CHALMERS

Customer Knowledge Management in Global Software Projects

Master of Science Thesis in the Master's Programmes International Project Management and Project Management

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ABSTRACT

Background – In global software projects, potential customers could be situated in another department within the same organization or in other parts of the world. In both circumstances, retrieving knowledge and useful information from customers in an appropriate approach could be crucial and challenging from different perspectives.

Aim – This research is aimed to explore dynamics influencing customer knowledge management in global software projects whereby project teams and customers are not necessarily collocated, and to recognize some of the key dimensions of an effective system, designed specifically for customer knowledge management in such projects.

Method – The research design for this thesis is based on an exploratory study and by conducting an on-line survey among more than 50 professionals from relevant industries. The purpose of undertaking exploratory research is primarily to investigate and to identify some of the key dimensions of customer knowledge management and to contrast empirical approaches which are currently in practice among various project teams with academic researches and literature being studied by academicians.

Findings – A significant amount of information being exchanged between project teams and the customers includes discussions about technical issues and problems while there is a high capacity for exchanging knowledge in non-technical areas, in order to facilitate future collaborations. Electronic media, particularly email is the key communication method being used and as a result, lack of sufficient social interactions appears to be a key challenge in communicating with customers. Cultural and geographical differences as well as building trust, could be realized as other important challenges in this regard.

Conclusions - Despite the fact that customers are among the most significant stakeholders in almost every project, it has been realized that there is a significant room for improvement when it comes to communicating with them and learning from. Key factors including but not limited to social interactions, as well as development of a trustworthy environment whereby efficient communication could be facilitated, should be considered by project management teams, in order to develop and maintain an efficient and sustainable customer knowledge management system.

Overall, sufficient investments in project communication management, as well as project integration management are recommended, in order to enable such systems.

Keywords

Knowledge Management, Customer Knowledge Management, Global Software Projects

Preface

Pursuing a post-graduate study in International Project Management was probably the best decision I ever made in my educational journey. Some could argue that lessons learned in various academic programs could be forgotten after a number of years - if not months - but I believe that what I have generally learned in this program can last and be useful, as long as pursue further growth in life. Studying at Chalmers University of Technology and being among some other talented minds from all over the world, was certainly a great honour that makes me feel proud and humbled. Proud, because every moment of being in the campus was a priceless opportunity to learn something useful and humbled because the more I have learned, the more I realized that there's so much more to learn.

This journey with all ups and downs could not lead towards success without the inspiration and motivation of certain people, specially my brilliant professors. In particular, I would like to express my endless thanks and gratitude to my wonderful supervisor, Dr. Petra Bosch, for her patience, continuous support, inspiration and motivations. She was there like a true coach, whenever I needed to consult and always offered her valuable guidance to ensure that I would continue with this journey. My humble words feel week to extend thankfulness and appreciation towards her.

Also, I would like to thank Dr. Max Rapp Ricciardi, for having such an inspiring character and helping me to learn about deeper aspects of self and others' behaviour.

Lastly, I would like to thank Chalmers University of Technology for providing this priceless opportunity and of course all my friends and family who supported me in different ways during the past couple of years. I will do my very best to deserve it all.

Gothenburg, September 2013

Seyedali Vaezitehrani

Contents

List of Illustrations

List of Acronyms

APM	Association for Project Management
APMBoK	Association of Project Management Body of Knowledge
CKM	Customer Knowledge Management
CRM	Customer Relationship Management
GSD	Global Software Development
ICT	Information and Communication Technology
IT	Information Technology
KM	Knowledge Management
KPI	Key Performance Indicator
MNC	Multinational Corporation
PMBoK	Project Management Body of Knowledge
PM	Project Management
PMI	Project Management Institute
VT	Virtual Team

1 Introduction

This research project aims to explore various aspects of customer knowledge management in software development projects, whereby project teams and customers are geographically distributed. The author believes that utilizing customers' knowledge about different aspects related to the project, including but not limited to products, market, new technologies as well as competitors could benefit project teams in strategic decision-makings and also can facilitate a collaborative ecosystem in which both project team and customers can enhance their innovative capabilities. In this chapter, study rational and backgrounds will be introduced. Research's aims and objective in addition, will be briefly discussed and project's scope and limitations, as well as some of the potential contribution to the academic and business world will be concisely discussed.

1.1 Rational of the study

In the last decade, there have been a number of studies on Knowledge Management (KM) and Customer Relationship Management (CRM) theories and practices, which clearly made them an area of interest for both project based organizations as well as academia (Gebert, et al., 2003). One reason could be due to the fact that a key success factor in any given project is to satisfy stakeholder's requirements (Association for Project Management, 2006) and customers are certainly among the most significant stakeholders in almost any project. Therefore, it is crucial to ensure that a sustainable relationship to be established between the project team(s) and customers, not only during the project execution period, but also after its completion. Close collaboration with customers prior to the start of the project is also arguably important (Association for Project Management, 2006).

One important enabler to develop and maintain a customer-oriented strategy could be applying an appropriate knowledge management strategy, together with customer relationship management practices, mainly because using KM might allow organizations to secure robust and equally beneficial relationships with their customers (Smith & McKeen, 2005). Consequently, a new area of study has become into existence in the past few years, aiming to identify and analyse successful factors in integrating KM practices and CRM approaches from the viewpoint of knowledge in customer-oriented processes (Gebert, et al., 2003). This field, Customer Knowledge

Management (CKM), is expected to be a substantial enabler in increasing overall quality of projects (Bueren, et al., 2004). On the other hand and as businesses are expanding to various parts of the world, the number of projects with globally distributed customers has been increased significantly. Particularly in software development projects, there has been a noteworthy growth in this regard which results distributed project teams and customers. In Sweden for instance, outsourcing software projects have become a key strategy which many organizations have adopted due to "reduction of operating costs, shortage of domestic IT skills and resources and focus on core competence" (IT Sourcing Europe, 2011).

Hence, the author aims to explore various angles of CKM in GSD projects whereby customers are spread globally and exchanging knowledge might be challenging.

1.2 Aim and Objectives

The aim of this research is to investigate various aspects of customer knowledge management theories and practices, particularly in GSD projects in which communications essentially rely on technology-oriented mediums and usually within an inter-cultural environment. To achieve this, three key areas to be explored:

- Global software development (GSD)
- Knowledge management (KM)
- Customer knowledge management (CKM)

Presumably, conducting a comprehensive study on the three mentioned fields could be resourceful in a way that developing a pragmatic framework for CKM in GSD projects could be achievable.

While the focus of this research would be exploring theoretical and empirical aspects of customer knowledge management in global software development projects, the objectives of this project could be summarized as:

- Providing a clear understating on what customer knowledge management means in GSD projects,
- Assessing key challenges in CKM in GSD efforts,
- Identifying critical success factors for CKM in GSD projects.

1.3 Research Questions

In order to meet the objectives of the project and to eventually propose empirical guidelines which could be beneficial to both academia and industries, the following research questions are aimed to be answered:

- ✓ How can KM enhance customers' engagement in GSD projects?
- ✓ What are the challenges in retrieving knowledge from customer in GSD projects?
- ✓ What are the key characteristics of a successful CKM system in GSDs?

1.4 Outline of the report

In order to conduct a comprehensive study on the targeted areas, progressive steps will be taken to deliberately understand and elaborate various dimensions of the topic in both theoretical and empirical forms. The following summarizes the structure of this effort:

Literature review - In the literature review section, the author is aimed to explore previously done researches in three key areas: GSD, KM and CKM. Combination of the three key topics is the basis of this research and yet, every each of them needs to be initially studied.

