuous improvement of knowledge. (Evans, Dalkir & Bidian 2014.; Dalkir 2005, 43.)
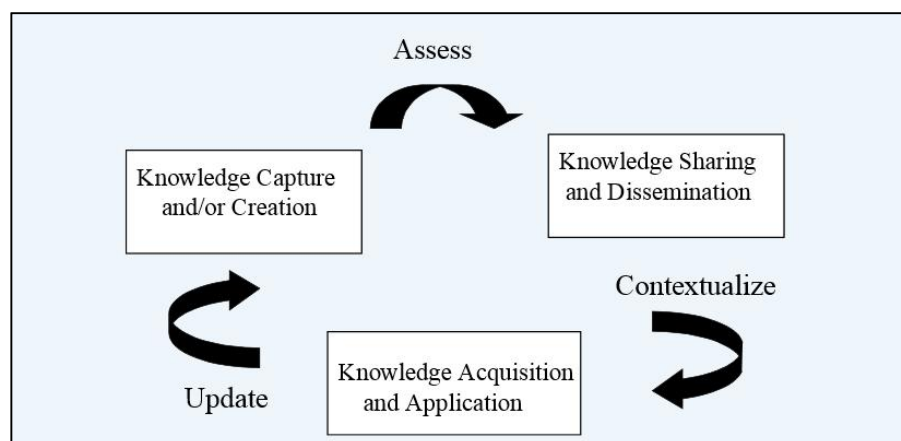

Figure 7.   The Integrated KM Cycle (Dalkir 2005, 43).

<u>First Stage: Knowledge Capture and/or Creation</u>

The model stresses and considers the importance of both tacit and explicit knowledge. Knowledge is captured by identifying and codifying the existing, however usually unnoticed, knowledge and know-how of an organization or external knowledge. Knowledge creation concerns the development of new knowledge and know-how that was not previously in the organizational memory, in other words, knowledge creation means innovation. After knowledge is either captured or created, it must be assessed in order to classify and verify whether the knowledge add value and is relevant to the organisation and/or its members, whether it is compatible to the organisation's goals and to which audience it is of value. (Dalkir 2005, 43.; Evans, Dalkir & Bidian 2014.)

<u>Second Stage: Knowledge Sharing and Dissemination</u>

In the next phase knowledge is either shared (between people) or disseminated (through technological platform, system or tool). In order to make knowledge understandable and used, knowledge must be contextualised. Contextualisation refers to documenting, creation of support material (from simple notes to developed best practices), or any other mean by which others can understand (acquisition) the knowledge for further use (application). In addition to that, contextualisation involves linking the knowledge content to those that actually know or have experience with the specified knowledge as well as the identification of the key attributes of the knowledge in order to match a wider audience. Dalkir 2005, 44.; Evans, Dalkir & Bidian 2014.)

<u>Third Stage: Knowledge Acquisition and Application</u>

In the third and final stage of the cycle people understand and decide whether to use and apply the knowledge content. In this way, knowledge is acquired, used, applied and reused. People, or knowledge users, are the contributors to continuous improvement and knowledge update, once they will be continuously validating and revalidating the content as well as entering more valuable information to it restarting and enriching the knowledge cycle. (Dalkir 2005, 44.)

2.6.6 Summary and Important Notes

Today there are numbers of different Knowledge Management Cycles models or frameworks developed. Already in 2009 Peter Heisig made a research where one-hundred-and-sixty different Knowledge Management frameworks were compared. The main intention with the research was to analyse the several chosen Knowledge Management frameworks and identify the differences and compatibilities between them. The results of the research showed that even though different

terms were used in each framework, a common sense was present concerning the main characteristics of knowledge management activities as well as the fundamental factors that have an impact in reaching their success. (Heisig 2009, 4.)

It was with this idea that the phases and stages of the above studied KM cycles were compared and, as a result, a summary of the activities were gathered. This summary is presented in Table 3, from which the activities will be used in the development part of this thesis research.

Table 3. Résumé of the main Stages of the Studied KM Cycle Models

Models	Stages	Activities
Wiig's Model	Build Knowledge	Capture/Create
	Hold Knowledge	Store
	Pool Knowledge	Share
	Use Knowledge	Apply
Meyer & Zack's Model	Acquisition	Capture/Create
	Refinement	Add value
	Storage/ Retrieval	Store
	Distribution	Share
	Presentation	Apply
Bukowitz & Williams Model	Get	Capture/Create
	Use	Apply
	Learn	Apply, add value, store
	Contribute	Share
	Assess	Add value
	Build/ Sustain or Divest	Store
McElroy's Model	Knowledge Production = Knowledge Claim formulation & evaluation	Capture/Create, add value
	Knowledge Integration = Integration of knowledge to the organisational memory for being shared, spread and used	Store, share, use, apply, add value
Dalkir's Integrated Model	Knowledge Capture/ Creation + Assess	Capture/Create, add value, store
	Dissemination + Contextualising	Share, add value
	Knowledge Acquisition and Application + Update	Capture, apply, add value

The intention of Knowledge Management frameworks is to handle, organise and systematise the knowledge (or potential knowledge) of an organisation in order to make it useful and capable of adding value to the organisation and their members (either as groups or individuals) and, consequently, increase competitive advantage. This handling and organisation of knowledge is understood as activities or processes of the Knowledge Management framework. The success of the framework depends on certain factors or contexts, which can either have a positive impact to the framework or act as an obstacle to its implementation. Most of the contexts have much to do with the level of readiness of an organisation to act as a learning and an intelligent one, supporting an open and trustful environment that motivates the sharing of knowledge. (Heisig 2009, 5.)

The challenge remains in finding a way of effectively and sustainably handling the valuable knowledge resources (both tacit and explicit) an

organisation has. Additionally, the understanding of Knowledge Management as an entire system that comprises several organisational activities, individuals, groups and the whole organisation is crucial as is the understanding of the connectivity and the relationship between all parties. For this reason, focusing in a single part of the system is not enough to achieve success. (Heisig 2009, 16.)

3 TEAMWORK: A PATH TO A SUCCESSFUL PROJECT

3.1 Team and Teamwork

In general a team can be understood as a group of people. In its turn, a simple collection of people does not form a group. In order to be a group, the members must be somehow related to one another and share something in common. Most commonly, team is simply defined as a specific group. However, some approaches emphasizes the difference between the behaviour of a team from that of a typical group and define team as an organised group of people whose main objective is to accomplish a common task or to reach a common goal by means of interaction. In other words, a team can be defined as "any group of people who need each other to accomplish a result" (Senge et al. 2002, 354). In addition to that, team members play different roles in the team, as each of them has a specific knowledge, skills and abilities that will contribute to the fulfilment of the task. In this concept, team members act as a complementary part to one another and as such every one of them is of equal value. How well team members are able to collaborate with one another, to build upon one another's knowledge and to communicate to one another will be the measurement of how well and how efficient the team will reach their common goal. (Levi 2014, 4-6.)

Synergy between the members is the key element to the functioning of the team. The main idea of teaming is to get greater capabilities than the sum of the capabilities of the members; however, without synergy, the results might be quite the opposite. When this comes to knowledge, how team members work together in order to build upon their shared knowledge, will be the measure of how efficiently they will reach the common goal; when synergy is present the results will be considerably better. The more team members understand, support and trust one another the higher will be the synergy between the members. (Wiig 1993, 412.)

Considering the above, teamwork can be understood to be the work performed by a synergetic team, of which the members' relationship is based on trust, sharing, respect, openness and commitment to the ambition of achieving their common goal in the best way possible. In this way, teamwork provides the strengths to face problems and challenges

as well as open the doors for new innovative and different ways of doing things.

Fundamental elements must be in place to support, guide and facilitate the performance of teams to successfully achieve their goals. These elements may vary depending on the nature of the team and the defined tasks to be completed. However, the following are the main elements to increase the possibility of teamwork to reach success: (Levi 2014, 29-30.)

− Clear goals and clear division of tasks: the division of tasks, i.e. the definitions of roles and responsibilities, and the goals must be clear, realistic and appropriate to the team members.

− Tasks suitable for teamwork: the nature of the task must be considered complex, challenging as well as important and recognised. Tasks must be of such nature that they cannot be accomplished individually and requires team effort in order to be fulfilled.

− Availability of appropriate resources: intellectual competence capable of and committed to the completion of the task is needed. In addition to that, the synergy between the members of the team must be strongly in place. The availability of other resources that facilitate and support the performance of the tasks are also crucial, such as necessary tools, systems, material and training.

− Supportive organisational environment: teams must be allocated with enough empowerment to make necessary decisions needed to accomplish the tasks. The organisation culture and structure has, in this sense, a direct impact to the success of the team, the more hierarchical the organisation is the more bureaucracy there is in decision making processes. An organisation that encourages a collaborative and open environment is thus the basis to promote teamwork.

− True leadership: good and true leaders who act based on ethical characteristics are the key to facilitating teamwork and creating an environment of trust and respect. Consequently, this leadership will increase both motivation of and the interaction between the team members in order to reach the common goal in the best way possible.

3.2 Ethical Leadership and Its Importance

Pre-notes:
This chapter is based on a research assignment prepared by the author of this thesis in response to the participation in the Ethical Leadership and Management Symposium organised by FUAS (Federation of Universities

of Applied Sciences, Finland) which took place in Laurea University of Applied Sciences in Tikkurila, Vantaa, Finland from 6 to 7 October 2016.

Describing ethical leadership is a very difficult task, once the concept is based on people, their values, experiences and culture. However, in a very general way, there are two distinguish perspectives of leaderships present in todays' business:

− Transactional leadership: autocratic characteristics with a top to down leadership; typical in hierarchical organisations

− Transformational leadership: interactional characteristics that allows shared processes and responsibilities seeking for common values and goals; typical in more linear organisations

Transformational leadership is based on motivation, intellectual stimulation and valuing individuality. Such leadership increases the trust followers have towards their leaders and consequently positively influence both their work performance and their commitment to the workplace. This kind of leadership is thus the one towards which today's businesses are trying to achieve or adapt themselves to, since it supports and stands for an open, transparent and fair work environment, which is the path to an intelligent and learning organisation and is based on ethical characteristics. (Arnold, Barling & Kelloway 2001.)

Ethics is understood to be the line between the good and the bad, the right and the wrong. This line is, however, very difficult to be drawn, once what might be considered right for a culture, an organisation or a person might the opposite to others. Ethics is based on and motivated by moral and cultural values, beliefs, emotions and facts that will help and lead people in decision making by separating what action is right and what is wrong. In business, ethics involves applying ethical reasoning to commercial activities, which besides being often profit-oriented they also consider the wellbeing of the organisation and their members. (Weiss 2014, 55.)

Successful organisations see true leadership as the key factor to the implementation of the organisation's strategy as "true leadership involves moving followers towards the realization of the vision that the leader has formulated to fulfill the organisation's mission" (Mendonca & Karugo 2007, 3). People need both direction to perform their tasks and the assurance that they are acting in the correct way and in accordance to their moral.

Trust is the key word and focus of ethical leadership. When followers trust their leaders and know that they are morally acting correctly, they simultaneously acquire a positive attitude towards their work, which in its turn increases both their satisfaction and commitment towards the

workplace and towards their work performance. The main reason for that is the followers' confidence that they are being cared of, treated fairly and according to their moral standards. (Treviño, Mayer & Epley, n.d.)

Ethical leadership has a strong influence in diminishing bad or unethical behaviour, principally because ethical leaders are considered to be role models to their followers and their actions will serve as examples to others. Moreover, employees that observe unethical acts from others will have the courage to report those acts due to the confidence and trust that such situations will be treated fairly and respectfully. (Treviño, Mayer & Epley, n.d.)

Leaders have both the responsibility and the duty of giving the correct directions to others in order to achieve the common goal. In other words, the leader is the heart of the organisation or group, the one that will reflect through their behaviour and communication the organisation's or group's values, culture, vision, mission and goals. If the leader's moral integrity is questioned by their followers, it will have a negative impact in the overall performance to achieve the goals. As a conclusion, a true leader needs the charisma to engage their followers into the journey of goal achievement. This will happen only by creating an environment based on trust, respect and transparency as well as the leader's own commitment to and involvement in such creation. (Treviño, Mayer & Epley, n.d.)

Many people can be seen or called as leaders, however, only few actually manage to become a true leader capable of engaging their followers to reach the common goals emphasizing ethics in their actions. On the other hand, many efforts have globally been made in order to make organisations understand that changes into a transformational leadership are extremely important for their success and competitive advantage. The following are important characteristics of true leaders: (Treviño, Mayer & Epley, n.d.)

– Ethics must be as priority: it is not enough to only be a good person. Ethical leaders embrace ethics in all their actions, behaviours and decisions, putting ethics as a priority in their everyday actions. An ethical leader is a model and example to their followers.

– Creation of ethical culture in every personnel related functions: searching for those employees that are in accordance to the organisation's culture and values; making clear the borderlines between the rights and wrongs, engaging and training employees to the correct direction. Clear and open communication and the creation of an open and trustful environment are essential.

– Encouragement, measure, and reward of ethical leadership at all levels: top ethical leadership is important, since it allows other levels

to act accordingly. However, ethical leadership must be in place at all levels of the organisation.

– Power: ethical leaders must know the borderlines of their power and focus on not to use abusive power. An ethical leader seeks to understand the whole picture before making decisions. For this reason, presence is important. Being close and willing to know their followers and their situations are precious opportunities of making the right decisions at the same time that this generates and strengths trust.

3.3 Creating Effective Teams

3.3.1 The Processes of Team Creation

The creation of teams goes under a series of processes and aspects that must be well planned and adapted. These processes and aspects will vary depending on the type of the team in question, its purpose and nature. Despite their types and nature, the process of creating any group or team takes time before the team is able to effectively perform. Existing theories of group developments are various, however, they all possesses similarities within their fundamental elements. The most popular and well known theory was created by Bruce W. Tuckman in 1965 which divided team development into four stages: Forming, Storming, Norming and Performing. This theory was revised by the author and Mary Ann C. Jensen in 1977, when a new significant stage complying the termination or closure of the team was added to the model. (Tuckman & Jensen 1977.)

– Forming: the stage where the members familiarise themselves to one another and how they operate as a team

– Storming: this stage is characterized by conflicts of different perspectives and opinions as well as disagreements about group roles and task requirements. Even though unpleasant, this stage is crucial because members' different opinions and perspectives are sharpened and goals are clarified increasing the team cohesion. It is important though to maintain the conflict on a positive and constructive level. Negative influence in the interpersonal level and the social climate of the group must be avoided. On the contrary, a positive conflict leads to new ways of thinking and new opportunities for building on diverse knowledge and perspectives (Ness & Søreide 2014, 8-10).

– Norming: refers to the organisation of the team to start working on the task. Even though conflict is still present, disagreements are solved through negotiations or constructive discussions. This is because some foundations for teamwork such as rules and norms

have already been established and the team members have already gathered a level of trust and communication skills between one another.

– Performing: Total focus on performing the necessary actions to accomplish the tasks and reach the team goals.

– Adjourning: the stage when the task is completed. Teams might also end in this phase, but not always. In both ways, however, evaluation is advisable, mostly in forms of feedback. In the spirit of continuous improvement, and considering organisation memory, creation of best practices and lessons learnt should be considered. To increase commitment of team members to future tasks, rewards celebration due to successful accomplished tasks are also important.

Understanding the processes involved in the development and creation of teams makes it possible to focus on how to create a functional and successful team with high level of performance. This performance deeply corresponds to how strong the building foundations of the team are. These foundations are team roles, motivation, team cohesion and commitment, task and social behaviours and team learning. The items below show important aspects to be considered when creating teams and give direction to how to improve the effectiveness of team performance.

3.3.2 Team Socialisation

Team socialisation is the process that an individual crosses to become a member of a team. Teams are of different natures and purposes, some are long term teams while others are temporary. For this reason, the timeline of this socialisation process will depend on the type of team and its purposes. How well teams are capable of, ready for and flexible to accepting new members and how well new members are ready and committed to being a part of the team will also influence the timeline of this process. Work organisations are today becoming more flexible giving more emphasis and value to a sharing and learning environment, which in its turn, support a dynamic composition of teams, increasing in this way the efficiency in this socialisation process. The qualities of an intelligent organisation is their efficient way of accepting changes, of learning and of adapting and readapting themselves to cope with the changes. By common and shared organisation goals, the acceptance or of new members to a team inside this organisation and vice-versa is much easier. (Levi 2014, 46-47.; Sydänmaanlakka 2012, 220-221.)

The first stage of the team socialisation is actually a mutual learning process, where the team learns about the new member at the same time that the individual learns about the team in order to define whether or not the new team member will be integrated to the team. This learning

process is where the individual attempts to discover what will be their role and what are expected from them at the same time that the team provides information about the team activities. The introduction of a new member usually generates uncertainty in the team as they are firstly seen as a threat that brings new perspectives and objectives which might be in contradiction to those of the team. On the other hand, diversity does have a great impact on increasing creativeness and innovation and in thinking "out-off the box". In this sense, new members can act as the key to opening the doors for new and usually more effective ways of doing things. However, how both the individual and the team are willing to share and listen to one another's opinions will have a great impact in both acceptance processes. (Levi 2014, 46-47, 222-223.; Ness & Søreide 2014, 8-10.)

Modifications in the team members thus might have both positive and negative impacts in a team. Usually the introduction of a new team member affects the team performance, once the new member is not able to understand how the team operates. In this sense, socialisation process is time and energy consuming, both for the team and for the individual. On the other hand, the new members might contribute to improving team performance, once they can provide new knowledge and different viewpoints and ideas to increase the productivity of the team. (Levi 2014, 47.)