Method - After conducting a comprehensive study on the literature, obtained research methodology would be introduced and the approach towards gathering resourceful information will be explained. Main goal here would be collecting useful information from the business world, in order to compare and contrast the practical and theoretical aspects related to the topic of CKM.

Findings – when gathering empirical data is completed, the results will be analysed and contrasted with the literature accordingly.

Discussions - Based on the analysed data from the previous sections, this chapter provides comparative and analytical discussions regarding the study materials and findings. Accordingly, some of the key aspects that can be suggested for developing CKM in GSD projects to be proposed.

Conclusions – Relying on the lessons learned from the literature reviews as well as empirical studies, this section is aimed to conclude the overall research by

highlighting some of the key results of the overall study. Furthermore, some recommendations for future studies to be included in this section.

1.5 **Research method**

Research methodology design is defined by Yin (2003) as “an action plan for getting from here to there”. The term ‘here’ could be understood as the initial research questions and ‘there’ as the objectives achieve point. The rationale for using a methodology is to ensure that the research project remains focused on its objectives and is most likely to accomplish desired outcomes. Accordingly, an exploratory research methodology has been chosen for this research, in order to explore various angles of the proposed topic from a holistic view and also to ensure that the depth of understanding from the research topic will be adequate (Rudestam & Newton, 2007), while it allows further researches to be more specific and precise. In addition the author is aimed to explore new dimensions of customer knowledge management in a sector which have not been studied before and an exploratory research method seems to be more applicable in this case. Adopting closed interview questions by using an on-line survey as the core of data gathering has been chosen, firstly because it provides the ability to use the limited time in the most efficient way by collecting data from all over the world (Biggam, 2010) and also because the author would be able to develop gathered data into patterns that can be compared to the literature (Naoum, 2007). In addition, analysing certain topics from different dimensions by using surveys and cases allows for a flexible study where the research design can be altered when new insights or themes emerge.

1.6 **Research scope**

The scope of this research project is primarily focused on global software development projects in which project teams and customers typically communicate using technology-oriented systems, due to distanced environments. Thus, identifying and analysing successful customer knowledge management tools, techniques and strategies in global software projects (Herbsleb & Moitra, 2001), as well as in virtual project teams (Gammelgaard, 2010), would be the main investigation area from customers knowledge management perspective.

1.7 Research Limitations

Two main constraints in conducting this research would be obtaining appropriate empirical data from the industry, mainly due to the fact that most organizations are relatively concerned about their specific relationship and approach towards customers. In addition, limited portion of time assigned to this research could be another challenge. Yet, conducting a study in this field should be profound enough to identify and contrast various attributes that could have impact on the topic and therefore, concentrating on three key areas in the literature review and also conducting online surveys in order to gather appropriate data has been carefully chosen.

1.8 Potential contributions

The project will allow scholars to understand various challenges in transferring knowledge to the customers in global software development projects and also different types of characteristics an appropriate approach should have to facilitate customer knowledge management in GSDs. In this manner, the scientific objective of this research is to contribute to the research fields of Customer Knowledge Management as well as Global Software Development with practical observations and analysis. The results of the research would also benefit industrials organizations in Sweden and worldwide to conceptualize and cope with geographic distributions in managing global software projects whereby transfer of knowledge across the project teams and customers could be challenging.

It's expected that the following roles / teams in GSD projects could benefit from the outcome of this research:

- Customer Project Managers
- Distributed Teams
- GSD project organizations
- Knowledge Managers
- Product Managers
- Product Owners
- R&D Project Managers
- Virtual Teams

2 Literature Review

There are fundamentally two main purposes for conducting a literature review: Principally, it provides an overall understanding about certain topics by obtaining systematic study of previously published researches related to the field of investigation and also offers some helpful insights into how the researcher can design the on-going study in a rational approach (Naoum, 2007) by learning directly from other researchers. To conduct literature review effectively, some researchers have suggested adopting a Venn diagram of three intersecting areas that are derived from the previously deliberated exercises on formulating research questions (Rudestam & Newton, 2007). Therefore, the literature review being undertaken in this chapter is aimed to provide a clear understanding about three key aspects of this research project, as shown in the below figure:

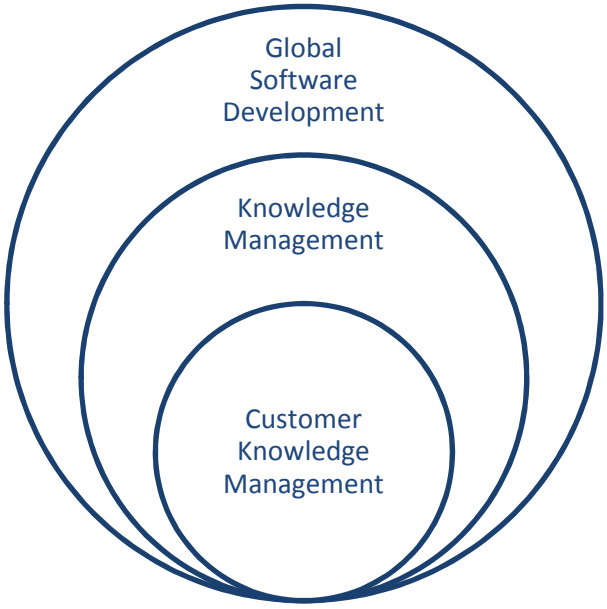

Figure 1: Venn diagram of three key area to be discussed in the literature review, adopted from (Rudestam & Newton, 2007)

Starting with global software development, the author aims to provide a better understanding about the scope of this research which is limited to GSD projects. Subsequently, an overall investigation in the topic of knowledge management would lead to a comprehensive study on the state of the art literature in customer knowledge management in order to develop a solid ground for further analyses.

2.1 Global Software Development Projects

2.1.1 What is GSD?

Over the last decade or so, software development has become an important aspect of many businesses. In fact, organizations are somehow connected to computer software industry - directly or indirectly - and as a result, certain approaches in utilizing software development projects have been adopted by various organizations. This is while not every organization has enough motivation, capacity or resource to develop software in-house and consequently, such efforts has been outsourced to other teams within the same firm or external project teams. As a result, there are a lot of examples which can elaborate a circumstance in which software development project is actually distanced from the original project team. Particularly in ICT organizations, it is relatively common to develop various pieces of software in different departments or project teams which are not necessarily collocated or to outsource the project to be done in other countries for certain reasons. As an example, one motive for choosing a particular offshore country could be based on "access to knowledge being provided in the customer base" (Noll, et al., 2010). Low cost of development could be seen as another significant motive for outsourcing (Herbsleb & Moitra, 2001).

Accordingly, global software development (GSD) which refers to "software development that is geographically, remotely or globally distributed with the aim of rationalising the development process and products" (Avram, 2007), has been known as a solution to overcome such challenges (Herbsleb & Moitra, 2001). In the other words, GSD could be defined as "a phenomenon that is receiving considerable interest from companies all over the world" (Holmstrom, et al., 2006). Yet, it is important to recognize the fact that 'global' in this context could be referring to the entire organization (e.g. a large enterprise with several project offices in different locations) or literally mean international as certain companies provide services to customers in various parts of the world. Many major IT companies are examples of this fact.

On the other hand and while project teams would collaborate globally, it is obvious that in some scenarios, there is a high probability that project teams and customers are not interacting directly. This simply refers to the fact that the communication channels between the project team and customer(s) are primarily via technology-based mediums and not in a face-to-face approach. For instance, a GSD team is based on

Bangalore, India, and their main customer is based in Gothenburg, Sweden. One more example could be large enterprises which are operating globally and certain pieces of software are being developed or tested in different offices, before being combined to form the final product. In such scenarios, chances of missing certain information during the running phase of projects are significant.

2.1.2 GSD characteristics

In GSD projects, there are a number of variables which might affect the overall communication experiences. Some of the key aspects in this regard could be recognized as: temporal distances, geographical distances and socio-cultural distances (Holmstrom, et al., 2006) Furthermore, factors such as individualism and collectivism, short-term commitments and long-term orientations are some other examples which could differentiate individuals based on their cultures in any given society (Wayman & Gillette, 2012).

For many, GSD projects are equivalent to a complex series of interactions among different teams in a worldwide level which essentially is correlated to virtual teams (Tanner, 2009) and virtual collaborations using networked technologies. As a result, adopting various technological platforms has become an accepted practice in such organizations which might bring new challenges into the entire environment by hindering the communication processes, despite all the benefits which they offer.

As several studies confirm, there is a significant correlation between cultural backgrounds and the quality of communication, particularly in global software development efforts (Tanner, 2009) and despite the fact that English is used as an official business language in many organizations; there are obviously potential encounters which need to be addressed accordingly.

Global virtual collaborations are indeed dependant to the advancements of information and communication technologies (Zakaria, et al., 2004). In fact, one of the key factors which make virtual teams different from common global teams is the use of technological tools for communication and as a result, intercultural communications in such environments becomes even more complex, due to reliance on various technologies as a medium of communication. However, studies show that appropriate engagement of such technologies can significantly enhance the communication system and facilitate intercultural issues (Zakaria, et al., 2004). Yet,

there are certain downsides which need to be addressed accordingly. For instance, using networked technologies, such as social media are getting popular among virtual teams in order to improve cross-cultural communications (O'Brien, et al., 2007). But it yet appears to be an area which needs more in-depth analysis in order to make it useful for initiatives such as GSDs. Particularly in case of knowledge transfer in cross-cultural organizations, using technology-enabled media might be a real challenge. Furthermore, and while software project management has been recognized as a complex endeavour, it becomes even more complicated when being undertaken in virtual teams in geographically distributed environments (Noll, et al., 2010).

Customers on the other hand could be viewed as one of the key stakeholders in such projects and due to the complexity of GSD projects and distribution among the project team(s) and customers, they need to be served differently as they typically would. Certain aspects, including but not limited to requirement analysis, sustainable communication and appropriate response to changes should be considered by the project management team (Noll, et al., 2010).

2.1.3 Software project management approaches

Software project management has been evolved significantly in the past few years (Augustine, 2005) and developers are taking new approaches towards delivering quality products to the customers worldwide. Although it is yet a challenge for GSD projects to appropriately adopt modern ways of managing projects, Agile methodologies seem to be rising as a reliable approach towards handling customer needs in software projects, according to Augustine (2005).

In the following section, Agile methodology and project management practices will be briefly discussed.

2.1.3.1 **Agile methodology**

Augustine (2005) argues that "the right product for the right price at the right time" is essentially the definition of customer's value in software projects. From another perspective, it is reasonable to identify the above definition as one of the key goals of software projects and its project manager's role to ensure that it will actually be achieved appropriately. While there are a number of methods and practices to address to such issues, agile philosophy for software project management is aimed to interactively engage customers. As described in the Agile Manifesto (Beck, et al.,

2001), customer collaboration is preferred over contract negotiation, in agile software project management. In fact, agile philosophy gives the highest priority in satisfying the customer through early and continuous delivery of valuable software and harnessing change for the customer's competitive advantage, Beck, et al. argue (2001).

Agile methodologies (Augustine, 2005), with their focus on addressing such needs by having the customer in the centre of attention in software development projects have been adopted in a number of software projects.

It is worthy to mention that in this context, agility is basically the ability to deliver customer value while dealing with dynamic environment of software projects and also recognizing and adapting to changes when required, as Augustine (2005) explains.

2.1.3.2 **Agile project management**

According to Augustine (2005), "Agile project management is the work of energizing, empowering, and enabling project teams to rapidly and reliably deliver business values by engaging customers and continuously learning and adapting to their changing needs and environments".

In fact, a reliable correlation between the project team members as well as customers is a key identifier in Agile projects and as it is illustrated in the below figure, the cycle of interaction between customers and project team is designed to be a significant aspect of such approach to managing software projects in all phases of the project.

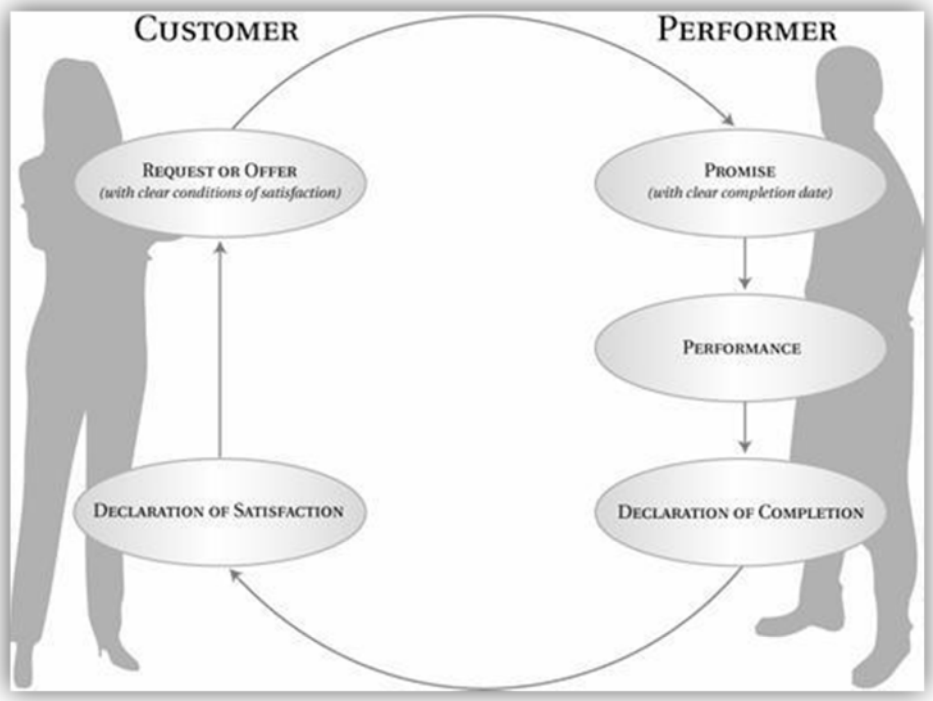

Figure 2: Typical conversation theme with customers, adopted from Augustine (2005)

In agile projects, it should be a common practice to engage customers continuously and effectively, so that needs and requirements are addressed in an appropriate manner. A continuous conversation is indeed the most effective approach for achieving such goals. However, in GSD projects that might be a challenge since agile methodology is basically designed for co-located projects in which project team members and customer actually have a chance to interact closely.

In fact, GSD projects have a number of challenges in terms of execution of the project and collaborations between the project team(s) members (Noll, et al., 2010) and having customers location in other parts of the world will certainly cause additional issues that need to be addressed.

The following section, introduces some of the key challenges in GSD projects.