3.3.3   Definition of Goals

The main purpose of defining team goals is to establish the directions and the motivation of the performance of a team and for this reason it is crucial that the goals are clear and understandable to all team members. The level of difficulty of goals should be well balanced; they have to be challenging to increase motivation but also realistic and not impossible to be achieved. When the goals are not realistic they will sooner or later cause frustrations within the team which will lead to not successful results. In this sense, goals and their performance towards it is important to be measurable, otherwise feedback on teamwork performance would be impossible, which in its turn would lead neither to team's nor individual's improvements. (Levi 2014, 48.)

The performance of the team increases dramatically when there is the involvement and participating in the settlement of the goals. This is because this participation increases both the understanding of the task and the belief or confidence that the team is able to accomplish the task. However, most commonly teams are not able or allowed to settle their goals; on the contrary, the goals have been already settled by the organisation. Usually this causes the problem of not having clear goals which might generate misunderstandings or multiple interpretations about the goals. This is a typical case of project teams that usually spends

more time in trying to understand the scope of the project than in finding the solution. (Levi 2014, 48.)

One of the most valuable features in teams is their capability of adapting to changes and learning how to make their performance more effective. In this sense, it is important to understand goals setting as a continuous and improving process of re-adaptation and re-evaluation of the goals to meet the changed situations. Periodical follow-up of the goals with the team members helps in understanding the whole situation and the necessary measures to be taken in order to cope with the changes. Additionally, continuous follow-up makes the foreseeing of possible future changes visible, giving more time to prepare the team to future situations. (Levi 2014, 49)

3.3.4 Development of Common Rules and Norms

Norms and rules draw the line between the rights and wrongs, between what is appropriate and what is inappropriate behaviour in a team. Common rules and norms are extremely important to team performance because they establish a shared understanding of terms, concepts and procedures, increasing in this way the effectiveness of teamwork. At the same time, when team members accept the common rules and agree in "speaking the same language" they consequently contribute to avoid further misunderstanding and misjudgements between them. (Ness & Søreide 2014, 8-10.)

The main objectives of developing common rules and norms are as follows: (Levi 2014, 50-51.)

– Drawing the core values of the team showing who they are as a team

– Coordination of team activities by establishing the foundation of how to work making team behaviour more predictable.

– Definition of appropriate behaviour which contributes in decision making or how to cope with difficult situations

– Contributing in showing the uniqueness of the team and how they differ from others by creating a team identity.

3.3.5 Team Roles

The basic function of roles is to define the tasks as well as the fields and limits of responsibilities of each team member. For this reason it is extremely important that when defining the roles in a team or fulfilling the roles with possible competences that they are clear and understandable for all team members.

Roles not well structured and defined cause major problems in team performance and lead to conflicts and misunderstandings that result in delays and errors in team's deliveries. When a member does not completely understand what their role is in the team, it will create uncertainty in the role performance as well as disappointment to others, once tasks are not running as they should and the results are not as expected. Duplication or overlap of roles is also another common problem, what not only causes doing twice the same things, but also generate confusions and conflicts towards the whole performance. Ambiguity and conflict of roles is one of the major causes of unmotivated, unsatisfied and uncommitted employees in organisations and regarding teamwork, this negative response is critical. (Levi 2014, 69-70.)

Concerning projects, role problems most commonly appears at the end of the project, when members of the team are struggling to accomplish the tasks in the deadline and the expectations towards the responsibilities of the roles are different from the performer's viewpoint and other members' viewpoint (Levi 2014, 41). Roland and Frances Bee (1997) stressed the importance of a detailed process of role clarification that would go beyond the simple task-related overview and deepen in understanding how the relationship between members would work in terms of interpersonal behaviours. They claimed that even though the process takes time, the return in investment would be significantly positive, especially in considerably complex projects. (Bee & Bee 1997, 70-71.)

3.3.6   Motivation

Motivation of team members to work in the team is one of the most important factors to ensure the success of their performance and to promote efficiency. When teamwork functions, the motivation level of the members is high. On the other hand, there are cases when individual efforts diminish when working in teams, social loafing is the used term to refer to this drop of motivation. The causes of social loafing can be various, and knowing the actual reason is the key to fixing the problem. However, preventing that social loafing occur is one step forward to the success of the team.

Both to prevent social loafing and increase motivation, it is necessary that the base foundations of the team are solid and supportive. Clear tasks, goals and roles, for example, diminish stress and give direction of what individuals are supposed to perform in the team as well as give the information about from who they can receive support and assistance when needed in order to perform their tasks. Balanced level of tasks, i.e. challenging but not impossible tasks as well as appropriate to teamwork, also promotes motivation, especially when they can provide positive

effects both to the team as a whole and to individuals at personal level. (Levi 2014, 62-66.)

Another important way of decrease social loafing, and simultaneously improve motivation, is through improving evaluation and reward systems to consider both team and individual efforts. This can be clearer seen in sports teams; winning a game cannot be achieved without team effort; however, players are evaluated and rewarded also individually. (Levi 2014, 62-66.)

Team efficacy can be defined as the capacity of a team to accomplish their goals and objectives. Increasing a sense of "can-do" attitude helps in increasing motivation. Different factors can influence team efficacy, such as the believe team leader has upon their team and the trust member has upon one another. Regarding leadership, transformational leadership has proven to have a great positive impact on team efficacy, once this kind of leadership promotes trust, respect and encouragement of an open environment. However, the most important way to influence is through positive attitude of encouragement to higher team identity with members that believes in one another and that together they can reach their goals. (Levi 2014, 62-66.; Arnold, Barling & Kelloway 2001.)

Motivation can be seen as both the raw material, the input of team performance process and as the energy that will pull teamwork forward. Teams are formed by people, humans full of emotions, feelings and other external issues that can interfere with their motivation towards their performance. Fear is one aspect that has a tremendous influence in individuals and fear is stronger in an environment where trust and respect do not exist. Increasing motivation can only happen in an environment where people are confident to expose themselves to others without the fear of failure, of not being accepted or listened to. Motivation can only be increased in an environment where people are able to share their knowledge and build together, knowing that their input is valued. Trust and respect are thus the key factors and the fundamental elements of successful team performance.

3.3.7   Team Learning as a Path to Team Cohesion

The main problem in teamwork is the incapability of members to actually joint their efforts and work rather as a group than individually. The result of this is a waste of energy, which could be used in a much more profitable way to the good of the team. This means that the efforts members do are not being efficiently aligned to one another, decreasing in this way team efficiency. On the contrary, when team members align their efforts, a synergy between them increases and consequently the focus onto a single and common direction diminishes energy waste. This alignment is the understanding not only that each team member's efforts complement one another but also how they do so, is when team

members fight for a common purpose and share the same vision, it is knowing that together they are more than only one. This phenomenon is called team cohesion. (Senge 2006, 216-218.)

In previous chapters it was mentioned how empowerment is an important element to increase efficiency in team performance; however empowering before team alignment usually causes chaos and increase the difficulty in managing the team. Figure 8 below shows the effects of alignment in team performance. (Senge 2006, 217-218.)
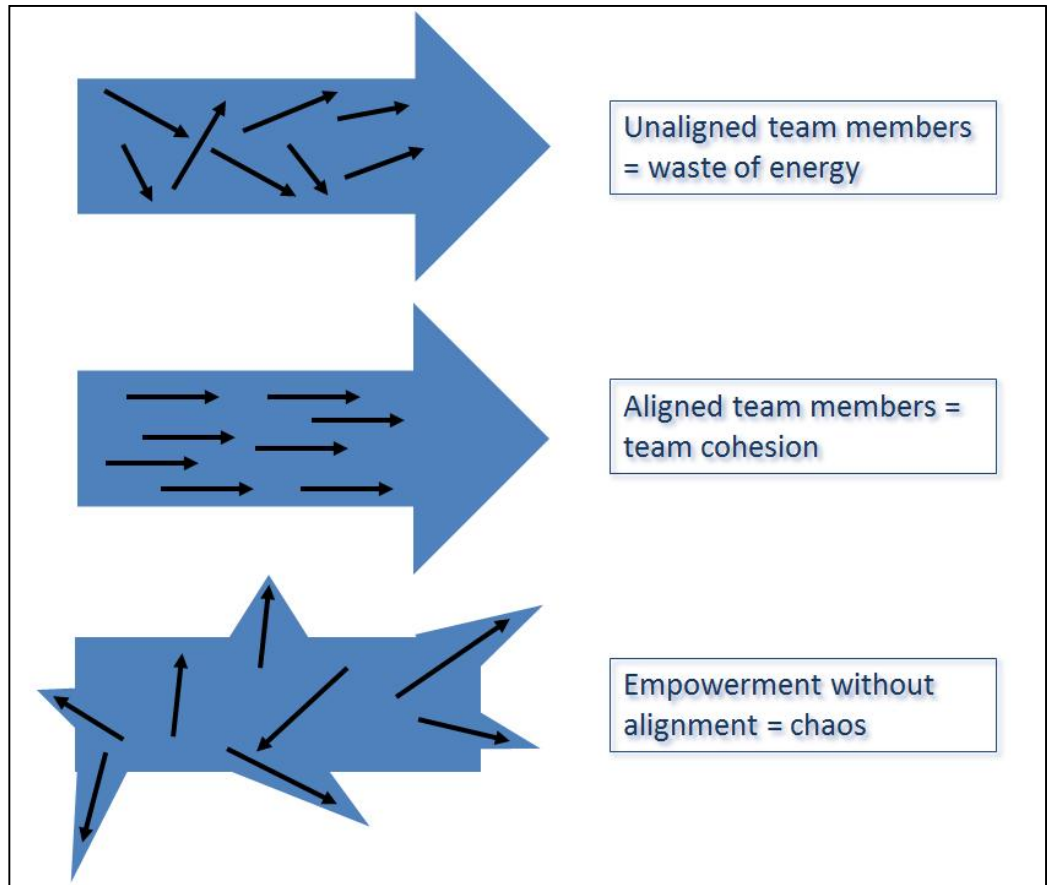
Figure 8.   The Effects of Alignment in Team Performance - Adapted from Senge (2006, 219-218).

The best way to understand alignment is looking back to musicians, to the improvisations of a jazz band. In order to play music, players are in a constant learning stage, listening to one another, giving both space and support for individual and group creation with not only respect to one another but also with proud of their mates and of the shared vision of the result they together want to achieve. The more they learn from one another the better the performance will be, learning until players are capable of foreseeing the next steps of each other. This is the objective of team learning, which is indeed the process of aligning personal powers and knowledge in order to develop the capacity of the team to reach its common goals with the desired results (Senge 2006, 218).

The question remains in how to do it and what are the requirements to make it possible. Team learning has three main dimensions which are based on certain pre-conditions. The first refers to the need of learning how to combine the different intelligent capital within the team to be stronger than the sum of all individually. Secondly is the need to innovate in an organised way. As the above example describes, musicians know how to do that. The basis for this is developing trust within the team and between team mates. Trust reinforces relationships, which, in its turn, increases both commitment and the knowing that the members complete one another, opening doors for "improvisations". The third dimension is leverage of team learning practices to other groups. With this, the most important thing to reach such level is to understand that practices of team learning can never be performed individually; it is the turn from the "I" to the "WE". (Senge 2006, 219-220.)

The pre-conditions refers to both individuals' and organisation's perspectives. From individuals' perspective, social behaviour is the focus. People must be willing to share and learn as well as capable of listen to others, to be open, to accept other ideas and to expose themselves. The actual understanding of what collaboration and cooperation means must be one of their values. From the organisation's perspective, it must support a transformational and ethical environment based on trust, respect and which gives the support and the foundation for the practice of learning and empowerment. Time is an additional pre-condition to develop the necessary trust that will facilitate team learning. The more team members have the time to know and learn about one another the more they will be able to reach alignment.

Team learning involves dialogue and discussions which are the principle ways of learning. Dialogues promote a deeper exploration about a theme or one's idea at the same time that it stands for listening and usually gives more time to thinking about the issue. Discussions, on the other hand, are mixtures of different ideas being presented and defended at the same time. (Senge 2006, 220.) Even though both dialogues and discussions usually lead to conflicts, they are the path to creativeness or innovations and to achieve decisions and solutions. In an environment of trust, conflicts are usually constructive; this is due to both the trust members have on one another and the common goal to be achieved together as a team.

The practice of effectively use feedback is an important way of developing and improving team learning. It is important to handle both positive and negative aspects, once positive feedback promotes motivation and reward and negative feedback, or rather positive criticism, development. By feedback both individuals and teams are able to evaluate their performance, learn and apply the learning in further performance. (Levi 2014, 75.)

3.3.8   The Pillars of Teamwork

The word team comes from the Indo-European word "deuk", which means "to pull", but were used with a meaning of "pulling together" (Senge et al. 2002, 354). From its origins till now, even though with some minor differences and improvements, the meaning of the word remains in joining forces together in order to gather something accomplished. Something that starts and, in order to be completed, needs the contribution of all the involved people; to pull together something heavy needs the joining of efforts until arriving into the previously defined destination.

The more team members know about one another, the stronger they will perform. This is because they start to think together allowing a more flexible way of working in order to rearrange themselves towards unexpected ways. Another reason for this achievement is trust between team members and the support received and given to one another, which increases motivation. As a conclusion, the following can be considered as the pillars of successful teamwork:

– Ethical and transformational leadership, promoting respect, trust and openness
– Ethical behavior as base for all action from all members
– Common goals and shared vision
– Empowerment
– Motivation
– Trust
– Commitment
– Learning: will and ability to share, speak, listen and build together
– Alignment

All in all teamwork is translating individuals' "I" into one "WE"; and borrowing a quote from Alan Stein (2016), Director of Performance for Pure Sweat Basketball Inc., "Championship teams are never built exclusively with extraordinary players. They are built primarily with ordinary players doing extraordinary things together" (Stein 2016).

3.4   Projects and Teamwork

3.4.1   Project and Project Team

The International Organisation for Standardization (ISO) defines project as "a unique set of processes consisting of coordinated and controlled activities with start and finish dates, undertaken to achieve and objective. Achievement of the project objective requires deliverables conforming to specific requirements, including multiple constraints such as time, cost and resources" (ISO 21500, 2012). This implies that a project has defined

start and finish dates and that it is ended when the agreed deliverables, the objective(s) of the project, are created. This definition also implies that projects are different from one another and are therefore unique. Consequently, the procedures to be applied need different approaches to meet the specific requirements in order to fulfil the task. For this reason projects need specific organisations, competences and procedures to make the achievement of objectives possible and in an efficient and liable way.

Considering the above statement, it can be concluded that project teams have certain characteristics that differ from other team models. These differences are important to be considered when forming project teams. The main differences remain in the following: (Bee & Bee 1997, 6-7.)

— Teams are often gathered together to achieve a specific goal and usually people just jump into the project without previous notice. This means that quite often the members do not participate in the definition phase of the project, diminishing in this way the important time in the socialisation stage, reinforcing relationships, creating trust, involvement in creating rules and procedures among others. In addition to that, very often individuals' job descriptions differ from their roles in the project, which might create confusion, ambiguity and conflicts. In this sense, the involvement and commitment of the key members is extremely important from the beginning till the end of the project.

— Team members usually are involved in more than one project, making own time management and prioritisation skills critical for members. This generates obstacles in giving their best performance to all projects that they are involved, reflecting in motivation and commitment towards projects.

— Teams are usual cross-cultural and cross-functional, where members come from different parts and locations from the organisation, with different backgrounds and culture. As already mentioned in previous chapters, diversification is a positive issue, however attention must be paid to provide the appropriate time to learning and gather trust.

— Project teams usually consist of "visible" and "invisible" members. Team performance is not only based on the key members' efforts, but also on the invisible members that appears in order to perform a sub-task of the project and are not involved in the whole project.

— Project teams must be created and built in a very short and fast time, and reach effectiveness almost immediately in order to perform the tasks to meet the deadlines.

For projects to be succeeded performed, the initial or definition phase can be considered to be the most important one, since it will provide the foundation for project performance. It is in this phase where the planning of the project will be done, defining and clarifying the goals, the activities and tasks necessary for performance, time schedules, resource planning and responsibilities. Equally important is establish a strong foundation to support team performance. The key issue for this achievement is setting up team processes and procedures that clearly define how the team members are supposed to work and assuring that the involved team members have both competence and teamwork skills to work and build together, in other words, having teams where synergy is visible. (Bee & Bee 1997, 8-10.)

Even though this initial stage is the key to guarantee effective team performance, quite often teams (and especially projects teams) skip this stage. There are several reasons for that, but the main ones relate to the tight time schedules of accomplish of the tasks and not spending proper time in development and learning, no empowerment in team organisation creation and fear of facing the conflicts that this stage might cause. Regardless what is the reason behind it, project organisations and individuals must make efforts to change and understand that spending the needed time in this development stage will avoid problems in further stages, increasing in this way the possibilities of reaching successful results at the end of the project. (Levi 2014, 54.; Bee & Bee 1997, 63-64.)

As previously mentioned in Item 3.3 above, in order to create effective teams, common goals, clear procedures and rules, appropriate roles clarifications as well as definitions of the expected performance are needed. A good way to do this is by team contract or a plan showing how the team intends to manage their work performance or activities. The intention with this plan is to clarify role expectations and responsibilities as well as to document the work procedures and processes agreed. This plan helps in avoiding misunderstandings, doubts and possible future conflicts regarding roles, responsibilities and work procedures. (Levi 2014, 54-55.)

Concerning project teams, where people might come and go in a short period of time, such contract is important to make the members efficiently understand how the team works being able to focus on task faster. Especially large projects, which are considerably complexes, require that sufficient time should be spent to well develop and define a series of processes of which the following three are considered very important: information flow, understanding roles and responsibilities, and managing meetings. (Levi 2014, 54-55.; Bee & Bee 1997, 66-67.)

– Information flow: the establishment of information strategy is important. This strategy includes firstly identifying "who needs what"

and secondly who is responsible for providing the information.

– Understanding roles and responsibilities: as previously mentioned, the understanding of own and others' roles and responsibilities are of utmost importance both to the team performance as to avoid possible conflicts and misunderstandings.

– Managing meetings: project team meeting is one of the most important means or method of communication. Among others, meetings promote team identity and cohesion, enhance relationships as well as open the space for knowledge sharing, learning and building. However, if not efficient and well managed, meetings can become time wastes rather than collaborative improvement. The purpose of project team meetings are to give and receive information, identify problems and build solutions and to make necessary decisions. Therefore, it is important that the target and flow of the meetings are well planned and the members and participants understand the reason they are there and the roles they have in the meeting. The number of participants is also important to consider. Especially in cases when the input of the participants are needed in order to make decisions, gathering all the inputs and opening discussions to make a decision might be quite challenging. Preparing a plan for how meetings are held facilitates the project flow and increase meeting and team effectiveness. Establishing meeting protocols describing how meetings are held in the future is important to guarantee its effectiveness.

3.4.2 Leadership Communication

Communication is the key element to effective leadership. Good communication skills are the means of leverage the message to others, of creating the necessary trust and encouragement that will make people to follow their leader. As a part of leadership, communication is the foundation to efficiently execute projects and for this, one of the inevitable characteristics an effective project leader has is having strong communication skills. (Zulch 2014.)

The style of communication will depend on the type of leadership adopted. As already studied in Chapter 3.2, an authoritarian and hierarchical leadership is based on dominance and control, which has a negative impact on engaging and promoting employees' motivation. By contrary, a transformational type of leadership acts as an inspiration to team members and promotes a shared vision and a learning environment, where both leader and all other members and consequently the whole team will gain a great number of benefits. This transformational type of leadership contributes to a more effective communication, once it is based on listening, sharing, collaborations and learning. In addition to that, transformational leadership promotes

empowerment, and sharing responsibilities attains more from team members and consequently improves the effectiveness in communication. (Zulch 2014.; Arnold, Barling & Kelloway 2001.)

As previously mentioned, the effectiveness of team performance corresponds to the level of collaboration among the members. Team members must share, integrate and build knowledge in order to fulfill both team and project goals and objectives. Project leaders have great impacts on those achievements; when they are trusted by the team, they manage to improve teamwork and communication level. It is important to note that communication implicates not only language skills, but also social behavior skills such as attitude and personality. Projects and teamwork in general are task oriented and in order to reach success, motivation of team members must be in place to ensure group cohesion, for this reason both team's collective and individual's needs must be identified. It is only through communication that project leaders are able to enhance a balance between the different needs required by the projects goals (tasks), the project team and the individuals. (Zulch 2014.)

The project leader is the key asset of projects and therefore the skills he or she has will have a positive or a negative impact on the success of the project in question. A successful project leader needs to perform several simultaneous roles and a number of skills are required to this purpose. These skills are interpersonal, stress handling, problem solving, management, but most importantly, a successful project leader must be provided of excellent communication and leadership skills, which are connected to one another and are the foundations for reaching aligned teamwork. (Zulch 2014.)

The necessary skills manage communication effectively are cognitive, technical, social, emotional and interpersonal skills. The cognitive skills refer to the knowledge background and experiences of the leader, in other words the level of competence to handle the role. The technical skills are related to the use of necessary tools and techniques required to project management. The social skills imply the ability to proactively interact with a large number of people from different background, professions, cultures, etc. The establishment of cooperative relationships increase and ensure a trustful and open environment increasing communication, knowledge sharing and, which correspondently, contributes for ensuring the success of the team and project performance. Emotional skills include the capability of decision making especially under difficult and changing situations as well as the capacity of taking responsibilities. Emotional skills are the bases of interpersonal, which are related to self-confidence to act and to communicate. (Zulch 2014.)

The project leader is thus the heart of the project team, the one responsible to maintain the proper and supportive environment that will

allow a successful team performance. Communication and leadership skills based on ethical and respect promote trust which, in its turn, increases knowledge sharing and building: the fundamental assets of reaching effective solutions and innovations. Additionally, good communication skills are the way of maintaining and improving the motivation of the team and the key to team alignment.

3.4.3 Project Knowledge Content

In project operations, existing knowledge is usually diverse and valuable; on the other hand, quite often there is an overflow of knowledge. The main challenge in projects remains in identifying the essential knowledge that will dramatically increase the probability of a successful project. The benefits of identifying this essential knowledge, or knowledge content, are clear: the higher the level of awareness about the potential challenges and success factors of a project and the available know-how to handle knowledge the higher is the probability of reaching its success. (Vartilainen, Ruuska & Kasvi 2003, 22.)

In order to understand the whole picture, it is important that knowledge content is analyses and evaluated from different angles. The main three perspectives can be defined as success factors, risks and know-how. In fact, these three perspectives are complementary to one another, as shown in Figure 9 below; the project success factors and project risks forms the knowledge content or existing knowledge and the know-how perspective focus on the mastering of knowledge content. (Vartilainen, Ruuska & Kasvi 2003, 22.)
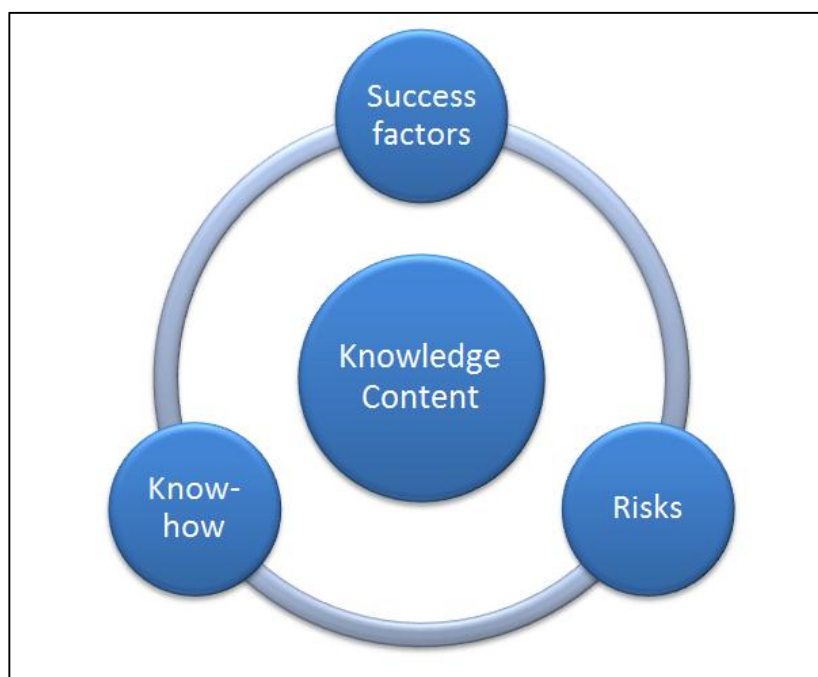

Figure 9.   Perspectives of Knowledge Content

<u>Success Factors:</u>

Successful practices that were applied in previous projects provide guidance to project work performance and are therefore a valuable source of knowledge. The gathering of best practices is usually done at the end of a project, however the identification of such factors both at the beginning and during the projects is also important to evaluate and improve work performance. Knowing and identifying the mistakes done before is also important in order to prevent that the same mistakes are done. As previously mentioned in this work, most of the repeated mistakes of projects are due to a lack or poor appliance of lessons learnt. Ignoring the previous gained knowledge is the main reason for making the same mistakes over and over again. (Vartilainen, Ruuska & Kasvi 2003, 23-29.; Anumba, Egbu & Carrille 2008, ix.)

Several researches have already been done in order to identify the factors that contribute to the success of projects. Some crucial factors are as follows: (Vartilainen, Ruuska & Kasvi 2003, 23-29.)

—   Establishing clear goals and objectives

—   Client relationship: knowing their background and history, identifying possible previous projects, how to add value, listening to client's needs, what are the client's directions, their values and culture.

—   Establishment of a strong project team with high level of cooperation, motivation and commitment and capable of working and building not only with internal team members but also with the client. The involvement of the key project team members right from the beginning of the project, already in the conceptual phase, increases the time members have to learn about the project and its goals, increasing in this way the possibility of success. Additionally, early involvement of members strengths client relationship facilitating the creation procedures and processes as well as the establishment of roles and responsibilities that will ensure work performance efficiency.

—   Capability for collaboration between team members from different offices and departments, which increases innovation by bringing together different views and knowledge in order to gathering better solutions and ways of working. For this to be possible, the organisation must support an open and trustful environment that facilitates knowledge sharing and encourage empowerment.

—   Leadership and communication skills of project manager

- Support from top management and how the project is considered important to the organisation

- The impacts from project external factors

- Trustful, controlled and clear project management and implementation procedures

Risks

Another perspective to determine the factors that affect the success of projects is to identify the risks associated with the project and how to avoid them in the future. Risk assessment is done by the understanding past experiences that prevented the success of previous projects as well as attempting to foreseeing future challenges. The changes in the project operating environment must also be considered, once they promote higher risks when compared to a stable environment. The key factures that contribute to project failure are the following: (Vartilainen, Ruuska & Kasvi 2003, 30-32.)

- Inadequate resources and their constant replacement during the project
- Unrealistic deadlines
- Unclear goals and objectives
- Uncommitted Team Members
- Inadequate planning
- Poor communication
- Conflicts between departments, functions, roles and responsibilities
- Incorrect leadership style from the project manager or poor leadership skills
- Lack of top management support

Know-how

The third approach to understand the critical factors that affect the success of the project is to identify the knowledge, competences and skills that are needed to efficiently perform the project as well as the available knowledge, competences and skills within the organisation to support this need. In this sense, this required know-how expands into three dimensions, upon which it depends, the whole organisation, its cross-functional offices and/or departments and its individuals. The main needed know-how areas are the coordination of the different parts and phases of the project, time management, cost management, quality checking, human resources, communication, risk management and procurement. (Vartilainen, Ruuska & Kasvi 2003, 32-33.)

In a general view, the critical needed knowledge is focused on collecting, gathering and defining information that contributes to the success of the project. Such knowledge includes the objectives of work, technical, organisational and procedural information. The objectives of work complies information regarding the aim of the project; the technical information refers to the tools and systems used to perform the work; organisational information includes the work processes as well as definition of roles and responsibilities and procedural information refers to the ways of acting, e.g. in decision making and in conflicts. Most of this gathered information is assembled into the project plan, which will serve as guidelines for work procedures and teamwork. (Vartilainen, Ruuska & Kasvi 2003, 33-34.)

3.4.4   The Obstacles of Knowledge Sharing

Sharing knowledge and experiences within the project is a prerequisite to building best solutions and reaching project success. It is by sharing knowledge that learning takes place, what leads to more efficient and intelligent ways of doing things with a focus on the whole picture instead of smaller and separate parts. However and unfortunately, most commonly knowledge is not shared as it should. The reasons for this lack of collaboration can be several; however the main reasons remain in "not knowing", lack of making knowledge assimilation possible, lack of relationships and lack of motivation. (Vartilainen, Ruuska & Kasvi 2003, 34.)

This "not knowing" reason occurs when people do not realise that others may benefit from their knowledge and therefore do not trouble to share their knowledge; or when those who can benefit from a certain knowledge do not know who knows (Vartilainen, Ruuska & Kasvi 2003, 34). Not knowing the knowledge an organisation has or has not is actually one of the most critical challenges any organisation has and is therefore one of the core elements of Knowledge Management (Sydänmaanlakka 2012, 175).

Knowledge assimilation needs time, and this is why the second most popular of the reasons for the shortage of knowledge sharing is correlated to the project budget and time schedule, which can be so tight that do not permit any space to knowledge assimilation and share. The other two most critical obstacles for sharing knowledge is directly related to human behaviours and the trust they have upon others. Regarding to relationships, usually people assimilates and share knowledge only from and to those who they know and respect, in other words, knowledge sharing only occurs when there is a trustful relationship between the people involved. So is motivation, people will only be motivated in and environment of trust and respect, as already mentioned in Item 3.3.6 of this Chapter. (Vartilainen, Ruuska & Kasvi 2003, 34.)

Another challenge in today's world is that projects are often decentralised and the project team members are working from different locations. The geographical distance can contribute to a reduction of knowledge sharing, especially because face-to-face communication does not exist or is scarce. Face-to-face communication is perhaps the most powerful tool to increase trust, since it promotes the space needed to open discussions. It is important to stress that communication is not only verbal, but it consists of much more complex expressions and inputs that verbal communication cannot cover and for this reason face-to-face meetings can be considered extremely important, especially in the project initial phase, when dealing with conflicts and when assembling lessons learnt. (Vartilainen, Ruuska & Kasvi 2003, 34-35.)

Today, virtual communication has been replacing face-to-face communication with successful results, especially considering the fast development of technology and the increasing opportunities it brings. However, virtual communication cannot fully act as a substitute to face-to-face communication, at least not yet (Vartilainen, Ruuska & Kasvi 2003, 34-35). Additionally, strong skills and techniques of managing virtual communication are needed in order to create the required trustful environment that will promote knowledge sharing. Virtual communication related challenges, skills and techniques are covered in Item 3.5.

As a conclusion, the obstacles knowledge sharing faces within projects are more related to human factors. The individuals' ability to learn and will to share, their relationships and how they interact between one another as well as the trust they have upon the environment and other individuals will affect how well knowledge will be shared. The lack of awareness of the importance of knowledge dissemination together with the unwillingness to disseminate knowledge is a critical challenge that teams and organisations have and identifying these problems should, therefore, be one of the focuses in projects initial phase and planning, considering also the time and budget required to knowledge assimilation. In addition to that, more and more projects are scattered across different locations, which increases challenges in communication. For this reason, knowing how to manage virtual teams has become one of the most important tools to reinforce team collaboration and performance, which will lead to successful projects.

3.5   Managing Virtual Teams

3.5.1   From Physical to Virtual

As already mentioned in previous chapters, the fast development of technology, especially in the field of communication, has been playing an important role in connecting people all around the world, allowing an

exchange of cultures and opening the doors for new ways of doing and seeing things. This development together with the constant seeking for economic advantages, doing more with less and diminishing of extra costs, e.g. travel costs, has driven global organisations to make more use of their worldwide distributed workforce by increasing collaboration among them in order to both increase competitiveness and retain a place in the market. Virtual team has thus become perhaps the most important facilitator to increase competitiveness. However, the skills of how to manage virtual teams to make them work properly and effectively have become one of the most critical challenges that global organisations are facing today.

Virtual teams can be described as a group of people, with the same characteristics and challenges of teams described in Chapter 3,   who collaborate to and interact with one another mainly by electronic means with the purpose of performing and fulfilling a specific task. The collaboration of virtual team members occurs across geographical, time, nationality and cultural boundaries with the purpose of making use of the best competences a company has or the best candidates to perform a certain task around their different offices and countries. While this might promote huge advantages in effectiveness, simultaneously, several challenges are raised. (Saarinen 2016, 9, 23.; Levi 2014, 284-285.)

Technological tools and systems are one of these challenges, especially because team members must rely on those in order to perform their tasks and be productive. Finding the correct system or tool to be used, common and useful to all members as well as the still concerned technological capabilities, restrict and even political issues, e.g. in China, might create obstacles for such collaboration and achieving team efficiency. The variety of technological communication tools available is numbered including both text-based and audio media that are used to share information and work as collaboration channels to reinforce teamwork. Examples of text-based communication, more can be emails, share points and different document management systems and examples of audio media can be telephone calls, online meetings, chatting, video conferences and blogs among others. (Saarinen 2016, 23.; Levi 2014, 284.)

In fact, the alternatives are so wide that choosing the correct communication channels used by the team in order to ensure team performance effectiveness is a critical and difficult task that should be considered in the conceptual phase of team creation. Clear communications procedures must be in place in order to members know how to work, to whom contact, how to search for information, how to communicate and how to share knowledge. The question remains in finding the right tools that facilitates and increase the interaction of the team members as well as team performance efficiency and alignment. (Saarinen 2016, 24.)

If managing teams is a difficult task, since it has to do with people and building trust among individuals as previously described, virtually this task is even more difficult. Physical presence and face-to-face communication is one of the most important tools to create and build trust and deal with difficult situations, once they give room to emotional and other factors that make communication more real and dynamic diminishing the risks of misunderstandings that verbal communication by its own might create. The replacement of physical presence with virtual is a challenge that managers are increasingly facing. For this reason, the know-how of managing virtual teams effectively has become a key factor of organisational development. Managers play an important role in bringing the right and required trustful environment to team performance, how they adapt their skills to this changing environment is a definite factor to how virtual team will perform. The capabilities and skills of a team leader in virtually managing their teams and bringing the necessary trust environment that will reinforce members' commitment correlate to how well the teamwork will succeed. For this reason leadership skills have become more and more demand in the virtual world as have the leader's skills related to openness, cross-cultural understanding and interaction as well as their utilization of technology. (Saarinen 2016, 9-11.; Levi 2014, 298-299.)

3.5.2   Globalisation & Technological Development and Teamwork

Globalisation together with the fast development of technology has brought a great number of benefits and opportunities to organisations to cope with the continuous changes in today's business world. Such benefits are very well seen in global organisations, once they have the chance to cross geographical and time boundaries making use of their global expertise in order to serve their clients with better and innovative solutions at the same time that costs are reduced. Diversity is one of the key elements to innovation and virtual collaboration has provided the possibility of creating teams with members from different cultures and backgrounds, what open rooms for thinking outside the box, for seeing things in other ways, for creation and innovation. On the other hand, this virtual collaboration faces several challenges as well, which are described in more detail in Item 4.3 below. (Saarinen 2016, 9-10.)