2.1.4 Key Challenges in GSD projects

As studies show, poor knowledge and information management would cause project teams missing many opportunities in reusing already adopted knowledge by different project team members and in a long term, this could be seen as a significant drain in time and cost of various projects (Herbsleb & Moitra, 2001), while it also impacts on efficiency of human capital. In fact, as Herbsleb & Moitra (2001) suggest, “Without

effective information and knowledge sharing strategies, project managers cannot exploit GSD benefits" as much as they should. Furthermore, other issues such as temporal, geographical and socio-cultural distance (Holmstrom, et al., 2006) could cause extra difficulties in getting advantage of GSD projects as appropriate communication among the project teams as well as customers might be challenging. Physical separation between GSD project teams could eventually contribute to conflicts in different forms, according to the researchers in the University of California (Elliott & Scacchi, 2003), and this could be due to the issues raised as a result of lack of sociability, agility in respond to changes or more importantly, the lead time which might be required for various team members to get updates regarding certain aspects of the project. On the other hand and when it comes to customer relationships, there might be other unexpected issues to surface, primarily due to the "Geek" culture (Elliott & Scacchi, 2003) that could exist in certain project teams.

Besides, another key risk in GSD projects could be realized in cross-cultural management as "conflicts and misunderstanding may arise unless people learn how to interact in a harmonic way with persons from different cultures" (Casado-Lumbreras, et al., 2011). Obviously, organizational culture could have certain impacts on such issues (Zakaria, et al., 2004), yet, such aspects are significant enough to plan for and manage appropriately.

With regards to customer relations and engagement, all the above mentioned challenges could be recognized also. In fact, dealing with customers which are not co-located with the project team(s) could actually involve a number of issues, including but not limited to: cultural differences, time variations, language, etc. (Noll, et al., 2010). Virtual communication mediums, such as email or forums are some of the examples which could be applied in customer challenges with GSD projects.

2.2 Knowledge Management

In this section, the term knowledge management will be explained and some of the key challenges related to this topic will be discussed.

2.2.1 What is KM?

Although knowledge could be simply defined as what we know, it is generally described as "a mental state that bears a specific relationship to some feature of the

world" (Howells & Roberts, 2004). That is probably why in a world where businesses are striving to enhance their presence in the global markets, knowledge has become an essential competitive asset to almost all organizations (Ajmal, et al., 2010) which actually is recognized as an important factor that can lead businesses towards profitability and survival (Lopez-Saez, et al., 2010) and as a result, the term "knowledge-based organization" (Zack, 2003) has become a well-known expression among researchers as well as professionals. In fact, according to Zack (2003), businesses have realized that in order to survive in today's economy, "it is necessary to become a knowledge-based organization". Therefore, it is reasonable to agree that just like the need to adopt project management (PM) concepts in project-based organizations; there is also a need to adopt knowledge management (KM) concepts in knowledge-based organizations. But what is KM after all?

Knowledge management as is known nowadays has been into existence since the early 90s (Ringel-Bickelmaier & Ringel, 2010) and along the years, there has been a number of explanations describing it from different perspectives, depending the direction of knowledge flow (Gammelgaard, 2010) in various fields. In general, knowledge management involves undertakings which are related to capturing, utilization and sharing individuals' knowledge in favour of the organization (Ringel-Bickelmaier & Ringel, 2010). In the other words, KM could be recognized as a "systematic process of acquiring, organising, and communicating the knowledge of organisational members so that others can make use of it to be more efficient and productive" (Ajmal, et al., 2010).

There are many reasons which could explain the importance of KM to academia as well as businesses. Some researchers simply see it as an important aspect needed in any circumstances to provide a balanced flow of knowledge within the organization (Ajmal, et al., 2010). Others could view it as a purposive approach which could harmonize the transition of inflows and outflows of knowledge to accelerate innovation, which in a bigger picture is known as open innovation (Chesbrough, 2003). Nevertheless, it is certainly an important concept in knowledge-based organizations and needs to be addressed accordingly.

2.2.2 KM characteristics

According to Levy, et al., (2010), there are a number of processes involved in KM practices, including but not limited to: using, creating, identifying, organizing, sharing

and adapting knowledge. There are obviously other factors such as utilizing and exploiting knowledge in different levels within the organization as well as externally and it could be agreed that KM has the capacity to be reviewed from different dimensions and perspective. Yet, knowledge management as a process is generally known to obtain a typical life cycle as it is shown in the below figure:

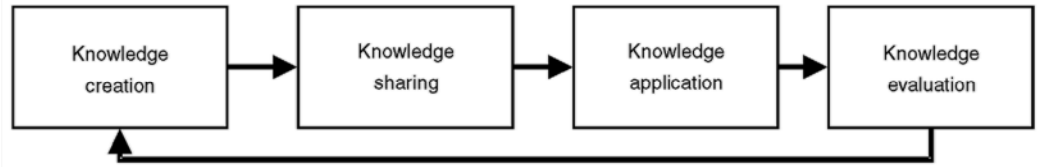

Figure 3: Knowledge Management Life Cycle, source: (Bharadwaj & Saxena, 2005)

Moreover, KM shed light on the various characteristics of knowledge in organizations by categorizing it into a number of aspects. Below, a couple of key attributes will be briefly introduced:

2.2.2.1 **Individual vs. Collective**

With refer to the above illustration of knowledge management life cycle, knowledge could be viewed in two key categories: individual and collective.

While individual refers to the utilized information that helps particular project team members, collective knowledge could be realized as the overall knowledge acquired by a number of individuals (in form of project team, etc.) that can enable project teams and organizations to develop, resolve certain issues and innovate (Ringel-Bickelmaier & Ringel, 2010).

2.2.2.2 **Tacit vs. Explicit**

Moreover and with regard to the nature of this topic, researchers recognize two other types of knowledge, defined as: tacit and explicit. “The degree of tacitness, and how quickly the body of knowledge is changing, determine which modes of collaboration are most suitable, knowledge transfer effectiveness” (Hutzschenreuter & Horstkotte, 2010). In their review, Holste & Fields (2010), claim that explicit knowledge is often impersonal and formal in nature and can be “easily articulated or reduced to writing, is often impersonal and formal in nature, and frequently takes the form of documents, reports, white papers, catalogues, presentations, patents, formulas, etc.”, while tacit knowledge in contrast is highly personal and would be really challenging to be converted into text for instance.

Note: All the mentioned categories are certain perspective which knowledge could be viewed and obviously, they would be applied to both project team as well as customers. In fact, it is important to notice that while knowledge of project teams could be categorized as tacit and explicit or individual and collective, customers would also have similar attributes when it comes to "their" knowledge.

2.2.3 Knowledge Management in GSD Projects

Tacit knowledge could be recognized as one of the key drivers of any IT organization (Bharadwaj & Saxena, 2005) and for this very reason, applying KM practices in an appropriate manner seems to be crucial. In GSD environments whereby most of the communications are indeed virtually and relying on technology (Zakaria, et al., 2004), this transfer of tacit knowledge becomes even more challenging.

According to Bharadwaj & Saxena (2005) and on-site researches they have conducted in various project teams, there are five major types of critical knowledge in GSD environments, including: "application domain knowledge, technical knowledge, application requirements knowledge, project status knowledge, and project experiential knowledge". On the other hand and according the same researches, there are some dimensions in such environments which could be considered as knowledge base, including: project documentation, best practices documentation, and issue bases (issue logs). Obviously, similar concepts could exist in different organizations with different names, however, what is important to notice is that almost all of the recognized knowledge bases are applicable for explicit knowledge and again, transfer of tacit knowledge should be addresses in a different approach.

"Knowledge sharing is a joint process in nature because participants need to be engaged in the process if they really want to share knowledge" (Li, 2010) and in GSD projects and when it comes to virtual collaborations, this process of knowledge sharing would require the use of networked technologies.