As already mentioned in previous chapters, work life is getting more complex than ever. This increase in global collaboration, not only regarding to the business world, but also regarding to people's personal lives, has contributed to both an increasing amount of knowledge available and increasing possibilities of learning. For this, the knowledge era has arisen and with it the need to organisations to work more intelligently giving value to employees who have features of collaboration, teamwork and will to learn. Correspondently, workers are more demanding towards their workplaces making employee motivation

one of the most important elements to guarantee employee engagement. This online collaboration, crossing the limits of time, creates the impression that people need to be twenty-four hours a day available, increasing in this way the need to self-time management. In addition to that, the amount of information a person receives per day is tremendous and the time they have to analyse the information is getting smaller and smaller. For this reason, it is essential that virtual teams are well managed and most importantly well aligned, that roles and procedures are clear and that the tool they use to share information allows this collaborative way of working.

Virtual collaboration (or any kind of collaboration) does not happen without an environment of trust, respect and openness, what has been forcing organisations to move into a more transformational leadership style, which promotes and stand for such kind of requirements. In addition to that, as work has become more complex, the consistency and use of virtual teams has increased and developed continuously. One contributor to that is definitely the new digital native generation, who was already born and has been growing within a virtual environment, what contributes to a much faster acceptance of changes and what will lead to further improvements in virtual life. Today the youth who is entering their working stage of life sees virtual communication as a common part of their lives, and therefore, much of the challenges people are facing today with this virtual changes will, for sure, not be of such big issue in the near future. (Saarinen 2016, 9.)

Current researches show that virtual communication, regardless its large range of possibility it already provides with the existing technology, does not have the same effects and impacts of face-to-face communication. On the other hand, there is an increasing and continuous need for making more use of virtual work, what in turn faster the development of communication technology. The tendency is thus that virtual teams will continuously increase and evolve as will the value they give to organisations facing the characteristics of new digital era employees and the continuous development of more collaborative communication tools and systems. (Saarinen 2016, 10.; Levi 2014, 299.)

3.5.3   The Challenges of Virtual Teams

Virtual teams main challenges remains in communication and building effective relationship between team members to promote trust, which, in its turn, will increase collaboration between the members. Both challenges are correlated to each other, i.e. the more communication works in a positive way, the more positive will be the relationship between members and vice versa. The selection of the adequate communication and collaboration technology to be used and to support teamwork plays an important role; however, the main problems are still due to a lack of clear communication procedures and management that

leads to misunderstandings and ambiguity problems in task performance. (Levi 2014, 288, 297.)

Physical distance from team members usually causes a lack of familiarity between them causing a negative impact in building relationship and consequently trust among the members. The feelings of isolation, loneliness and not belonging to the team are challenges that virtual teams members often suffer, once the interpersonal social relations are missing or very scarce. In addition to that, when compared with face-to-face teams, virtual teams initiates with a much lower levels of trust and cohesion between the members. This is because they are from different cultures and backgrounds having different rules, procedures and ways of working. For this reason, in order to be effective, virtual teams need a much more structured, coordinated and clear objectives, rules and work procedures. Leadership becomes then the key factor that will make an impact on team performance. Transformational leadership, with focus on developing and increasing the social and emotional side of teamwork, which will lead to team alignment, is thus crucial to reach success. (Levi 2014, 297-298.; Saarinen 2016, 27-28.)

Diversity has been already said to be one advantage in teamwork bringing valuable inputs of people from different cultures and backgrounds, which enriches the creation of new ideas and innovations. On the other hand, diversity brings also challenges. Differences in cultural values, beliefs and ethics might have a great impact in team performance, especially in relation to communication and leadership, since these differences might cause misunderstandings and difficulties at several levels. Language is a typical problem, even though language skills might not be the issue, very often both written and verbal communication are misunderstood or interpreted in different ways depending on the culture. Cultural differences might be a challenge also in working face-to-face, however, this challenge is still emphasized in virtual work, once communication many important factors and elements of communication are restricted. (Saarinen 2016, 26.)

Communication is much more than simply words. Verbal communication is the understanding of the meaning of the spoken or written words, of the silenced ones and all the space between them. This understanding and interpretation of words will deeply depend on personal experiences a person has as well as their cultural values and ethics. Visual communication is as important (and sometimes even stronger) as verbal. Physical and emotional expressions, gestures and even colours and all different senses tell and show a great deal of the truth. A mixture of verbal and visual communication provides thus a much deeper understanding of the whole. Taking away the possibility of visual observation of behaviours is therefore of the biggest challenges faced by virtual teams in building relationships and in the attempts to seeing the whole picture. Even though certain technology, such as video conference

among others, can be used to cover this missing non-verbal communication, they are not as effective as meeting people face-to-face. Balancing physical and virtual communication as well as providing clear work procedures, rules, definition of tasks and objectives is the key to ensuring the effectiveness of virtual teams. (Saarinen 2016, 25-26.)

3.5.4 Creating an Environment of Trust within Distance

As already studied in previous chapters, trust is the key factor to collaboration and knowledge sharing, which in their turn are the contributors to team alignment and cohesion transforming it into an effective team. Building trust depends on social relations, making it one of the biggest threats for virtual teams, once face-to-face encounters are either scarce or non-existing. Leadership plays an important role in bringing and building an environment of trust and respect that will allow collaboration. Replacing physical presence with virtual ones is not an easy task, but it is something that team leaders have to deal with and be prepared to (Saarinen 2016, 11).

As leadership is one of the most important elements to team performance, virtual team leaders need to have strong transformational leadership skills and behaviour in order to promote and build the so required trust environment. Furthermore, besides these leadership and all the project management skills a leader should have in order to create and build team alignment and cohesion, virtual team leaders have to know how to overcome the challenges that distance, time, different cultures and languages brings when leading their teams. The knowledge of influencing cross-countries people to collaborate with one another and share their knowledge in order to fulfill a task efficiently is the most valuable knowledge a virtual team leader can have. (Saarinen 2016, 29, 33.)

Indeed there are several tactics to facilitate, better coordinate and improve trust and consequently team performance. Such techniques are based on creating alternatives communication channels that will ensure, encourage and increase open and transparent collaboration between members. The development of communication plans, norms and clear procedures are elements to avoid misunderstandings and possible conflicts as is the definition of tasks and clarification of the team objectives. These are the elements that increase motivation and commitment. (Levi 2014, 298.)

Increasing Influence

The skill of influencing is essential to team leaders; it is by influencing others that the leader will guarantee commitment and team alignment. In a virtual context, it has been researched that influence is performed similarly as it does in face-to-face environment, however, the influence

techniques used might considerably differ from one another. The reason for the differences is due to the challenges a virtual environment brings when compared to face-to-face environment, especially regarding presence. According to Wadsworth's and Blanchard's (2015) "Influence tactics in virtual teams" study, influence tactics in virtual environments tend to be more assertive and some are performed in novel communication ways to emphasise or create a sense of pressure, coalition, legitimation, rational persuasion, consultation or personal appeals. Examples of such tactics are adding the word "Urgent" in email subject fields, the use of colours to emphasise the level of importance or emoticons to describe emotions. (Saarinen 2016, 103-104.)

These might seem little and simple techniques, however, they play an important role in enriching influence and bringing positive impacts to communication. Emotion is the main element of building trust and influencing others, when the tools of eye-contact together with the strength of non-verbal communication are missing, it is much more difficult to influence or pursue others. All the new ways to fortify emotion are thus important and make a difference. Since virtual teams have limited social relations, an active leadership based on reinforcing and developing of social and emotional aspects of teamwork is crucial. Once again a communication plan where commonly agreed practices, procedures and rules for interaction is needed in order to prevent communication misunderstandings and unclear items that might create confusions, conflicts and lack of motivation. (Saarinen 2016, 129.; Levi 2014, 298.)

As discussed previously in Item 4.3 above, one of the most critical challenges that might prevent the success of virtual teams are misunderstandings and ambiguity of tasks especially due to a lack of or poor communication. For this reason, virtual teams need more structured performance and communication plans, so that they know what to do and are able to monitor themselves, their performance and their behaviour towards other members as well are able to coordinate their tasks within the team and between other team members. Clear procedures, rules and norms to be adopted and used by all team members are thus necessary to ensure effective team performance and collaboration as is periodic meetings to reinforce influence, motivation and collaboration that will contribute to team alignment. (Levi 2014, 298.; Saarinen 2016, 105.)

The possibilities to influence in virtual environment are much less than in the face-to-face environment. However, they can be improved and developed as members starts to know one another. By increasing familiarity within team members, the level of the personal relationship between the members also increase, giving more space to build trust and influence. For this reason finding a balance between virtual and face-to-face meetings is of great importance in building relationship. Periodical

face-to-face meetings or site visits that include social activities are important tool for building and maintaining relationships. Meeting face-to-face is critical in the beginning of the project in order to accelerate relationship building, establish communication procedures, rules and norms as well as to define and clarify tasks, objectives, roles and responsibilities. Additionally, encouraging team members to maintain their relationship by means of continuous informal communication between the members is also a good way to increase familiarisation among team members. (Levi 2014, 298-299.; Saarinen 2016, 18-19, 106.)

Important strategies to increase influence are thus focused in building relationships and strengthening communication. Building relationship strategy, as mentioned above, is creating ways of establishing and reinforcing the personal social connection among team members, i.e. increasing familiarity between the members. Strategy to strengthening communication can be developed by documentation, establishing ways that leaders and members can record and document communication for clarification, coalition, and legitimation as well as to avoid possible misunderstandings and ambiguity. Such influence strategies are meaningful in building trust and as strategies they can be useful for increasing organisational memory. (Saarinen 2016, 106-107, 128-129.; see also Wadsworth & Blanchard 2015.)

Trust and Commitment Dynamics

Trust and commitment are essential for any successful teamwork, however building trust takes time and the facilitator of such is face-to-face co-working, which increases and accelerates relationship building. Trust is also a pre-requisite for commitment, which is the key to elevate team performance. Trust is the fundamental element to make people work together efficiently; it is the key factor in gathering positive results in collaborations and sharing knowledge, which contributes to reaching the best solutions and successful completion of tasks. For virtual teams, building trust is therefore a great challenge due to the fast-paced and vigorous nature of their teamwork and the scarce possibility of face-to-face encounters. (Saarinen 2016, 135, 138-139.)

Most of the work of virtual teams is done basically individually from members spread in different locations (Levi 2014,). Trust and commitment is thus fundamental for the success of the whole team performance and which must be present in three dimensions: the members have to trust their leader and be committed to the leader; the leader have to trust that members are committed and will accomplish their tasks the best way possible; and the members must have the trust that other team members are committed to and capable of fulfilling their tasks. In building this three-dimensional trust and commitment it is important the acceptance of a democratic virtual space, where members can collaborate and communicate to one another without the fear of

speaking and in an environment of openness, transparency and respect (Saarinen 2016, 178).

While building trust mostly occurs through social relations, due to the scarcity in possible face-to-face meetings to reinforce the social relations, in virtual teams quite often trust is gathered by work performance that meets expectations and by previous team experiences (Levi 2014, 299). Emphasising the beliefs, and perhaps assurance, of the expertise of others and showing the good achievements in previous teamwork is a way of accelerating the process of building trust (Saarinen 2016, 139). Focus on positive results and achievements, instead of stressing the negative sides of a person and the differences in ways of working that might act as obstacles, is thus fundamental to team alignment and have a positive and important impact on the interaction of team members. One major barrier for building trust are culture differences that might create misinterpretations in communication as previously mentioned, existing prejudgments and formulated stereotypes towards different cultures, locations and even people are important obstacles that cannot be forgotten (Saarinen 2016, 140). The reasons for those cultural challenges are very often related to a lack of cultural knowledge, improving the relationships among different cultures are therefore crucial for constructing trust.

Malhotra, Majchrzak and Rosen (2007) carried out a study on leading virtual teams and the results showed that a significant problem virtual teams face is a lack of clear and common work procedures and processes, which give rooms for misunderstandings and conflicts. Creating meeting routines with clear objectives and agenda, rules of common practices and procedures are thus extremely necessary not only to build trust and reinforce commitment, but also to increase team cohesion and gain the whole picture about the project situation (Saarinen 2016, 139). In their study Malhotra, Majchrzak and Rosen (2007) suggested the following practices to virtual team leaders to increase trust within the team:

– Establishing, maintaining and increasing the sense of presence by means of continuous and active use of communication technology

– Making the differences brought by diversity understandable and acceptable for all team members<

– Good management of virtual work performance by providing regular meetings as well as monitoring of team performance and progress

– Evolve visibility and transparency of virtual members and their communication inside and outside the team. The outside will also serve as existing information for future or other teams.

– Ensuring that individual members get benefits from virtual contributions

Building trust is not easy, especially in a virtual environment, however, creating clear and structured communication procedures and practices as well as well defining tasks and roles are the key elements to increase team performance and increase trust. Balancing the virtual environment with regular face-to-face meetings strengths social relationships among members to ensure that trust is developed. The creation of open and transparent environment for virtual communication, collaboration and knowledge sharing is the key factor to accelerate relationship building as well as provide a space for creativeness and innovation. The below Figure 10 completes Figure 1 in Chapter 2 of this work, showing the important relationship between common goals, commitment by trust and a proper virtual environment to fortify collaboration. At last but not least, emphasising good achievements and expertise of members is an important attribute to overcome existing prejudice and stereotypes that act as a critical obstacle in building trust, commitment and relationship.
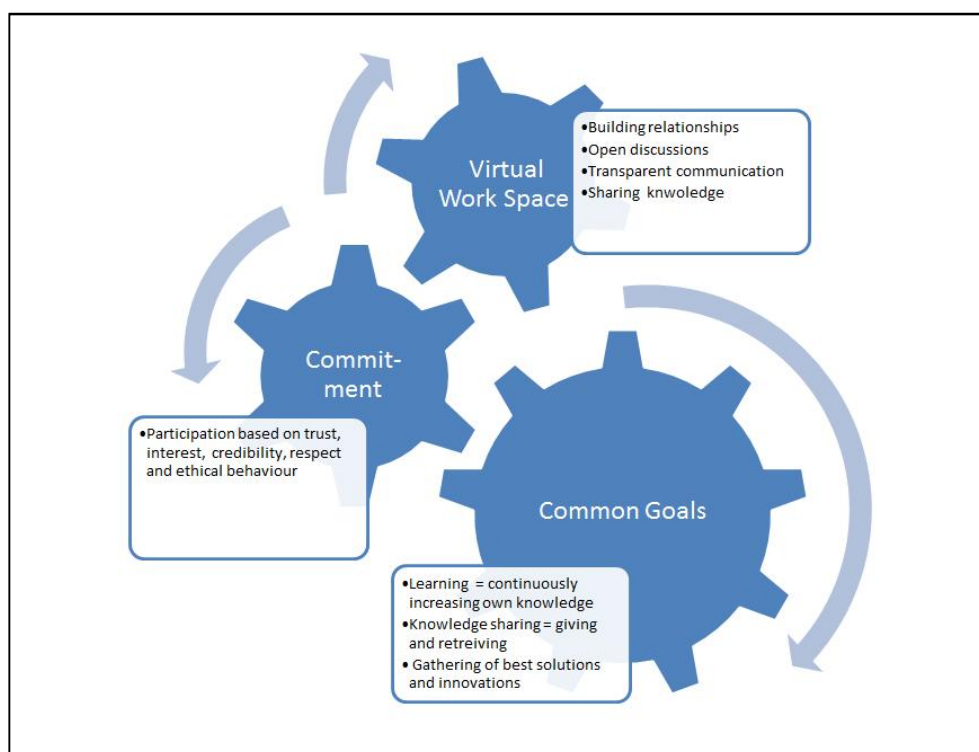
Figure 10. The Characteristics of CoPs – Completed – Adapted from Dalkir's "Common Characteristics of CoPs" (Dalkir 2005, 122).

3.5.5   Balanced Digital Environment

The opportunities the fast development of communication technology together with the pressure for being more effective in order to increase competitive advantage has forced global organisations to move to the virtual world. This change offers infinite opportunities in several aspects,

from economic aspects of cost reduction to creating innovations and being capable of serve their clients with better solutions. Communication technology has been fast developed in order to cope with the challenges and required needs virtual teams have. However, pure technology still do not completely cover face-to-face contacts needed to build relationship and create the demand environment of trust teams need in order to be effective. (Saarinen 2016, 14-15.; Levi 2014, 297-299.)

In order to build the relationship between team members that will lead to an increase of trust and consequently team performance, balancing virtual with face-to-face regular meetings has proven to be an effective way to build, support and reinforce trust among team members (Levi 2014, 298). Avoiding virtual work overflow is also important. This can be done by verifying and evaluating the number of virtual meetings as well as preparing clear agendas and objectives to be achieved in the meetings. Meeting guide lines contribute to improving the quality of the meetings and work performance. Such guide lines should include, among others, information about who actually need to be present, how to prepare to virtual meetings (models of agendas, background material, giving time to others to learn the agenda and the material), meeting behaviour issues (making sure of equal speaking opportunities to all participants), proper and available channels and meeting facilitator and other support people and their roles. (Saarinen 2016, 18-19.)

A common virtual environment for sharing information and knowledge, considering both explicit and tacit knowledge, increases collaboration and the possibility of innovation as well as facilitates building relationship and trust (Saarinen 2016, 18-19). However, not overflowing virtual work is also important to consider in this respect. Usually global organisations are provided with different technological tools that can be used for communication, collaboration and knowledge sharing. This creates a conflict in which tool to be used and most of the time, the use of several and different tools might cause duplication of work, risks of not having the latest information of knowledge available and above all a tremendous loss of time and increase in costs, once time is needed also to learn how to use new tools. Selecting the correct tools and agreeing on the tools and systems right from the beginning prevent possible conflicts, misunderstandings and minimize risks and loss of time. Today's document management systems are already provided with features that support communication, collaboration and knowledge sharing. The only challenge remains in finding the correct competence that understands and sees the whole picture, not simply the technical possibilities but also the team, their goals and objectives as well as the needs to fulfil the task. And this is where a Knowledge Management specialist stands for, a role that unfortunately is missing from many global organisations.