While different parts of project team(s) would essentially collaborate on a virtual basis in such environments, it is also important to recognize the fact that customer engagement and communication will also be held in similar approach and as a result, certain practices should be applied in order to have an effective communication with customers in GSD projects (Holmstrom, et al., 2006). Factors such as cultural differences, language barriers and more should be considered and addressed properly when collaborating with customers in GSD projects and when the medium of

communication is technology-enabled and not closely, the importance of adopting a proper strategy to engage customers might be vital.

2.2.4 Key challenges in knowledge-based projects

While the importance of knowledge management in project teams could not be overlooked, there are a number of challenges which require adequate consideration. Below, a couple of key issues in this regard will be introduced.

2.2.4.1 **Knowledge retrieval**

As Gammelgaard (2010) argues, in virtual environments in which a significant amount of communications is held through networked technologies, retrieving external knowledge is indeed a challenging process. In fact, such challenges are equally important in both internal and external communications in which different project teams, as well as customers are concerned.

Having an efficient flow of information among different project team members as well as customers, in conditions which several dynamics such as culture, geography, time differences, etc., are playing a role could be a key challenge to deal with, ensuring that information outputs and inputs are reasonably adequate:

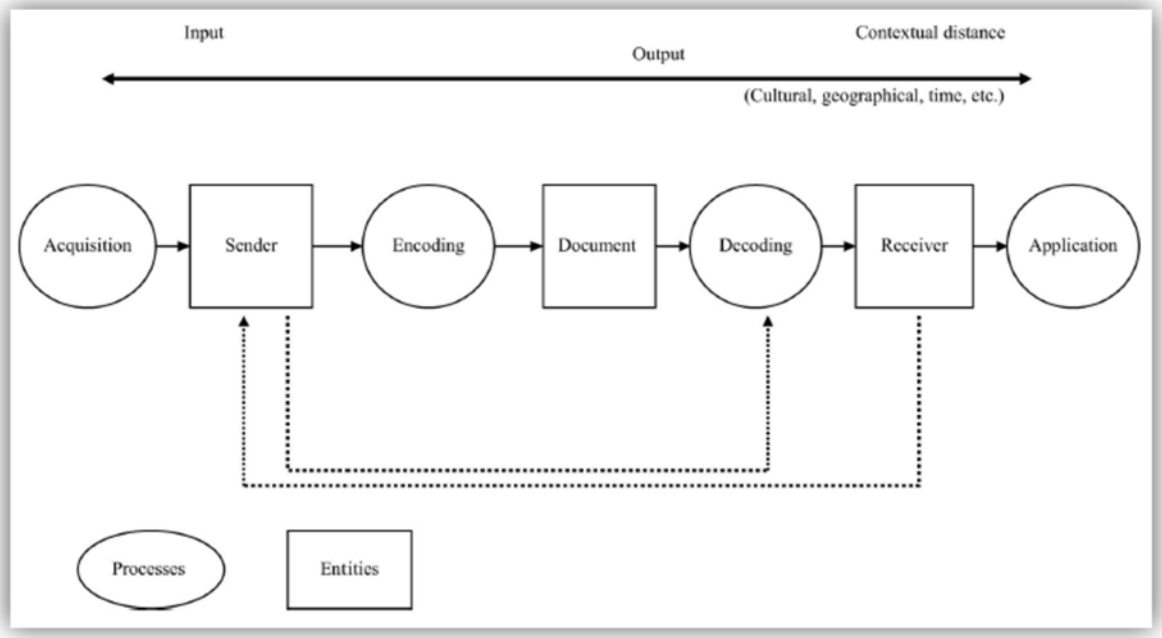

Figure 4: Knowledge retrieval process, adopted from Gammelgaard (2010)

In such environments, the process of acquiring relative information and transforming them into applicable knowledge could be a long process which involves a number of steps and ultimately, there are a number of barriers in between the input and output as illustrated in the above figure.

Besides, it could get even more complex when the knowledge retrieval process to be among the project teams and their customers, due to the fact that there are a number of aspects involved, including but not limited to: confidentiality and trust, financial aspects, competitors, politics, etc (Smith & McKeen, 2005).

Therefore, it could be important to develop a trustworthy and sustainable channel between the project team and customers, so that those barriers in retrieving knowledge could be set to minimum. Customers usually have a different set of information with regard to certain products (Lohan, et al., 2011) and it could also be important to constantly engage them in various phases of the projects, so that the chances of retrieving valuable knowledge increase in long-term perspective.

Furthermore, according to Ajmal, et al., (2010) some of the key challenges ahead of KM practices, could be identified as technology, project management method and culture variations. While these challenges are not essentially applicable to all sorts of projects, existence of one or a combination of all those factors could be seen across many project teams, globally.

2.2.4.2 **Knowledge transfer**

Despite the fact that knowledge could be considered as the dominant asset to develop competitive advantages, development of a dynamic flow of knowledge to and from the organization could create added value to businesses as well as their partners and customers (Hutzschenreuter & Horstkotte, 2010). As a matter of fact, and due to the nature of knowledge which essentially requires continuous development, transfer of knowledge should be seen as a vital aspect in knowledge-based organizations. This basically involves individuals who are parts of the project teams, as well as customers and other external stakeholders.

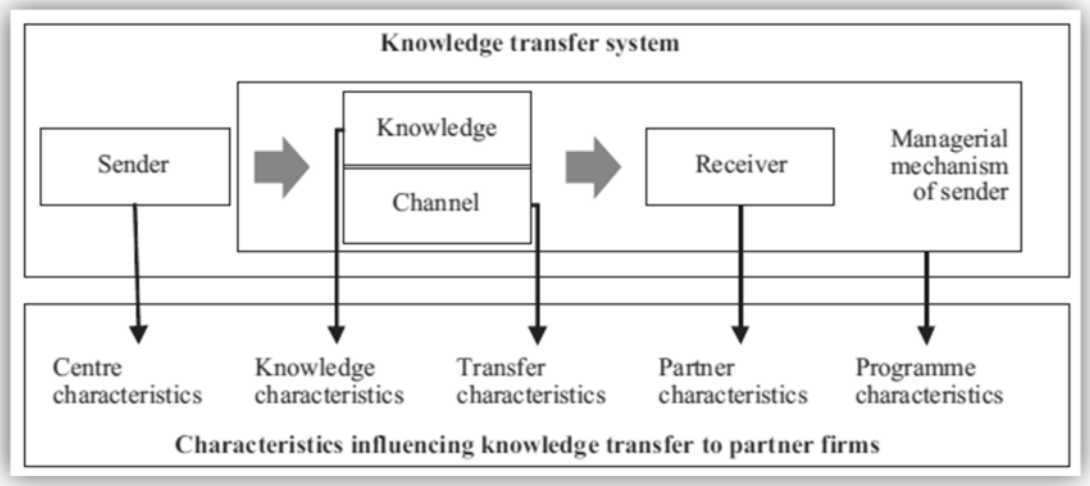

Figure 5: Characteristics of knowledge transfer in large networks, adopted from (Hutzschenreuter & Horstkotte, 2010)

As shown in the above figure, the process of transferring knowledge to external links including customers or partners, involves a number of dynamics that impact on the overall processes. For instance, transferring channel could actually have a significant influence on knowledge transfer in different ways. Studies show that there is a need to address this issue in a systematic approach (Hutzschenreuter & Horstkotte, 2010).

2.2.4.3 **Trust**

Holste & Fields (2010), claim that successful transfer of knowledge actually depends on individuals' willingness to adopt new ways of doing various tasks and risk the possibility of failure. On the other hand, as "project teams are typically established as groups of individuals with distinct responsibilities that address client requirements" (Gammelgaard, 2010), developing a trustworthy environment in which project team members can actually share appropriate knowledge to external parties such as customers and vice versa is certainly a challenge, especially in GSD projects that are dependent to a healthy flow of knowledge and information.