4 EMPIRICAL PART

4.1 Case Study 1

4.1.1 Background of the Project

This case was an investment project in Europe in the industry field with the intention of reconstructing a part of an existing mill to cope with market and sustainability demands. The company was awarded with the basic and most of the detail engineering of the project; however, some of the engineering was carried out by another company, which was, indeed, a strong competitor of the company. The project was realised from the end of year 2014 until the beginning of year 2016. The time schedule was very tight for this kind of industrial project. The project faced some particular challenges, especially in the initial phase due to the level of confidentiality of the project that restricted communication and the gathering of important and necessary information from the mill. Another important challenge was the incorrect or too optimistic estimates in time and resourcing plans and schedules, principally because the company did not previously have strong experiences with this specific reconstruction type of project.

In addition to the above mentioned challenges, the company faced two more that were significant. The first one was that the project was the first big and complex project the company was awarded after difficult times in the market that forced layoffs and internal restructuring. Finding the correct competence with proper skills and enough available time to handle the responsibilities was difficult. The other challenge was that the detail engineering was split and part of the engineering was carried out by a competitor, creating obstacles in the sharing of information and cooperation.

The awarded engineering was split and carried out mainly by three offices in different locations, two of which in the same country, including the main office, but in different cities. In this research, main office is understood to be the office with contractual responsibilities. Other global locations were also eventually used in smaller scale to assist and provide specialised needed engineering, but were not involved in the project for a long period of time. Previously to the commissioning phase of the project, part of the organisation moved to the mill site.

The project organisation, presented in Figure 11 below, consisted of a project supervisor, the project management team and engineering team, which was divided vertically by areas and horizontally by disciplines. The project management team consisted of a project manager, a project coordinator, who was at the beginning an external person employed only for this position and later on was replaced, a project assistant, a time

scheduler and a document manager who joint only after the project had already initiated. The main reason for this position was to monitor suppliers' documentation and to handle the project document management system that was an additional product sold to the client. The organisation presented only the key project people, other resources used during the project were not indicated in the organisation chart. During the project, resources were changed frequently, including some key resources.
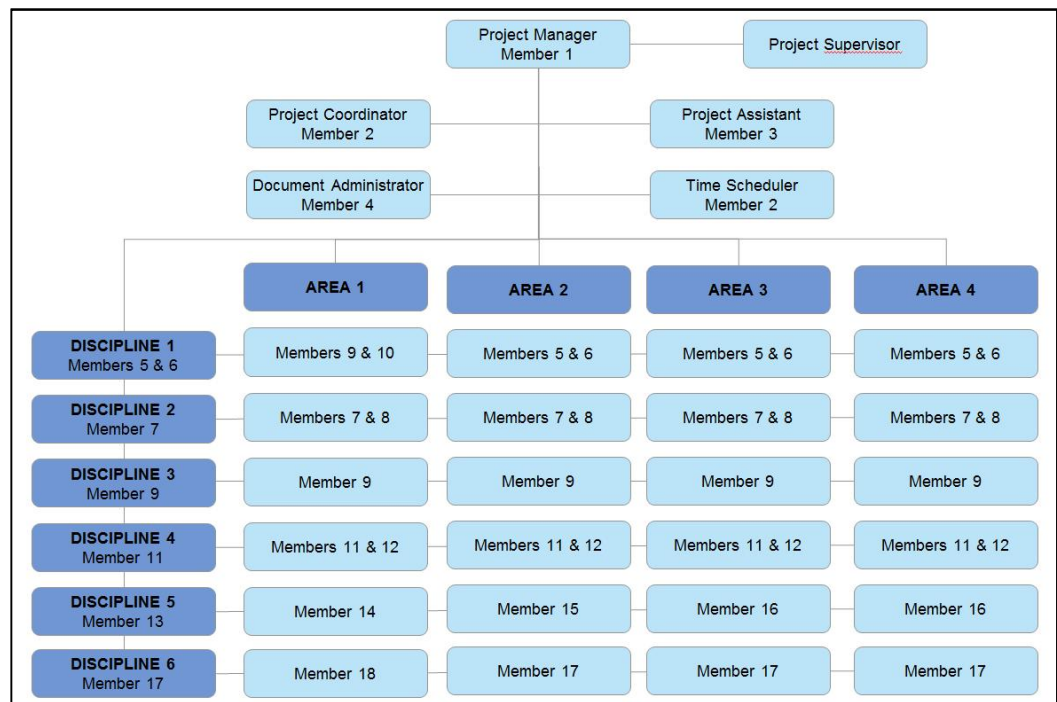
Figure 11. Case 1 Project Organisation Chart

In general roles and responsibilities were not clear nor well defined causing misunderstandings and confusions about responsibilities. The organisation itself shows that some people had several responsibilities and could not receive support, once they were both discipline and area leaders at the same time. Additionally, the organisation showed that in some cases more than one person shared the same responsibilities what also contributed to confusions and misunderstandings in responsibilities and in task performance.

The confusions were even increased due to unclear delivery limits in the scope of work that allowed different understandings and viewpoints, which consequently generated problems in work performance and in competence and time management as well as contributed to engineering mistakes. The project team was formed after the project has been awarded. The project manager was involved in the sales process, however discipline leaders were poorly involved. This explains the importance of having the involvement of project key people already in

the development of the scope of work in the sales or conceptual phase of the project. A clear definition of roles and goals is a key tool to ensure the effectiveness of the project, prevent risks and guide in choosing the proper competences to ensure the success of the project.

The project management team faced several problems. In the restructuring phase of the company, the roles of project managers were changed and many administrative tasks, which were previously under other administrative departments, became their responsibilities. This change created challenges to the project manager to find the time to actually lead the project, their team members and most importantly, time to be with the client and listen to their needs. Besides the additional administrative works, the employed project coordinator was not supporting the project manager as he should. The reasons for that were several, however the main reason was perhaps because as an outsider, the coordinator did not know about work procedures, rules and tools among others and had very little time to familiarise himself with the company culture. As the project itself had a so tight time schedule, the role of the coordinator to act as a supportive person to the project manager did not work and caused more harms than goods to the team. Eventually, the project coordinator was redundant and the project time scheduler started to act both in his own and coordinator roles.

Work procedures were also challenging. There was an underestimate about the difference of work procedures from one location to the other. Due to the tight time schedule of the project and the quick start, there was a lack of time to go through and establish work procedures, causing conflicts, misunderstandings and duplication of work. Document handling instructions including communication procedures were produced and shared. The instructions were comprised in two different documents, one with a focus on internal communication and document handling and the other with a focus on external communication and document handling used to all project teams from other organisations. However, it was not clear whether all team members had read and understood the instructions, especially regarding temporary team members. The tight time schedule of the project forced people to jump to task performances before understanding the procedures.

The communication channels used were emails for sharing of information, regular meetings and straight conversations either by telephone or face-to-face discussions and agreements. There were no instructions or common procedures regarding communication, which gave space for different ways of sharing information and misunderstandings about who actually needed the information. The use of emails was, therefore, abusive, causing an overflow of information to team members and consequently, important information was missed or never reached the person who actually needed it. Regular internal project meetings were held in weekly basis partially face-to-face to those

co-located members and virtual to those in other locations. The participants of the internal meetings were the key project team members, however some were not invited. The environment of the meetings was open and members usually spoke freely. The notes of the meeting were collected into an action list available to all team members.

The engineering tools used in the project was not previously used in some of the office locations and therefore created some problems and loss of time to learn how to use. The project had two different document management systems, one to internal documentation and the other was a product sold to the client to handle the whole project documentation from all parties. This second system was the official document management system of the project and documents was considered official only when entered to and distributed from the system. At that time, the company was introducing a new document management system, however, due to the tight time schedule and the lack of knowledge about the new system, the old system was used. This system was a very good tool to document management, control and distribution; however, with strict focus on document management, it lacked features for communication and collaboration. The other document management system used for all project parties was used only for document management purposes and did not have any communication and collaboration features in order to build knowledge.

Even though many challenges were in place, the team successfully managed to achieve their objectives and add value to their clients. The team members were successfully able to cross the difficulties and conflicts maintaining a good relationship within a general good atmosphere and environment. The level of commitment of the team members to perform the work was good, which contributed to gather positive results and increased relationship building. However, there were many problems that had to be fixed and that could have been prevented if certain actions were done in advance. Trust within team members and towards the leader was present but could be of higher level. As explained in the next Item 4.1.2, one of the findings was related to a poor project management due to several reasons.

4.1.2 Findings

As previously mentioned, the findings here presented were developed based on the gathered information from the lessons learnt workshops, the report with the results and my own observations. Both the findings and the gathered information to the analysis considered only information related to the topic of this research. Based on the analysis the critical problems were related to the project scope of work or project goals, information flow, organisation, resourcing & roles and technological tools.

Scope of Work (Goals)

The scope of work was not clear enough having many unclear or missing items that caused misunderstandings and confusions and was interpreted in different ways. The delivery limits between engineering parties and objects and what was included and excluded from the scope of work were not well specified generating an overall miscomprehension in responsibilities affecting the completion of the project tasks and led to further problems. The language of the scope was not clear, what also contributed to the misunderstandings and confusions. Such misunderstandings and confusions created several problems and one important was the uncertainty about the documents to be produced that caused either the production of unnecessary documentation or necessary documentation was not produced in time. In projects, documents are sources of knowledge and function both as outputs of certain processes as inputs for the initiation of another sub-processes. As such, when a certain document is not produced, a new task of the project cannot start, and this might cause a delay in the whole project time schedule. On the contrary, when documents are produced more than necessary they might contain different data causing more misunderstandings. Additionally, creating unnecessary documentation means loss of time and inefficiency. Besides affecting the project time schedule, the problem had also an impact on resourcing, once the number and the type of resources required was unclear. Clear goals are the foundation of team alignment, when unclear they compromise teamwork, open the doors to conflicts and generate confusions of responsibilities. Especially when team members are empowered, without alignment the situation can be chaotic.

These problems in the scope arose due to several reasons. The tight time schedule of the project created challenges to the development of the scope of work. The initial data or base data to scope development was not enough causing an underestimation of the complexity of the actual workload. The reasons for the misconception of the workload were because it was prepared based on too optimistic figures from previous projects and a lack of knowledge about this specific type of project. One crucial fact that had an enormous impact to poor scope of work was that it was developed without or very limited participation of the team leaders and decisions were made with not enough knowledge to cover all the requirements of an effective and clear scope of work.

The involvement and use of the knowledge experts in the development of the scope is crucial to diminish the risks of having not understood, mismatches or missing information. Their involvement contributes to gather the specific requirements to the success of the project and to add value to the clients in the search for the best solutions and most efficient way of running the project. As studied in the theoretical part of this research, it is the change to seeing the whole instead of the parties that

leads to success and it is only with collaboration that the best solutions and innovations are born. The scope of work is the goals of the project and therefore it must be clear, well understood and most of all challenging, but not impossible. For this reason, the collaboration of discipline leaders is important in this phase. Their collaboration with the clients, listening to them and understanding their needs are to tools to provide the best scope that is suitable for the project. This collaboration also helps to prevent misunderstandings, confusions and conflicts further on as well as facilitate competence and resource management and contribute to team alignment.

As contributions of key team members, time is also necessary to the development of the scope of work. Writing the project goals, i.e. the scope of work, must be done carefully in order to make it clear and understandable to all project parties and team members. The language used is therefore an important factor. The mistakes and not clear items in the scope could be avoided if there were a rank of feedback and comments collection upon the draft version of the scope. Due to the high confidentiality level of the project, the project team should be formed well in advance and their contributions and questions gathered before the final scope of work was signed. Additionally, language is a matter of quality that must be considered as a prior factor when developing goals in order to avoid unclear items, misunderstandings and mismatches, not only within the project team members, but also with the client and any other possible party.

Information Flow

One main problem related to the sharing of information during the project was the abusive use of emails. Emails are good tools to be used for remarking things that has already been previously discussed and agreed to make them officially written. However, emails might become a problem when they are used in a large amount, especially when some information is missing and needed fast. The number of emails team members received per day was enormous, and the time they had to open, read, filter and analyse the data inside the email was very short, especially due to the tight time schedule of the project. By nature, emails are very one sided, what makes the building and sharing of knowledge difficult, since it misses the collaboration and knowledge exchange feature and for this reason should be avoided in this purpose.

One critical challenge found in the project was the uncertainty whether a key person that needed some kind of information actually received it. One reason for that was exactly this abusive use of emails. The problem was both in the sender and the receiver. From the sender point of view, once the email with the information was sent they had the false impression that their job were done, without the assurance that the other person or people have actually read the email, understood the

message and started taking the right actions. From the receiver viewpoint, once the number of emails received per day was too many, they had to filter which ones to read and sometimes they missed the emails containing important information with urgent actions to be taken.

This abusive use of emails was enlarged with the problem of unclear roles and responsibilities that led to the unnecessary sending of emails to a larger group of people. Consequently this caused a lack of control and an increased time in decision making, which decreased effectiveness. In addition to that, this generated an uncertainty whether the message was really reached the correct person, and that it was read and understood.

Another important factor that created challenges in the flow of information was the constant changing of resources that happened during the project. These changes had an impact to time consumption, due to breaks in the continuation of tasks or the need to restarting some tasks and the time expended in both explaining and learning about the tasks and the whole project. The impacts in time consumption were even greater due to the lack of clear roles, responsibilities, goals and procedures.

The lessons learnt showed also a poor level of communication and collaboration between different disciplines, which caused mismatches in the different data used by each discipline in their engineering design. This mismatch of information contributed to later fixing of engineering to make different disciplines compactible to one another. If the communication, sharing and management of knowledge had been played well, such problems would not have occurred and efficiency would increase. This problem emphasises not only the poor communication, but also the lack of clear procedures and roles definitions. Managing data and information is crucial for the wellbeing of the whole project, knowing what data is the correct one and the one to be used by all disciplines is the fundamental element for success. Project instructions and procedures for document handling were prepared, however a project communication plan was not clear enough. In addition to that, it stayed unclear whether all team members actually were aware of the existence of the plans and whether they were read and understood.

A good project management is the key factor to a successful communication that fosters collaboration and through it knowledge sharing and building. When the project management team lacks the time or the competence to provide such supports, the project and the project team suffer. The problems encountered in the project management team are discussed in more details in the "Organisation & Resourcing" section below. However, it is important to mention here that the lack of a good project management contributed to the problems in information flow. The reasons were a lack of a clear communication plan and procedure and a lack of a responsible person or role to manage communication and

knowledge processes. Such processes should be in place to ensure that information is well distributed and understood, to avoid overflow of information to other team members, to manage the data to be used and that all engineering discipline is provided with the latest information and data necessary for their design and compactibility to any other discipline. Such processes should be developed right from the beginning of the project and even previous to its starting in the conceptual phase. It has been already mentioned the importance of key team members involvement in goals clarification and development, who will need and analyse the quality of the initial data which contains all the basic information that will affect the scope of work. Therefore it is important that such data is well managed already from the beginning, which indicates that the responsible person for communication and knowledge management is a part of the team also from the start.

As already mentioned, regular internal meetings were held in weekly basis with the participation of the project key project team members, however not all key members were invited to the meetings, e.g. the project assistant was not always invited. This exclusion shows some possible hierarchical viewpoint of the organisation that might generate the feeling of not being valued in the team, which might decrease trust, motivation and commitment. In the theoretical part of this research, the importance of a more transformational leadership was discussed, such leadership approach focus on diminishing the old-fashioned hierarchical way of using leadership, which is in fact an obstacle to strengthen trust. Additionally, motivation and trust is increased only in an environment of respect that does not underestimate the expertise of any member. A key factor to increase team performance and efficiency is the involvement of all team members to work together, it is the differences and diversity in their expertise and viewpoints that will lead to the creation of better solutions to the project as a whole and to the challenges during the whole project life-cycle.

The arrangements of the internal meetings were done by the project manager. Meeting rooms were reserved to those members that were in the same location and other members from different locations participated virtually. The tool used was Skype by which the necessary presentations or documents were shared in the screen. Face-to-face meetings with the participation of all project key team members were rare if none, what had a possible negative impact on building relationships and development of trust. On the other hand, this low frequency in face-to-face meetings was due to the great numbers of face-to-face meetings with the client and other suppliers, which thus diminished the time in making arrangements for internal face-to-face encounters.

The environment of the meetings was open, not so formal and members usually spoke freely and honestly. Meeting memos were not prepared,

however, open items were handled and documented by a working and continuous action list, showing the open items, actions to be done, responsible and due date for the action. This action list was updated during the meetings with the input from all members. Agendas for the internal meetings were not prepared, however usually the meetings had the same structure and when changed, it was informed at the beginning of the meeting. The use of the action list had a positive impact in the efficiency of the meetings. On the other hand, the list could be even more efficient if there were a more proactive way of using the list by the members, which would give a more up-to-dated and liable information. This also shows the importance of developing clear work procedures.

Organisation, Resourcing & Roles

The project had a considerable tight time schedule, which brought several challenges to the project organisation. The lack of involvement of the project key members and correct expertise in the development of the scope of work caused misunderstandings and underestimations in resource planning, resource management and work load. The tight time schedule also made people simply jump into the project without having the time to learn about the project.

As previously mentioned roles and responsibilities were not clearly defined. The organisation presented people with double responsibilities and responsibilities shared by two people. The unclear and/or duplication of roles promoted misunderstandings and confusions in responsibilities and had a negative impact in efficiency, decision making and the whole team performance and contributed to conflicts and engineering mistakes.