As studies show, one of the biggest challenges that a project manager might face would be encouraging individuals to share their knowledge, particularly tacit knowledge in favour of organization's overall success (Holste & Fields, 2010). It would be even more challenging to enable a trustworthy channel that customers and the project team can transfer their knowledge accordingly. Nevertheless, such ambition requires a well-developed trustworthy environment which includes

appropriate social interactions among project team members as well as customers and other partners.

2.2.4.4 **KM assessment**

In order to get a better understanding about the current conditions of KM in an organization, knowledge audits could be considered as the first essential step according to Levy, et al., (2010) and the reason is simple: by conducting regular audits, key success and failure aspects of implementing appropriate KM systems in knowledge-based projects could be identified and monitored.
While having such system within the organization might be achievable as a result of certain efforts, engaging customers for similar strategies might not be very easy and certainly will require a fundamentally well-established environment which enables healthy communication and collaborations with customers (Dahlsten, 2006).

Moreover, assessing KM efforts is not an easy endeavour and could be measured in few ways only. Indicators such as resource growth, knowledge content development, project survival and financial return (Ajmal, et al., 2010) are the key attributed which has been identified as key aspects for such purpose. Yet, a number of aspects are not easy to be measured. Tacit knowledge for instance could not be measured by quantitative procedures (Ringel-Bickelmaier & Ringel, 2010) and in case of customers; developing Key Performance Indicators (KPI) has been the most common approach so far, to measure various aspects of customer's engagement and collaboration strategies (Bueren, et al., 2004). Therefore, it is fair to identify knowledge management assessment as one of the key challenges in such environments, both among the project team(s) as well as customers.

2.3 **Customer Knowledge Management**

After learning some of the key aspects in Global Software Development (GSD) projects as well as Knowledge Management (KM), it is time to explore some of the key characteristics of the new term, Customer Knowledge Management (CKM).

2.3.1 What is CKM?

In today's fast emerging market, organizations are very much dependant to external resources and networks, such as supply chains, customers and obviously their knowledge (Swart & Harvey, 2011). As studies show, customers in general have a

significant role in success of projects, since project's success as actually depends a lot to customers' overall satisfaction (Vosough & Vosough, 2011). In fact, both "practitioners and researchers agree that building relationships with customers is a critical factor to an organization's success" (Smith & McKeen, 2005).

Furthermore, there is no doubt that appropriate communication and collaboration with customers in different phases of the project, could help in increasing the overall satisfaction of customers which eventually could increase the overall success of the entire project. Probably that is the reason that many organizations are trying to develop their Customer Relationship Management (CRM) as a tool to maintain a collaborative relationship (Smith & McKeen, 2005) with their clients. However, in the recent years a new term has been defined by researchers that unlike CRM is not a tool, but is a process which is intended to capture, generate and integrate knowledge about and for customers continuously (Smith & McKeen, 2005) and is recognized as Customer Knowledge Management (CKM) among researchers as well as business experts. CKM in fact could be defined as a systematic approach towards communicating certain knowledge and information with the customers (Smith & McKeen, 2005) which includes knowledge for the customers as well as knowledge from the customers. This as it suggests by definition means that there are certain conditions in which the knowledge of the customers could be beneficial for the project team and from another perspective, what project teams know, could add value to the customers and need to be communicated through a systematic approach (Smith & McKeen, 2005).

In software projects in particular, adopting practices such as agile methodologies, benefitted project teams to collaborate with customers in a more efficient way, due to continuous interactions between the project team and customers, which results better understanding of customer's requirements and eventually a more satisfying product (Lohan, et al., 2011). However, in GSD projects, adopting facilitating methods such as agile which could result more interactions with the customers is a challenge, due to the nature of such projects and the fact that project teams would perform virtually and on distributed basis (Noll, et al., 2010).

2.3.2 CKM characteristics

Customers are realized as one of the most important stakeholders in any project (Association for Project Management, 2006). Furthermore and as far as it is the scope

of this research, one factor which could provide a significant impact of differentiating software projects with other projects could be realized as the role of customers. In fact, customers in software projects could be viewed from different dimensions. One could view the role of customers principally as a stakeholder whom should be satisfied by delivering the final product and the other one could view customers as a significant partner in delivering satisfactory results (Zhang, 2011).

As mentioned earlier, customers in software development projects could be colleagues in another department within the same organizations, or literally customers as being known for end users across the world (Augustine, 2005). Nevertheless, developing a close and efficient relationship in both situations could make a difference in the outcome of any given project. It is worthwhile to emphasise to the fact that in software projects, customer's engagement and continuous interactions until final delivery of the product is particularly important, because of the nature of the projects in which a number of changes, including changes to the project's scope, as well as technological changes could occur during the execution of the project (Elliott & Scacchi, 2003) and for this very reason, it is important to keep customers engaged throughout the project until final completion.

In software development projects in particular, there has been four key aspects which could be realized as a conceptual framework for customer focus, including but not limited to: improvement of customer relationships, receiving and utilisation of customers' feedback, collection and utilisation of customer information and more importantly, gathering and understanding of customers' requirements (Lohan, et al., 2011).

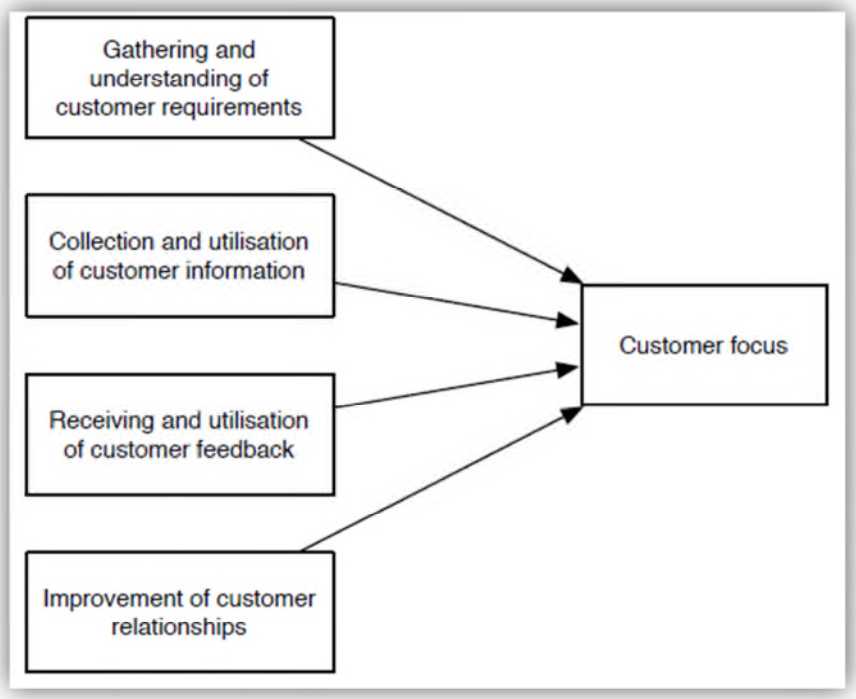

Figure 6: Conceptual framework for customer focus in software projects (adopted from: (Lohan, et al., 2011)

In this method, CKM could be used as a facilitating approach which should be used specifically in receiving and utilisation of customers' feedback, collection and utilisation of customer information as well as gathering and understanding of customers' requirements (Zhang, 2011). Furthermore, it could also be beneficial in development and maintenance of long term customer relationships so that project teams and organizations in general be able to establish a long-term relationship with customers, aiming to improve the level of collaboration as well as adding value to both parties in terms of advancement and innovations, together with financial improvements (Mortara & Minshall, 2009).