The underestimation of work load, especially at the beginning of the project, caused a problem in placing the correct competence in the organisation that was challenged also due to the availability of such competences. This created a continuous change in the project team key members, which in its turn, contributed to difficulties in commitment to the project, break in communications, confusions, team performance and inefficiency. Once again, this proves the importance of securing the key competences to the whole project from the beginning till its end. For this reason, the involvement of HR in the project work is so important. HR should work more closely to the project team in order to be able understand their needs and take the necessary actions beforehand, i.e. before the problems are born. For this to happen, a global transparency in the company's competence management is a priority as is the presence of HR experts in project work and working closely to project team members. In fact, the involvement of HR in this project was very low and only focused on minor administrative issues.

As already mentioned, the project management team faced many problems. One crucial was the involvement of the project manager in

many administrative tasks which diminished the time in actually managing and leading their team, in communication and especially the time with the client. Another problem the team faced was with the project coordinator, who was not an employee of the company and for this reason did not know about the company's culture, ways of work, procedures and project tools. This caused a loss of time in a phase where time was crucial. Additionally, this also influenced in bad decisions at the beginning of the project regarding communication and work procedures that were against the company's existing and common ones causing more confusions. The unclear definitions of roles and responsibilities also contributed to these misunderstandings, as there was no clear understanding about the boundaries between the roles of the project manager and the project coordinator and between the project assistant, the project coordinator and the document administrator. Communication was one main item that suffered with these unclear boundaries. After a while, but still at the beginning of the project, the project coordinator was made redundant and the time scheduler took the coordinator role. However, this created a share box in the organisation, which did not solve the problem, especially because one person does not have the sufficient time to carry out two different tasks and/or roles in the same time and still gather the best results, especially when the time scheduler was also engaged to other projects.

Technological Tools

The used tool for the company's internal document management was an old system that is not in use anymore by the company. By the time the project was awarded, a new tool was being launched, however due to the quick project start and the tight time schedule, it was decided that this old tool would be the one to be used, once it was already familiar to at least the major part of the project team members. This document management system was a very good tool for document handling; however, the tool did not have any feature to support collaboration and/or sharing of knowledge. In fact, the whole project did not have any virtual tool that fostered collaboration and share of knowledge and basically these occurred in the exchanging of emails and during project meetings. Another problem with this tool was regarding the slow and difficult access when the team members were abroad.

The project also had a simultaneous document management system, which was an actual product sold to the client. This second document management system was used by all project parties (client and suppliers) and managed by the document manager in the company's organisation with the role of checking and follow-up all project related documentation from all project parties. Many problems arose in this regard, however, they were more related to external communication and therefore will not be consider in this research. On the other hand, on issue of concern to be consider here is the importance of the involvement of this role already at

the beginning of the project or at least as before the implementation of the tool in order to consider the best possible solution for the client and for the project team. When an expert that knows about different projects, how the tool is used and how it should be implemented is crucial to avoid future problems considering the client's needs. The simply use of IT personnel that misses the project expertise is not enough to create a tool that would provide the best solutions to the parties involved and avoid future problems.

As already mentioned, the tool used for meetings was Skype. This was a very good tool that facilitated team work and information sharing during the meetings. In a general way, people were satisfied with the tool, even though sometimes there were problems with connections, especially when the team was in the mill site due to firewalls and slow internet connection. On the other hand, regarding engineering tools, the project team suffered substantially, once the "common tools" were not actually common. Different offices were acquaintance to use different tools that those agreed to be used in the project. This caused both a loss of time in the process of learning the tools and the attempt to "scape" and "turn around" the problem, which in its turn created misunderstandings in the sharing of information and resulted in not liable data or confusions and inefficiency in document management.

A well organised and systematised document management and delivery is one of the most important element to ensure that the correct people, who actually needs the information, receives the latest information that will, in turn, ensure that the engineering is being designed with the correct data. The project faced also challenges in document deliveries and management, especially in document revisions. These problems were the result of a misunderstanding of the roles and responsibilities, what allowed decisions to being taken without the involvement of the expertise who actually understood the whole situation. Problems and unexpected situations always arise during projects; however, it is always better to consult all the people involved in order to gather the best solutions for the problem. And even though this has already been mentioned in all parts of this research, here one more time, it is only by collaboration and sharing of knowledge that the best solutions are created.

4.2   Case Study 2

4.2.1   Background of the Project

This case is an investment project in Europe that is in fact still on-going. Similar to the previous case, the investment is in the industry field with the same intention of reconstructing a part of an existing mill to cope with market and sustainability demands. The project was also extremely

confidential at its initial phase. The whole project was divided into four phases. Phase 1 was an investment analysis study, of which results were the basis for the following phases. The objectives with the second phase of the project were to develop the technical scope of the project as well as to provide cost estimate accuracy. Phase 3 was a preparation work or execution analysis to the implementation and last phase of the project contributing with a more detailed and accurate cost estimate. Phase 4 started simultaneously to Phase 3 in some areas where information could be used as final to the engineering. The company was awarded with the Phases 2, 3 and 4. The time schedule of the project is very tight and the client considered one of the company's strategic and key clients. Currently (European spring of year 2017), the project is in Phase 4, however Phase 3 has not yet been completely finalised.

The project manager has been involved in the project during all phases and in sales and definition of goals until Phase 3. During Phase 3 the project manager was not involved so much in sales anymore; this generated some problems and difficulties especially regarding resource management. However, since the project manager is working side-by-side with the client, he/she was aware of the situation as a whole and the further steps and kept the team well informed. The involvement of other key members of the project team in the sales and development of goals stage was not in place. The project organisation has increased in competences to cope with the different demands of each phase. There have been some major and inevitable changes in the project organisation that caused some problems to the project and that affected team efficiency especially in some key disciplines.

The Phase 2 was carried out mainly by the main office (Office 1). One discipline of an especial area was carried out by a second office (Office 2) located in the same country of the main office. The project management team consisted of a project supervisor, who was involved in sales, the project manager, a project assistant, a scheduler and a cost estimate engineer, all located in Office 1.

In Phases 3 and 4 the engineering was split into several countries and even though the project team key members basically remained the same, there were significant changes to the organisation. The discipline for one area started to be carried out totally from an office in a different country location (Office 3) under the supervision of one person located in Office 2. Another discipline was helped with the engineering of an office located in a third country (Office 4). A part of the engineering has been also performed in the client's mill site (Office 5) in a different country from all previous countries, to where some team members were allocated. The allocation process did not run smoothly and had several problems related to poor HR support. Other issues that also caused problems in the site team at the beginning were related to technological issues, such as internet connections causing inability to perform their tasks.

There were some modifications in the project management team between Phases 2 to 4. The project assistant was changed twice. In the first change, the project assistant was located in Office 2 and faced some problems in communication, roles and work procedures, established by the project that differed from those usually used in Office 2. For this reason, the project assistant role returned to Office 1. In Phase 3 the project organisation was enriched by a project coordinator and a document control manager. The project coordinator duties were to help the project manager in administrative issues, which increased the time of the project manager to be with the client and to lead the project team. The document control manager role was more related to the control and sharing of supplier's documentation and the management of the whole project document management system, which was a product sold to the client. Phase 3 and 4 suffered with changes in a main discipline leader who left the company.

A project management plan with an external focus was prepared in Phase 2 and updated in Phase 3. This plan contained a communication plan, however, with not enough details to cover all communication procedures. In Phase 3 procedures for document handling and information sharing as well as roles definitions of the management team were prepared to avoid misunderstandings and confusions and gather improvements in information sharing and distribution. However, the roles of important key project members were not well defined or established.

Communication and collaboration between the members were encouraged, however without a clear procedure on how to do it. The communication channels still remained too much focus on emails. In Phase 3, a collaborative team site tool was established and implemented and achieved some positive results, especially in the preparation of monthly and weekly reports and the action list for internal project meetings. However, there were some resistance in the use of the tool for collaboration and sharing of knowledge purposes and the attempt did not succeed.

Internal project meetings have been kept weekly with the participation of all project key people. The meetings have been held partially face-to-face to those co-located members and virtually to those in other locations by Skype, which allows the sharing of screen. The action list in the collaborative team site tool has been used for following-up and additional items have been freely discussed. The meeting atmosphere has been rather positive with good cooperation from all members. In a general way, the project team key members are committed to the project; however, some of them are additionally engaged to other projects, causing a lack of time to cope with all the necessary duties. In addition to weekly internal project meetings, other follow-up and review

meetings between different disciplines and other team members are kept in regular basis and as needed. The tools used in such virtual meetings are mainly Skype.

It is important to state that the leadership of the project manager has been clearly characterised by a more transformational style with the use of moderate authority when needed. Empowerment of team members has been also strong, however, with some unclear roles some difficulties have been in place in team alignment.

The project has two separate document management systems, one to internal documentation and the other to the whole project documentation from all parties. This second system is the official document management system of the project and documents are considered official only when entered to and distributed from the system. Even though the system contains features that allow collaboration, those are not in use yet. The reason for that was the lack of information about the existence of the tools. As discussed in the Case 1, the company was introducing a new document management system. This system was in use for this Case 2 project. Regarding engineering tools, there were no other special difficulties in their use among the project team. On the other hand, there were some difficulties with the communication tools and channels used with third parties. Communication tools and channels were not well defined in the scope or in the communication plan. This stresses the importance to agreeing these tools with the client already in the development of goals and/or in the development of working procedures.

4.2.2   Findings

The findings here presented were developed based on the gathered information from the results of a project internal audit, informal discussions with key team members and my own observations. The gathered information to the analysis considered only that related to the topic of this research. Based on the analysis the critical problems were related to the project scope of work or project goals, information flow, organisation, resourcing & roles and technological tools.

Scope of Work (Goals)

The scope of work and some delivery limits were not clear enough and brought some challenges in resources evaluation, work estimation and definition of roles. The main reason for that was due to the several changes in the scope mostly related to client's delays in decision making, purchasing and consequently missing information. Even though such changes were out of the team members' hand, there should be a more proactive communication between the different disciplines to check what kind of information is missing and how this would affect the whole

project in terms of time, resource and changes in scope. In addition to that, the project was divided into phases and there were some misunderstandings about what work belongs to each phase.

Especially because of the frequent changes in the goals of the project, the participation of the discipline leaders in goals development would be fundamental. However, their involvement in the development of the goals was not strong enough due to a long distance between the sales people and the project team. The project manager was involved in sales in phase 2; however, the project manager involvement in sales of the next phases was not so active. In a more positive viewpoint, this gave more time to the project manager to concentrate in the project work and with the client, on the other hand the change contributed to unclearness of the goals causing difficulties in handling time schedule and resources.

Information Flow

As mentioned in Item 4.2.1 above, a project plan, instructions for document handling, project management procedures and clarifications of the roles and responsibilities of the management team were developed. However, still there were confusions regarding those issues. A reason for that was the tight time schedule and the lack of resources, as explained below, which gave too little time to members to learn and apply the knowledge inside the instructions and procedures. In the stress of jumping into the project to complete the tasks according to the schedule, there was no available time to get familiarised with all the procedures. Another contributor for this problem is the different work procedures within different locations and disciplines. This was generated by the misconception that the company's employees have actually common rules and procedures and that those are clear to all.

The lack of knowledge of common work procedures together with the not clear and continuously changing project goals and tasks enhanced the problems within the communication between key project team members to other members. This was emphasised by the poor coordination of the discipline leaders towards their team. Regarding communication, the project missed a strong and clear communication procedure what created misunderstandings in "who is responsible to inform who" or "who needs to know what". There was a lack in communication between sales people, key project team members and other members. Especially because of the continuous changes in the project goals and deliverables a more open and proactive communication should be in place as well as the participation of the project key members in the development and evaluation of the changes. This not transparent environment increased confusions in gathering the initial or correct data to complete the tasks in the best and most efficient way.

As already mentioned in the theoretical part of this research, the introduction of a new member to a team is extremely important to team socialisation, which in its turn increases trust, commitment and team performance efficacy as well as accelerates team cohesion. Some important team members felt a lack of a welcoming to the team, which gave the impression of being "outsiders". In projects of this type the number of people coming and going is enormous; however a process or procedure of how to introduce new team members should be in place, especially when the new members intend to be in the project for a longer time. Project instructions and work procedures plays an important role once again as well as the communication plan and knowledge of "who handles what" or "who knows what". Especially regarding engineering tools, document management and other information, there is always the need of access to the tools; in this case the communication should also reach the responsible people for those as fast as possible.

As stated in item 4.2.1 regular internal meetings were held. The sharing of information and follow-up of the project situation was going through in these meetings. The participants of the meeting were mainly the project key members. Due to the lack of a communication plan, there was no indication about how the information was shared to other team members. In order to increase the communication between different disciplines, technical meetings between specific disciplines were also held. However, there was no indication that the learning of those meetings were captured and/or transformed into explicit knowledge.

The use of emails to sharing of information was also abusive, causing the same problems explained in Case 1. A new collaboration system open to all project members was implemented in order to facilitate the sharing of knowledge and any other important information with the attempt of diminishing the amount of emails between team members. However, the system did not function as expected. Several factors contributed to this unsuccessful attempt, such as resistance to use a new tool and to familiarise with a new procedure, "one more system" to be used and shortness of time. The introduction of a new tool also requires time, which was very scarce, especially because the tool was introduced after the project had already started. This stresses the importance of establishing the tools to be used already in the development of goals and tasks.

Organisation, Resourcing & Roles

There was an indication of uncertainty whether the key positions of the project team were fulfilled with the correct people with suitable background and experience to well manage the high level requirements demanded. Some team members also felt that they did not receive enough assistance and guidance that they needed to perform their work. This created a negative impact on the level of trust towards both the

project team and the whole organisation, diminishing in this way motivation. Additionally, some key people were also involved in other projects and/or tasks, making it impossible to have enough time to perform their tasks in the best possible way and provide the necessary assistance to other team members.

Not all the roles of the project organisation were well defined and there were gaps in both work and performance expectations, especially those concerning discipline leaders. This was perhaps caused by a misconception that everyone "automatically" knows about their roles without the necessity of clarifying or transforming it into work procedures. However, when roles are not well defined it gives rooms to misunderstandings in responsibilities that are followed by possible conflicts causing a lack of trust and demotivation towards their leaders, the whole project and the whole organisation. The contribution of an administrative coordinator showed to have both positive and negative impacts to the project manager's tasks. On the positive side, this assistance provided more time to the project manager to be with the client and concentrate on the engineering issues. On the negative side, it slightly affected the project manager to exactly follow-up project work performance.

Resourcing faced several problems and the tight time schedule of the project contributed to increasing the level of such problems. The involvement of HR in project work was clearly not enough to provide the necessary assistance in resource management and the necessary activities to help team members to perform their work efficiently. One example was the lack of HR assistance in resolving employees' relocation, which resulted in waste of time and demotivation to work when employees had to resolve and clarify many bureaucratic issues that should be under HR responsibility. Another problem the project faced was the changes in the project key members that caused interruptions in the flow of the project in some main disciplines and a waste of time and efficiency once new members had to learn about the project fast giving rooms for misunderstandings.

It was also indicated a lack of resources to fulfill all tasks in the scope of work in the best possible way. This lack of resources caused extra works to the project team members, which affected both the quality assurance and the efficiency of work performance well as increased the risks of individual burnouts. On the other hand, some resources that were allocated to client's premises were not fully utilised at the beginning. This shows a lack of work coordination by the discipline leaders, which might be the result of the unclear definition of roles.

A good example of the effects the lack of resources had in quality assurance was regarding documentation. The overflow of work did not allow enough time to document production checking generating a great

number of mistakes in its production. Several documents had to be revised many times due to incorrect or missing information, not enough clearness especially regarding language and contents not in accordance to other documents and/or project instructions and standards. In addition to that, the process of quality assurance in documentation review and approval was not clear, even though the processes are available and valid for the whole organisation.

This problem emphasised that the company lacks common rules and work procedures not only between different locations, but also between different disciplines from a same location and also a misconception that the organisations' rules and procedures are clear to any of its members. This also indicates that the roles of line management as well as their needed support within projects are not clear. This misunderstanding is a critical threat to project work, especially in projects with very tight time schedule when the time to learn the procedures and ways of working is very short. In addition to that, the different ways of working had a strong impact in team performance and increase conflicts between some team members, creating a not acceptable level of inside competition which affected team performance.

Technological Tools

The document management system was introduced to the company a few years ago; however, it was evident that some members were not satisfied with the system. One reason for that is that the system has not yet developed some important features that would facilitate work performance, features that were available in the previous system. On contrast, it was also noticed a great resistance from team members towards the change, which created a negative impact in the usability of the system.

The internal document management system is provided with tools for collaboration and sharing of knowledge, such as blogs, calendars and discussions space. However, those were not applied in the project because these features were not previously informed to any users and nobody knew about these possibilities. In the attempt of creating a collaborative space and environment for the sharing of knowledge, a new SharePoint team site was establish at the beginning of phase 3 of the project, when the new document manager started. This creation had some positive impacts, especially in increasing efficiency in internal meetings with the addition of an action list of easy accessibility to all members and in weekly and monthly reports. However, this collaborative tool was not strongly used to share ideas and knowledge. In addition to that, there were indicators that the use of too many tools is confusing and time demanding and that this should be avoided.

As previously mentioned, the project had another document management system which was an additional product sold to the client. This external system is built in the same principals of the internal system, however, with the intention to manage the documentation from all other project parties, including the client's and all other suppliers' and contractors' involved in the project. This external system was in use already at the beginning of phase 2 without the involvement of any document manager or other person with the correct knowledge about both the technology and the required features for the different phases of the project. This resulted in building a short term system that was not applicable to the following phases of the project and that did not fulfil all the requirements. In addition to that, the document system was not managed well enough at the beginning, which increased the problems in the following phases as well as increased the time in fixing the system to fulfil the needed requirements. These fixings were not only technical, but also and especially in readjustments to match with the requirements and re-explanations to the client about the reasons why the system had to be changed.

For internal virtual project meetings, the tool used was Skype, which proved to be efficient to and well-known by all members. Regarding to other engineering tools, there were some problems in ways of working and in the coordination due to the different locations. The technology does not yet support the updating of engineering documents, such as drawings and 3D models, in a sharing environment, creating a necessity to having a very well organised coordination in document production and updating.

The team members allocated to client's premises faced several problems related to network access. Those problems were fixed after a while; however, the whole process took too much wasted time, especially concerning bureaucratic decisions and too little empowerment to the members to request the solution. This indicates that even though the company shows changes towards a more open and transformational leadership, hierarchical issues are still strongly present hindering efficiency.

4.3   Conclusions

The main question of this study is how to enable or foster knowledge sharing between global members of a project team. As studied in this research, collaboration is the foundation of knowledge sharing and effective teamwork. The case studies were used to collect the main obstacles that are somehow hindering collaboration within team members and consequently the sharing of knowledge or its development.

The study cases showed several similar gaps and challenges global teams are facing in the company today in regards to collaboration and sharing

of knowledge. The main challenges found in both cases were divided into four category groups: 1) scope of work (project goals); 2) information flow; 3) organisation, resourcing & roles; and 4) technological tools. Even though the categorisations are linked to one another, the idea of dividing the challenges into different groups was to gather more focused points for possible developments.

By studying the two case studies, it is possible to note that the participation of the project team key members in the development of goals is poor or sometimes inexistent. As learnt in the theoretical part of this research, important factors to guarantee and accelerate efficient team performance are clear goals and tasks, well defined roles as well as the synergy between team members. To gain synergy team members go through a process to familiarise themselves to one another in order to increase trust, which is, in its turn, the foundation to commitment, motivation and team cohesion (or alignment). Gaining trust and reaching team cohesion is a process that needs time, simply because the needed elements are related to humans and their behaviours. The more time team members have to familiarise themselves with one another the greater are the chances to gather positive and faster results in collaboration and team efficiency. In addition to that, when team members are allowed to participate in the development of goals the easier it is to understand the tasks to be performed in addition to the possibility of opening doors to innovations, once the members will share their expertise to reach a best solution to be created with the client as well as to draw the lines of how to get there.

Regarding information flow, the studies showed that there are many gaps in the processes of sharing information. Perhaps the most critical one is a misconception that everyone and every location and/or office in the organisation have the same work procedures creating a false impression that the team members already know what they have to do, that they know who knows what and that they know how to do something. In fact, the lack of common rules and procedures is a critical challenge team members are facing. Especially regarding projects, where the time to learn new things is minimum, common rules, processes and procedures are the key to team efficacy. It is therefore important to establish those at the beginning of team creation in order to prevent possible future conflicts and misunderstandings. It is also important that team members have and take the time to learn the work procedures and act accordingly. It is especially important to transform those procedures into explicit knowledge and make it available to all participants. This is especially important in project teams, where people frequently "come and go".

Additionally, it is also important to both prevent an overflow of information and to make sure that information is reached by the correct person who needs the information. Finding the balance between those two is perhaps the most critical challenge. One problem in the sharing of

information noticed in both cases was the abusive use of emails. Email is a good tool of communication; however its abusive use might lead to an overflow of information and a misconception that the person who needs the information has actually received, read and understood its contents. Additionally, emails are a one way perception, which prevents the "working and building together". Its use thus should be balanced and restricted only to the right purposes.

In terms of internal meetings, there was no indication that the correct tools and the way of handling those were interfering with or preventing sharing of knowledge. However, there were rooms for improvements in relation to the assurance that the correct people were participating in the meetings and that the information and knowledge discussed were spread to other team members. In case study 2, the introduction of a collaborative tool to enhance knowledge sharing proved to gather positive results in meeting efficacy.

The problems related to organisation, resources & roles were several in both studies. Regarding roles and responsibilities, the main reason was the lack of their explicit definitions or not clear ones, which was precedent to a preconception that roles and responsibilities were already clear to everyone. These gaps reflected consequent problems in other sections, such as information flow, and contributed to conflicts as well as decreased trust and consequently team cohesion and efficacy. Another fact that contributed to the problems in roles and responsibilities was project organisations with shared roles causing confusions and misunderstandings. The cases also suffered in resource management because of a lack of suitable competences, not fully utilised competences and, most importantly, the poor involvement of HR to give the needed support. Especially due to the tight time schedule of both project cases, managing competences was a critical item. In addition to that, the organisations also faced problems in the availability of their members to fully work in the projects as some key team members were also involved in other duties. This caused many problems in quality, commitment, motivation and leadership as well as created a risk of individuals' burnouts.

Considering technology, the tools used for keeping meetings were good and efficient. The document management systems used were different in the cases; however, both were used with the single purpose of organising and storing explicit knowledge, in other words, documents. Tools for collaboration and sharing of knowledge were not available in case 1. In case study 2 a collaborative tool were introduced with the intention of increase collaboration and sharing of knowledge. Even though the system helped in increase efficiency in internal meetings and weekly and monthly reporting, the tool did not succeed in increasing collaboration and sharing of knowledge. In the findings, the main reasons for the unsuccessful results were resistance to change from team members and

too many tools to deal with. Collaborative tools creates several opportunities to project team members, especially in virtual teams, however it might create an impression that it is only one more tool to consume time without adding any value. As stated in the findings of the case 2, the document management tool is provided with collaborative features to foster collaboration and knowledge sharing. This will be one point of development presented in the next Chapter 5.

5 SUGGESTIONS FOR IMPROVEMENTS

As studied in the theoretical part of this research, knowledge is the most valuable asset any organisation has and is the key to effectiveness and competitiveness. The most valuable knowledge however, is tacit, the knowledge that is inside people's minds and that are gained with experience, which is the result of lived learning situations. This knowledge is the one that transforms individuals into living competences, and competence is what makes a difference in competitiveness. On the other hand, this knowledge is useless if not shared. It is only by mutually sharing those experiences that people are able to see the whole picture and to build something bigger, something better and something that really adds value to the purpose or to someone else. It is only by sharing knowledge that the parts will perfectly fit to one another, especially in terms of engineering and all its parts as they are dependent to one another. The key word to sharing is thus collaboration.

The main question of this study is how to enable or foster knowledge sharing between global team members of larger size engineering projects. The enabler of knowledge sharing is collaboration, in other words, the higher the level of collaboration is between team members, the more knowledge will be shared. This Chapter focuses on giving suggestions on how to increase collaboration between team members and what are the necessary infrastructures that will foster and allow collaboration. The given suggestions have a focus on the critical findings gathered with the studied cases. The suggestions for improvements are divided into two parts. The first part is devoted to the necessary infrastructure that will support and be the basis of an enhanced collaboration, which is the foundation of a successful Knowledge Management. The second part is focused on the development of a Knowledge Management model that is suitable and can be applied to larger and global engineering projects.

5.1 The Elements behind Collaboration

Trust is the key element to collaboration. Without trust people's will to be open, to share their knowledge and experiences and to be motivated

to learn from others and to build with others will not exist. The level of trust a person has on other team members, on their team leaders, on the leaders of their leaders and on the whole organisation will affect the individual's will to share and collaborate. Trust is thus affected from several dimensions that will, consequently affects the level of collaboration and the will of individuals to share their experiences with others and within an organisation. Trust is thus the foundation of teamwork and the path to and enabler of team cohesion, which in its turn represents the edge of collaboration. The faster team cohesion is reached, the faster and higher team performance efficiency will be in place.

As already studied in the theoretical part of this research, project teams is a type of team that is challenged by several facts that somehow difficult the gaining of trust. Some of these are related to tight time schedules that forces members to jump directly to task performance without having enough time in building trust and paying attention to work procedures and other factors, creating the risks of future misunderstandings and confusions. Other challenges are the number of "coming and going" members, who do not have the time to adhere and familiarise themselves with other team members or work procedures. When project teams are global and members are from different locations with different backgrounds, such challenges are intensified. To cope with these challenges it is important that the silos between different locations are broken and that locations are aligned with same goals, similar work procedures and ways of working.

The suggestions for improvements presented below considered the multidimensional characteristics of trust and not only within a single team. However, the aspects and characteristics of project teams, where trust is even more challenged, were deeply taken into account. By enhancing trust through all dimensions, the possibilities of achieving positive and successful results in individual cases will evidently increase. For this reason, it is important to stress the importance of commitment to trust through the whole organisation and adhered to its culture.

5.1.1   Involvement of Key Members in the Development of Goals

The participation of key project team members in the development of the project goals and tasks is critical to ensure a clear scope that is not only suitable for the existing competences and know-how, but also to contribute in building the best solutions to the clients. Disciplines leaders understand their competencies and know-how and are also capable of evaluate the necessary work, needed knowledge as well as allocate the proper competences to offer the clients with the best and innovative solutions.

It is the change to seeing the whole picture instead of separate parties that leads to success and it is only with collaboration that the best solutions and innovations are born. The participation of key project team members to development of the scope allows not only a better understanding about the clients, their needs and about the project, but also gives more possibilities and time to influence the scope of work and to make it suitable, interesting and clear to both project team and the client. In addition to that, the sooner the project key members are involved with the client, the faster they will be able to familiarise themselves with the client, accelerating in this way the cooperation and collaboration between the two teams.

Clear goals are the foundation to avoid misunderstandings and possible team conflicts. The clearer the goals and tasks are, the more it will ensure team efficiency, once it will not give rooms to confusions. Goals must be therefore understandable and realistic. When team members are a part of the process of goals development, the risk of having unclear tasks and goals are minimised. This also allows more time to team formation and socialisation, which are important elements to enhance trust, commitment and motivation and a path to gathering team cohesion.

5.1.2 Definition of Roles and Responsibilities

Clear definition of roles and responsibilities ensure team cohesion and avoid misunderstandings and possible future conflicts. In order to increase efficiency through all projects, such definitions should be implemented as a template or model to be used by the whole organisation. In this sense, the time in interpreting and understanding new roles and responsibilities would be minimised. Roles names and titles should also be unified and applied through the whole organisation to avoid confusions between members of different offices and locations. These definitions and names of roles with their respective responsibilities should be transformed into common, clear and detailed best practices or project procedures in the PMG of the company.

Time is always critical in projects, for this reason when roles and responsibilities are well spread throughout the organisation with common understanding, the project team will gather great advantage in saving time as well as in diminishing risks of conflicts. On the other hand, one main characteristic of projects is that they are unique. For this reason it is also important that such common definitions of roles and responsibilities are developed in a flexible way to allow their adaptation to the needs of each project. However, a general understanding of the roles enhances team efficiency, even though small changes are adopted. Especially because of both the continuous increase in the number of the project team members and the high number of "coming and going" members, such common understanding is essential to guarantee the continuance of the team performance efficiency.

Especial attention is needed to the definition of roles and responsibilities of team leaders, once they are the ones responsible to lead their discipline team. Discipline leaders must be provided with enough and suitable leadership skills to be able to perform their tasks of leaders capable of encouraging and motivating their followers. One of the main tasks of a leader is to provide the needed information to their team so that they are able to complete their tasks. In this way, good coordination and communication skills are important qualities needed by discipline leaders. In addition to that, enough empowerment of such roles should be increased in order to facilitate the engagement of new competences to their team as needed in order to avoid a decrease in quality, possible mistakes and delays as well as individual burnouts.

In general the roles and responsibilities are presented in the project organisation. For this reason it is important that projects organisations are done in a clear and comprehensive way. The boxes in the organisation should contain only one name, in other words, sharing a role or responsibility to more than one member leads to confusions and misunderstandings. In addition to that, having one member performing different roles in the organisation might create an overflow of work to the person, which can affect quality and result in possible mistakes and delays as well as increase the risk of burnouts.

5.1.3 Availability of Appropriate Resources through the Whole Project

The availability of appropriate intellectual competence capable of and committed to the completion of the project goals and tasks is crucial to gather successful results. The synergy between the members of the team must be strong. For this reason, a good resource management with proper measurements is needed. As previously mentioned, the empowerment of team members to make decisions in resources is also necessary to increase efficiency. This means an approach to a more linear organisation without the obstacles encountered by a hierarchical type of organisation. In addition to that and as previously mentioned, the participation of the key project team to the definition of the project goals and tasks facilitates the human resource elaboration and the allocation of the most suitable competences to fulfil the necessary tasks. A more supportive and true involvement of HR in helping resource management is necessary.

The commitment of the key project team members to the project is crucial. Their involvement in the project should be right from the beginning until the end. Changes in the project team key members usually cause a drop of the whole project team efficiency and productivity. The new member will have learn the project, the procedures and ways of working, learn how the team works, familiarise

themselves with other team members and, above all, build trust; and this all takes time.

In addition to intellectual and human resources, the availability of other types of resources that facilitate and support the performance of the tasks are also crucial. Examples of such resources are necessary technology, tools, systems, material and training. Especially in terms of allocation, the help of HR to manage needed bureaucratic issues and processes is needed to be handled more systematically. This ensures that team members can fast and efficiently focus on task performance not wasting time in resolving other problems.

5.1.4   Development of Work Processes and Procedures

Clear procedures for individual projects are essential; however common rules and procedures as well as tools that are understood, used and/or applied throughout the whole organisation are needed. The preparation of different procedures to each project is time wasting and definitely not efficiently. With common global rules and procedures used by the whole company, it is much easier to adopt and use global competencies without the risk of having to learn the basic procedures. Considering the individuality of each project, the procedures should be flexible to their adaptation to projects, however, the main and basic understanding of the procedures are evident.

These procedures should be prepared from previous experiences and with the cooperation of different locations in order to collect the best possible guide lines and spread and available for use and appliance through the whole organisation. It is also important to stress the necessity of updating the rules and procedures in order to cope with the continuous changes. Examples of necessary procedures are instructions for quality assurance, communication models, project instructions and specification of tools as well as templates to reporting among others. Such procedures would also have a positive effect in sales phases, once they would contribute to clarifications of the scope of work and act as examples of how value can be added to their clients and the assurance that the company knows what and how they intend to successfully achieve the goals.

5.1.5   Involvement of HR

The real involvement of HR in project work, their close presence and availability to people as well as the knowledge about their people is essential. The main objective of HR management is to know how to manage people and all the surround needs individuals, teams and the whole organisation have to be able to perform their tasks efficiently. The actual responsibility of HR people should be in supporting, understanding

and knowing their people. Especially in global companies, the knowledge of cultural issues, laws and work procedures in other countries is thus an advantage that should be handled by HR in order to provide efficiency in allocations whenever necessary. When individual people have to learn and deal with all these items by themselves, there is a huge waste of time in allocation processes and a loss of trust and motivation towards the organisation and other parties.

The involvement of HR in project team and teamwork is thus essential to competence management and to being able to forming and allocating the best competences into the correct places and projects. In addition to that HR should provide the necessary support to facilitate these allocations and make it easier and allow people to focus in task performance without the need to resolve other problems that affect efficiency and diminish the levels of motivation and especially trust towards the organisation.

5.1.6   Transformational Organisation & Leadership

The organisation culture and structure plays an important role in providing the necessary trustful and respectful environment that will foster, support and encourage a collaborative and open environment, which is the foundation of teamwork. As studied in the theoretical part of this research, hierarchy in organisations are obstacles to transparency and creates resistance to openness and collaboration as it generates fear. An organisation that supports transformational leadership is thus essential to provide the necessary environment to enhance collaboration. Leaders with ethical characteristics and capacity of creating an environment of trust and respect will foster collaboration and facilitate team alignment and cohesion to gather the best performances of team members in tasks completion and goals achievements.

The organisational steps towards transformational leadership must not only be said into words, it must be applied in acts and definitely not only by some. In order to succeed and have effective results, it needs the involvement of all members in the organisation and it needs to be shown. This indicates that changes are necessary in the way of thinking and in the way of acting; and acceptance of changes and the action of changing takes time. The best and most efficient way of making people believe that changes are for good is by examples. For this reason, leaders have to be the living examples, the ones that will contribute to changing their followers, the ones with the tools and weapons to make the transformation possible. The more they are close to their followers, the more they listen to their followers and the more they are capable of creating an open, respectful and trustful environment, the more effective will be the results. Presence is thus necessary as is the willing of seeking to the whole truth, to work together with their followers in order to build something extraordinary, together.

In order to gather extraordinary results, the knowing that it is the working together that makes the difference is essential. For this, the respect into each individual work is fundamental and this respect must be shown. The ways of showing this respect are several; however the most important thing is to show how individual's contributions are important to goals achievements. Usually the way of showing is by rewards, which do not necessarily need to be financial. People have different personal needs and goals that should be considered and respected, such as career development and receiving suitable recognition of their achievements. Recognition of a well done work is a powerful tool to enhance motivation and commitment, which are fundamental elements to effective work performance and employee engagement towards the workplace, the project and the team.

5.1.7 Feedbacks and Rewards

As mentioned above, rewards are important to either increase or maintain the level of commitment and motivation of employees towards their workplaces and their work. In order to understand, listen to and know individuals' needs, feedback is necessary. Feedback is also a good opportunity to ensure that the necessary recognition is addressed to the individual. To a feedback be effective, an environment of trust and openness is necessary. In addition to that, feedback must be driven by someone who actually knows about the individual, their work performance and their achievements.