As Smith and McKean (2005) suggest, customer knowledge management systems should be designed in a way that depending the type of relationships, customers to be viewed and treated exclusively or generally. This means that in certain cases, there should be a distinction between the knowledge being transferred to the customers, depending their role and significance to the organization and vice versa.

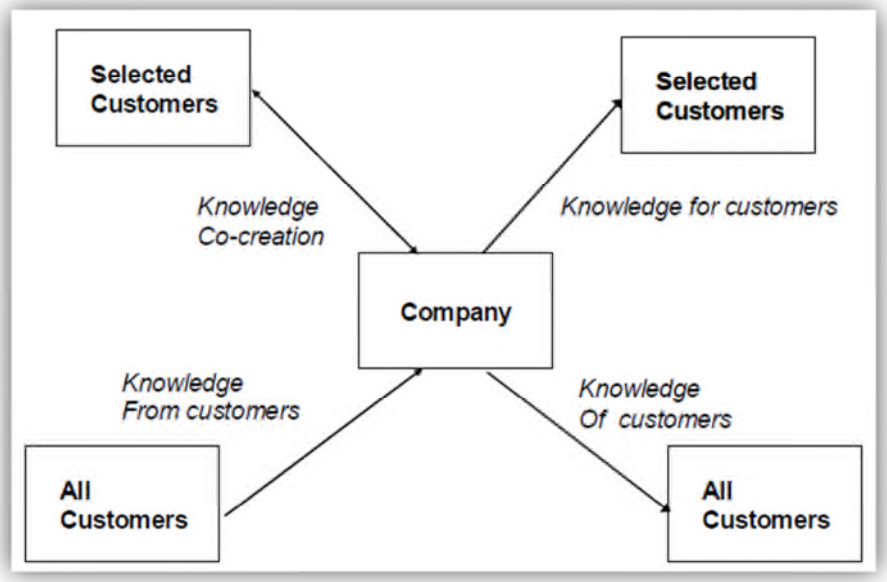

Figure 7: Four dimensions of CKM, adopted from (Smith & McKeen, 2005)

2.3.2.1 Knowledge for the customer

As the above diagram suggests, knowledge for customers should be carefully chosen for selected customers in certain cases and for all the other customers in other scenarios. This is particularly important when it comes to partnering with specific customers in innovative developments (Mortara & Minshall, 2009) which could lead to knowledge co-creation (Smith & McKeen, 2005) or teaming with other project groups within the same organization to pursue a common project (Avram, 2007).

2.3.2.2 Knowledge from the customer

Nonetheless, customers could also add value to the project teams by sharing certain knowledge from their side. In fact, customers' knowledge could always be beneficial to the project teams due to the fact that at the end, it is the customer who knows exactly what she wants and what alternatives are available for the need (Dahlsten, 2006). In the other words, it would always be helpful to know what customers expect from the final product (Roy & Stavropoulos, 2007) and know about how they will use the project deliverables. This way, the project team could see another dimension of the project's scope (Noll, et al., 2010) which eventually could lead to customer's satisfaction in the first place, as well as lessons' learned for the project team (Roy & Stavropoulos, 2007).

2.3.3 Customer Knowledge Management in GSD Projects

Customer knowledge management in global software development projects could be viewed as an important system to be adopted due to the fact that in such projects, the role of customers are significant (Holmstrom, et al., 2006) and also due to the fact that in many cases, current customers could potentially be future partners and CKM therefore, could play an important role in deepening the collaborative capacities between them and the project team.

As discussed in previous sections, knowledge management in GSD projects could benefit organizations by adding value to the project teams and increasing the quality of products, by helping project team members to effectively communicate their knowledge and information via a managed system which allow individuals to learn from each other and to contribute in advancement of the team (Avram, 2007). In addition to this and with regard to customer knowledge management in GSD projects, Dahlsten (2006) argues that increasing the depth of customer's knowledge about various aspects related to the projects seem to be beneficial to both customers and the project teams. In relation to this idea, studies confirm that the depth of customer knowledge could be related to the following key dimensions (Dahlsten, 2006):

- "Whether the relation between customers and the project team is based upon transactions, or
- Whether the relation between customers and the project team is based upon actual interactions in various phases of the project".

These two perspectives of the relationship between with customers could be interpreted as engaging customers in early phases of the project, usually in form of transactions, or to maintain the interaction with customers during the life cycle of the project. Either way, according to Dahlsten (2006), in order to deepen the level of knowledge that could be transferred from and to the customers; it is crucial to establish a reliable channel which could facilitate the process and reduce the risk of potential challenges in this process.

2.3.4 Key challenges in CKM

Similar to KM, developing a reliable customer knowledge management system could involve certain challenges such as knowledge retrieval, transfer and assessment, as

well as establishing trust among different sides of the equation. As discussed earlier, securing trust among different teams is crucial and challenging (Casey, 2010). This of course could become even more complex, when customers are involved. While the relationship between the project team and customers is sensitive by nature (Peng, et al., 2009), to cultivate a reliable and trustworthy platform in which both sides could feel secure and motivated in transferring knowledge could be realized as the main challenge in CKM system.

Furthermore, and due to the fact that in GSD projects the chances of having different backgrounds and cultures involved is fairly high (Hardin, et al., 2007), developing trust among the project teams, as well as customers could become even more challenging (Casey, 2010). Customers could find it difficult to trust external project teams, and the same applies to project teams, when a customer could seek their knowledge about products, technologies or other customers (Hutzschenreuter & Horstkotte, 2010). In other words, developing a trustworthy environment for this purpose seems to be the main challenge, while other dynamics such as cultural differences or business concerns could make the entire scenario more complex.

Certainly, the challenges are not limited to these dynamics only and based on the environments, complexity of projects and other variables, different difficulties might arise. However, realizing the key characteristics of challenges would help to identify some of the key elements which could facilitate developing reliable and sustainable CKM systems.

3 Methodology

This chapter describes the method used in the study and why certain approaches were adopted. Inspired by the form of structured interviews, the data was gathered through an on-line survey with respondents that had experience in managing or working in software project teams, as well as some others with a particular interest in customer relationships. In overall, answers from more than 50 participants has been gathered and analysed and as results confirm, industries such as energy telecommunications and IT, from countries such as United States, Canada, Sweden, Iran and Malaysia are among the key domains of research.

The survey questions have been designed in a way that not only certain challenges in GSD projects to be discovered, but also to get an understanding of key attributes that are claimed to be critical in such projects by professionals.

3.1 Research approach

A research design is aimed to provide a framework for collecting and analysing data (Bryman, 2008) and choosing research design methodology should reflect the priorities given to a range of aspects related to the overall research process. Aiming to explore various aspects of customer knowledge management in global software projects and due to the fact that this topic is fairly new and there hasn't been much of implementation of such systems within organizations, the author has chosen a qualitative research method, based on its explorative nature and also because it will provide the possibility to analyse and investigate the area of research, with a focus on patterns and current practices being undertaken in various industries.

An exploratory research method is subjective in nature. It highlights meanings, experiences, description, etc. "The information gathered in qualitative research can be classified under two categories of research, namely, exploratory and attitudinal." (Naoum, 2007). In this research, exploratory approach is being used due to the fact that the author is new to the field of research and also because the topic "customer knowledge management in global software projects" is relatively a new area which requires significant investigations in various dimensions.