In project work, feedback sessions to team members are seldom if not inexistent. Due to the tight time schedule projects usually have, there are no extra rooms to having frequent feedback sessions, which could contribute in building trust and in increasing commitment and motivation. Additionally, feedback helps in diminishing the risks of misunderstandings, confusions and conflicts. Developing feedback processes within projects and reserving enough time to such sessions is advisable. At least at the end of the project, the collection of the feedbacks helps in enriching the organisational memory by the creation of lessons learnt and best practices. In addition to that, these feedbacks also contribute to a better understanding about the individuals' needs and their expectations towards the workplace and future projects. This is a key knowledge to competence management and to employee engagement.

5.1.8 Improvement in Meetings

Meetings are important events to share valuable information and knowledge, build relationship and enhance trust. On the other hand, in order to be efficient and gather positive results, meetings must be well organised and present an open environment that allows and support the

sharing of knowledge. Time is thus one important issue as is the time management to give space to contributors to add their viewpoints, ideas and issues of concern. The number of participants and knowing who actually needs to be present in the meeting are important items that contribute to the efficiency of the meeting. Especially in virtual meetings, attention must be paid to such items. Internal meeting procedures produced in the conceptual or initial phase of the project should be in place. In this way, when attending the meetings, no extra time will be lost in explaining how the meetings are run as well as such procedures prevent possible confusions and conflicts.

The follow-up and notes of the meetings are important to be transformed into explicit knowledge and must be available and spread to all project team members. A good way of following up and making the notes of the decisions is a simple list of actions to be done in which tasks, deadlines and responsible people are marked. The use of a collaborative tool to enter this action list and make it reachable to all project members as well as updated by them is a good way of following-up the items. This is also useful to members that do not participate in the meetings to be aware of where the project is going. Transparency is thus necessary to ensure efficient flow of knowledge and information. However, commitment and will to independently collaborate and contribute is needed from team members.

Despite the fact that virtual meetings offer great saves in time and money, it must not be forgotten that face-to-face meetings offer a much higher opportunity to build relationships and foster trust between team members. In addition to that, face-to-face meetings also provide more rooms to knowledge building and sharing. Finding a balance between virtual and face-to-face meetings is thus important to the wellbeing of the team and to increase team alignment as well as to break the silos between different locations and cultural issues. Evaluating the background of the meeting and what are the reasons behind it is thus important to being able to decide how to the meeting should be held.

Virtual meetings need special attention to the tools to be used and other technological issues in order to guarantee the efficiency of the meeting. Collaborative tools with the capacity of sharing screens and presentations are important. In a personal level, the checking of who is present and who is not is also important to give speech turns equally to all participants, increasing in this way the collaboration between all members and ensuring respect to individuals' contributions. Internal meetings should also be used as an opportunity to collect general and important feedback and offers a space for improvements in work procedures and other items with the attempt to increase efficiency and teamwork.

The number of participants is crucial to bring efficiency in meetings. When the number of participants is too large, it is more difficult to manage the flow of the meeting and the risks of frustrations as the sense of wasting time increase. Additionally, in over populating meetings, decisions are difficult to be made. In project teams, the key members are advisable to be permanent participants, however it is important that the information gathered in the meetings are well distributed to other team members. Discipline leaders should be in charge of keeping their team well aligned with the information received or decided in the meetings, either by having separate meetings with their teams or by creating other suitable procedures of information flow. In addition to that, other team participants should have access to the explicit knowledge gathered in the meeting. Discipline leaders should also consider the collection of feedback and other information from their team and bring those to the key project members. For this reason, it is essential that discipline leaders are provided with strong leadership and communication skills.

5.1.9   Technological Tools

Today technological tools are inevitable to provide the success of any company. They are the essential element of guaranteeing any kind of development. Especially in terms of engineering, tools have to be proper and efficiency to provide the necessary foundation and support to the performance and completions of project goals and tasks. The importance of having common tools used and known by all locations within the organisation cannot be more than stressed. As common work procedure, common tools are the fundamental element to teamwork efficiency. The more different tools are used, the more difficult it will be to teams to perform their tasks. Different tools not only increase the time people need to learn how to use them but also create frustrations and increase the risks of conflicts. By having common tools and proper training is provided to all members of the organisation, the risks of unproductivity will be minimised. As this research is devoted to knowledge and communication, this part is focused on discussing the tools related to these topics.

As previously mentioned, documents are important explicit knowledge projects have. A good DMS (Document Management System) is thus crucial for the success of the project. On the other hand, tacit knowledge is the most important knowledge projects have. How to share this tacit knowledge to be available to others in order to complete the tasks is thus the most critical challenge of all. As already discussed, the way of increasing the sharing of knowledge is through collaboration, which in turn, is increased by trust. Considering technology, it is important to create or provide tools by which team members are able and encouraged to share their knowledge. Such tools are named collaborative tools.

Collaborative tools are numbered and examples can be the well-known Yammer and SharePoint. Regarding social media, the examples are much more numbered, however as this research is focusing in inside organisation tools, those are not considered here. The problem with projects is that the numbers of the necessary technological tools and systems are tremendous and introducing a new one is not only time consuming but also it is difficult to manage. For this reason, in projects, the number of tools to be used should be well thought and decided considering their needs to have the tasks efficiently performed. Introducing tools that do not give any value to the team members means inefficiency.

The number of tools used in projects should thus be minimised as possible. However, tools for collaboration and communication should not only be in place but used and applied by all members in order to increase knowledge sharing and communication. Such tools provide a much more effective way of sharing information and other communication and can be considered as replacements to the overflow use of emails. The greatest problems the abusive use of emails creates are an overflow of information and a misconception that the person who needs the information has actually received and understood it. Collaboration tools not only prevent this overflow of information, but when used properly, ensure that the person who needs the information has actually received it and understood it.

Today DMS systems are already provided with these collaborative features, such as calendars, blogs and spaces for discussions among others. In this sense, by transforming the DMS into a true KMS would be of great value to all users, not only because the tools is already known and used throughout the company, but most importantly it would increase the opportunity of managing explicit and tacit knowledge into a single system. In addition to that, this joint DMS/KMS would simplify document approval and quality measurements procedures.

5.1.10 Improving Knowledge Management in Projects

A high level of efficiency is the guarantee of having successful results in reaching the project goals and tasks. In order to achieve this high level of efficiency, it is important to well know what and how to achieve the project goals. Learning from previous experiences and avoiding making repetitive mistakes is one way of increasing efficiency. The collection of the existing necessary initial data or information is extremely important to ensure that the project can be completed efficiently and profitably. Managing this information and knowing what information is valuable is what measures the level of complexity of the project and the needed efforts to successfully complete the goals and tasks. For this reason, it is important that knowledge is managed right from the beginning.

In addition to that, as studied in the theoretical part of this research, most of the repeated mistakes of projects are derived from a lack or poor knowledge management. As also learnt knowledge is much more than only existing explicit information. Unfortunately today, the focus of Knowledge Management remains only in such explicit knowledge and very little efforts is done to develop the whole process of knowledge management through the whole life-cycle of a project. Today project organisations do not have any role with the responsibility of ensuring that knowledge is shared and that a proper space and environment to facilitate collaboration is in place. Project organisations miss a connective point to coordinate all the existing knowledge and foster knowledge appliance, value adding and updating. For this reason, the introduction of a role in project organisations to manage knowledge would considerably increase not only collaboration but also the effectiveness of the whole project.

This role should be the link to all project members and would create the correct infrastructure to ensure and enhance collaboration between team members. The skills to perform this role and take such kind of responsibilities should not only be focused on technological and technical issues, but principally on having the capacity to understand and see wholes instead of parts as well as analytical skills to categorise knowledge and to know what kind of information is important to each member. In this sense, my suggestions stand for a centralised information flow, which would minimise the risks of overflow of information among team members.

Increasing the importance of knowledge management in project work opens the doors for several improvements. Not only the management of information will be more efficient, but also the opportunities of collaboration and knowledge sharing would increase. Knowledge Management enables a more systematised way of leading with knowledge and fosters collaboration, which is a path to innovations. In addition to that, Knowledge Management ensures that new valuable knowledge is transformed into explicit format and spread through the organisation in order to contribute to the organisational memory and add value to future projects and sales opportunities.

5.2   Knowledge Management Process

The first part of this Chapter was focused on the needed improvements to foster collaboration and consequently the sharing of knowledge among project team members. This second part of the suggestions of improvements is devoted in the process of managing knowledge within a project. It is important to stress that in order to have a successful knowledge management, a transparent, open and trustful environment is crucial. The commitment of members and their will and motivation to collaborate is the foundation and enabler of Knowledge Management.

The Knowledge Management process here presented is divided into two parts. The first part consists in the development of the project goals and tasks, or the development of the scope of work, which is considered here as the initial data or the input to the start of the second process concerning the project.

The knowledge created in projects is usually transformed into documents, i.e. transformed into explicit knowledge. This is an important contribution to the organisational memory and can be used and applied in other projects. For this reason quality and approval processes are important to the evaluation of the knowledge. The number of documents produced in engineering projects is enormous and the process of knowledge takes time. For this reason, an evaluation of the necessary documentation to be produced is important to prevent loss of time in producing unnecessary documentation. In terms of efficiency, another important issue is producing documentation that fulfils the necessary quality level to avoid the doing and redoing of the same document, what might also negatively affect client's expectations and trust. Considering the virtual characteristics of global teams, quality and approval processes need to be developed in a more effective way. Here such processes are considered to be performed digitally and virtually and integrated to the existing DMS system.

5.2.1   Development of Project Goals or Scope of Work

First Stage: Knowledge Capture

In this first stage, existing knowledge is captured in order to understand what kind of information is in place and how useful and liable this information is. Information is captured both from the client and from the organisation itself. Important information from client concerns their background and history, previous experiences, previous investments, their position in the market, where they want to grow, previous studies and projects of improvements and possible existing documents and drawings that brings value to engineering and project development. From the organisation side, important information to be captured concerns previous projects preformed to the client or any other similar projects, the lessons learnt and best practices from those previous projects and experiences, collection of project instructions, procedures, reporting templates and other documents that can be added as examples of how the organisation works and how the organisation can add value to their clients.

Second Stage: Adding Value

In this second phase, the information or knowledge must be evaluated and value is added to the knowledge. The participation of the candidates

to the project organisation is thus crucial in this stage, because they will be responsible to evaluate the information to define its liability and develop and provide proposals for solutions. It is also important that the evaluation and adding value to the captured knowledge is done together with the client in order to learn more about their needs and expectations. This additionally facilitates and enhances building relationships between the project team key members and the client and among the project members. This stage is thus characterised by means of learning.

Third Stage: Storing Knowledge

In this stage, the selected knowledge is stored for further development and to be shared. It is important that that the knowledge is stored in a repository where knowledge can be easily accessed and achieved in order to gather continuous contributions to improvements, adding further values and propositions. Additionally, a collaborative tool that allows collaboration is important to be considered.

Fourth Stage: Sharing Knowledge

After knowledge has been evaluated and stored, knowledge must be shared either to be applied forming the scope of work or to be further developed going back to the second stage. Until the conclusion of the definition of the goals, new knowledge might enter the process or needed to the completion or clarification of the scope. Additionally, the inputs from other people is also necessary, it is thus important that knowledge and the sharing of knowledge is well managed making sure that all the needed inputs are considered. The whole process ends when the scope is defined and ready to be stored and shared. The scope of work will be the input to the starting of the project.

5.2.2 Project Work

First Stage: Sharing Knowledge

Project team members must share the scope of work in order to let other members acknowledged about the project goals. A good practice of this stage is a kick-off meeting where the members not present in the previous phase familiarise themselves with the project, the goals and with other team members. This is a good opportunity to discuss and develop the roles and responsibilities as well as defining communication and work procedures.

Second Stage: Capturing Knowledge

This second stage is characterised by learning the gathered knowledge or project scope and also other possible work procedures established in the

kick-off meeting. In this phase other knowledge necessary to the development of tasks is also captured from previous projects, experiences, lessons learnt and best practices. This phase is also characterised by the searching for knowledge. When necessary knowledge is not found, knowledge is created.

<u>Third Stage: Adding Value</u>

In this stage the captured or created knowledge is evaluated and modified in order to fit the needs of the project and the tasks. Knowledge evaluation usually occurs with collaboration. It is the searching for solutions, production of necessary instructions and documents among others.

<u>Fourth Stage: Storing and Sharing of Knowledge</u>

After a preliminary evaluation, knowledge is stored in the knowledge repository and shared to further evaluation, entering in quality and approval processes. The repository is usually a DMS. As already studied in previous chapters, the system should contain communication and collaborative features in order to enhance collaboration of further evaluation of documentation. As the knowledge created or developed is a document, the metadata or register of the document must be well completed in order to give enough information not only to the project itself, but also to be applied in future projects.

<u>Fifth Stage: Adding Value</u>

This second round of adding value is necessary to product valuable knowledge that will be used as an input to a sub-process of the whole project. Before being shared to external parties, knowledge must be useful to others and the knowledge contents correct. For this reason, this stage is characterised by adding values considering quality and approval processes.

<u>Sixth Stage: Sharing and Applying Knowledge</u>

After knowledge has been evaluated and passed through quality and approval processes, knowledge is then shared internally and externally to be applied and used by the project parties. In projects, knowledge enters the process many times before it becomes definite. However, quality and approval processes must be in place until its finalisation. This not only ensures that the company remains with a high quality issues, which is a significant competitive advantage, but also that the organisational memory is fulfilled with trustful and valuable knowledge to be used and applied in future projects.

6   CONCLUSIONS AND FURTHER IMPROVEMENTS

The main objective of this research was to gather the answers to how knowledge sharing can be fostered among the members of engineering project teams who are located in different parts of the world. The key element to knowledge sharing is collaboration and by creating an environment that encourages and supports collaboration, knowledge sharing will consequently increase. The concepts of Knowledge Management, teamwork, project teams and virtual teams were deeply studied in the theoretical part of this research in order to understand the connection between the concepts and the necessary infrastructure to support and guide the development of the suggestions for improvements. The case studies were used to understand the critical items in the organisation that hinder collaboration. The given suggestions for improvements were focused on those critical items.

Breaking the silos between different locations with the attempt of reaching common ways of working, procedures, guidelines and tools are the key items to increase global teamwork efficiency and the facilitators of team cohesion or alignment. A global understanding or clarification of roles and responsibilities of the project organisation is essential to avoid misunderstandings, confusions and possible conflicts that affect both team efficacy and trust, which is the enabler to collaboration. The findings indicate that there is a need for developing common templates for project instructions and procedures. Even though projects are characterised by their individuality, such procedures give a general understanding about the procedures and a solid background that enables a more efficient start in task performance and facilitates team cohesion.

The participation of the project team key members in the development of the project goals increases the understanding of the goals right from the beginning. This not only accelerate team efficacy, but also avoid future misunderstandings and confusions that affects efficacy, teamwork and trust, which in turn diminishes collaboration and motivation. Additionally, the involvement of the project key members increases the opportunities of building the best solutions and of having a clear understanding about the tasks and the competence needed to perform them.

The results showed that a true involvement of HR in project work is necessary to gather a better resource management and to provide real support to the project team. This ensures that the correct human resources are available to perform the tasks, prevent individuals' overflow of work and burnouts as well as facilitate allocated individuals to directly focus on tasks performance rather than resolving the problems related to allocation. These are important items that, if not well

managed, directly affect individuals' motivation and trust towards other members, the team and the whole organisation.

A transparent, respectful and trustful environment is the foundation to collaboration. Therefore, an organisation that supports such environment is fundamental for enhancing knowledge sharing. Hierarchical organisations and leadership are obstacles to transparency and openness and contributors to fear, diminishing in this way the will to share and contribute. An organisation that supports transformational leadership is thus essential to provide the necessary environment that will enhance and encourage collaboration. In addition to that, the findings also indicated that leadership skills are necessary to the project team key members. One of the important characteristic of a good leader is the ability of maintaining motivation at a high level. The development of clear and fair feedback and reward processes are important factors of motivation.

The results of this research present innovative solutions or suggestion in regards to Knowledge Management that is suitable for and focused on engineering projects. The introduction of a new role in the project organisation to handle both explicit and tacit knowledge would considerably increase not only collaboration but also the effectiveness of the whole project team. The centralisation of information and knowledge sharing ensures that information and knowledge is delivered to those that actually need it at the same time that minimise the risks of overflow of information. The transformation of the existing DMS system to a KMS system increases collaboration and the sharing of knowledge in an efficient way, as well as diminishes the number of tools to be used in the project. The development of a Knowledge Management process to be applied in projects contributed to a better understanding about the process of knowledge, especially in regards to the development of goals and quality and approval processes.

Even though feedback from the organisation to the achievements of this research was not received at the time of completion of this work, I do believe that the findings provide good, practical and innovative suggestions for improvements. In addition to that, the suggestions for improvements were developed in accordance with the organisation's current strategy, mission and vision. However, I would like to stress that I did not receive the support from the organisation that I had expected. In this way, the developments of the suggestions for improvements were done based on the analysis of the case studies which led to my own beliefs of what and where the organisation really needs to improve, which might differ from those of the organisation.

This research focused on improving collaboration within the company's internal project team. Further studies and researches in increasing collaboration and knowledge sharing between the whole project team,

i.e. all the project parties, such as clients, suppliers and especially competitors are strongly suggested to be developed. By increasing collaboration between all parties the possibility of increasing the efficiency of the whole project is higher. Additionally, this also allows better and more sustainable solutions. Considering the client, increasing collaboration would reinforce relationship, which in its turn increases client engagement towards the organisation. In addition to that, knowing their clients is how the organisation will find competitive advantage. Increasing collaboration with other suppliers also allows a much more efficient way of handling the whole project, especially with those suppliers with which the organisation often works. Examples of development would be common tools and common work procedures. More and more the engineering has been split between competitors. For sure this creates challenges in sales. However, by increasing collaboration with competitors, such threats could become new sales opportunities.

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