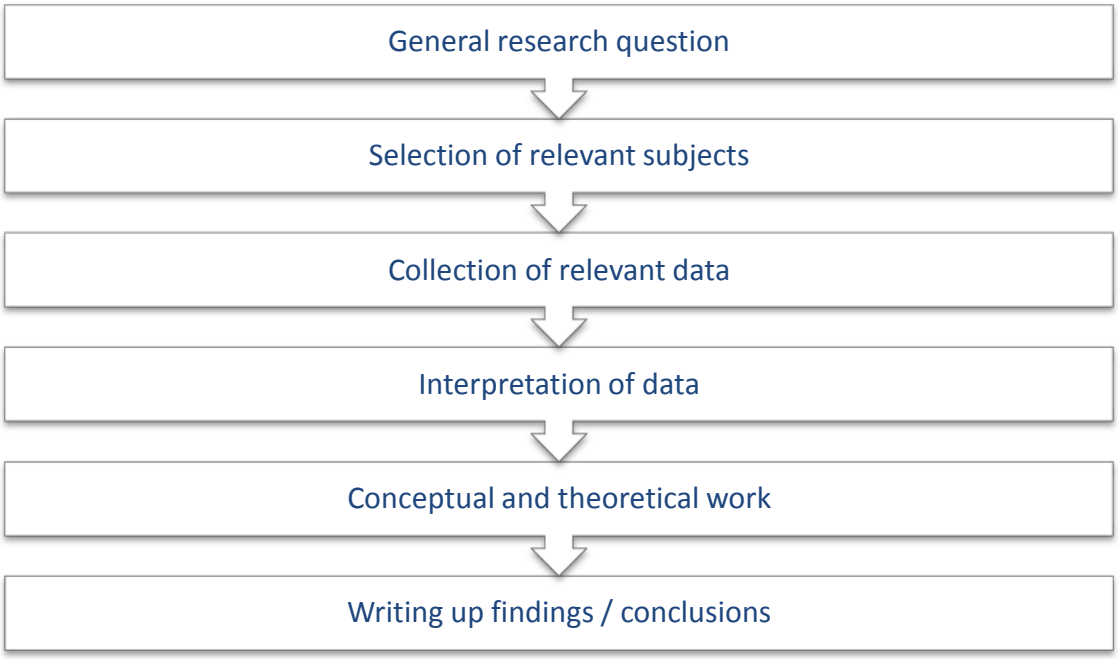

Figure 8: An outline of the main steps of qualitative research, adopted from (Bryman, 2008)

As illustrated in the above figure, the method chosen for this research is designed in a way that starts with realizing the key questions regarding the research project, followed by selection of key subjects to be studied in connection to the literature review. Then, data collection has been done, using an exploratory on-line questionnaire which led to analysis and conceptualization of the gathered data. Finally, the overall understating of the findings has been summarized in conclusion section later in this report.

3.2 Research strategy

In order to ensure a quality input to the questions, the author distributed the questionnaire to professional who had direct relation to the scope of this research or had extensive experience in similar area. This helped to increase the chances of finding more realistic and real-world challenges as well as demands with regard to the research's topic, while more answers could be collected in compare to personal interviews.

3.2.1 On-line Survey

Surveys are generally used in order to gather data from a fairly large number of respondents and within a limited time frame (Naoum, 2007). As Naoum (2007) explains, "there are two types of surveys available: the descriptive survey and the

analytical survey". For the purpose of this dissertation, a descriptive survey has been designed to gather information based on the "Five Ws" concept, explained by Dawson (2002). Questions designed to be simulating a structured interview in order to feature the followings, as Naoum (2007) describes:

- That for any research objective, the respondents have a sufficiently common vocabulary so that it is possible to formulate questions which have the same meaning for each of them.
- That it is possible to phrase all questions in a form that is equally meaningful to each respondent.
- That if the meaning of each question is to be identical for each respondent, its context must be identical and, since all preceding questions constitute part of the context, the sequence of questions must be identical.

Furthermore, by adopting such strategy, there would be certain advantages that could benefit this research. According to Naoum (2007), the following aspects could be some of the key advantages of applying a five Ws approach for developing survey questionnaire:

- The answers can be more accurate.
- The response rate is relatively high (approximately 60–70 per cent), specially if interviewees are contacted directly.
- The answers can be explored with finding out 'Why' the particular answers are given.

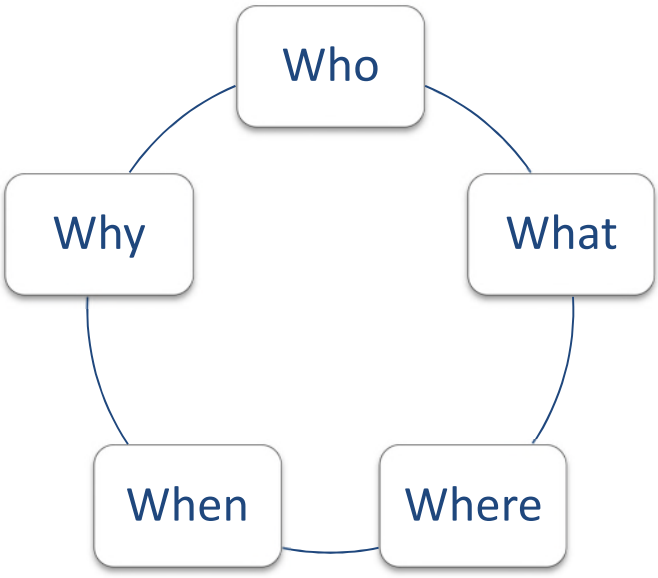

Figure 9: Five Ws for online research, adopted from (Dawson, 2002)

Inspired by the form of structured interviews, an online survey has been developed in order to reach a wider range of audiences and also to take advantages of networked technologies.

Self-completion questionnaires and structured interviews share many similarities (Bryman, 2008), and using an on-line survey in this case, facilitated the process of data collection while maintaining the quality and structure of the survey.

The online service provider Qualitrics has been chosen due to its intuitive design methods and also popularity among scholars.

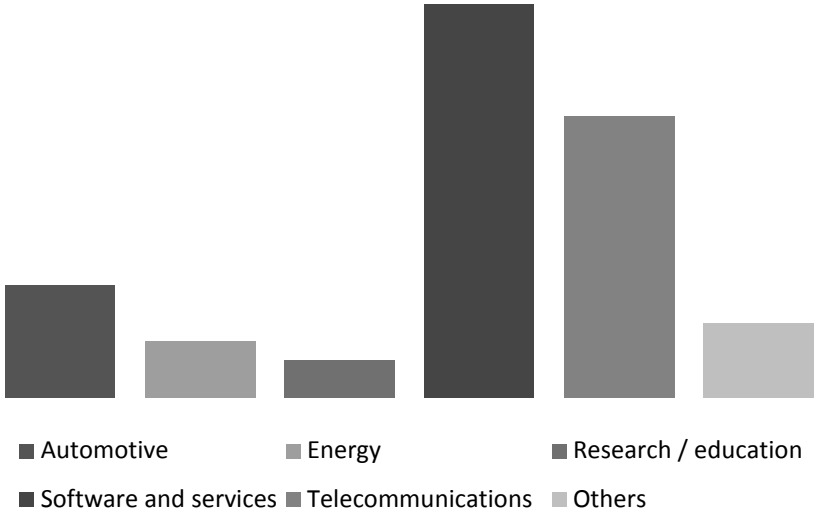

Figure 10: Key industries that are represented in the survey

3.2.2 Participants

Majority of the respondents to this survey have been directed from LinkedIn, the online social network for professionals and as a result, a wide range of professionals from countries such as United States, Canada, Sweden, Iran and Malaysia are among them. Industries such as automotive, energy and ICT are the key areas which respondents are coming from and project management, customer management, software project teams are among the main areas which answers are coming from.

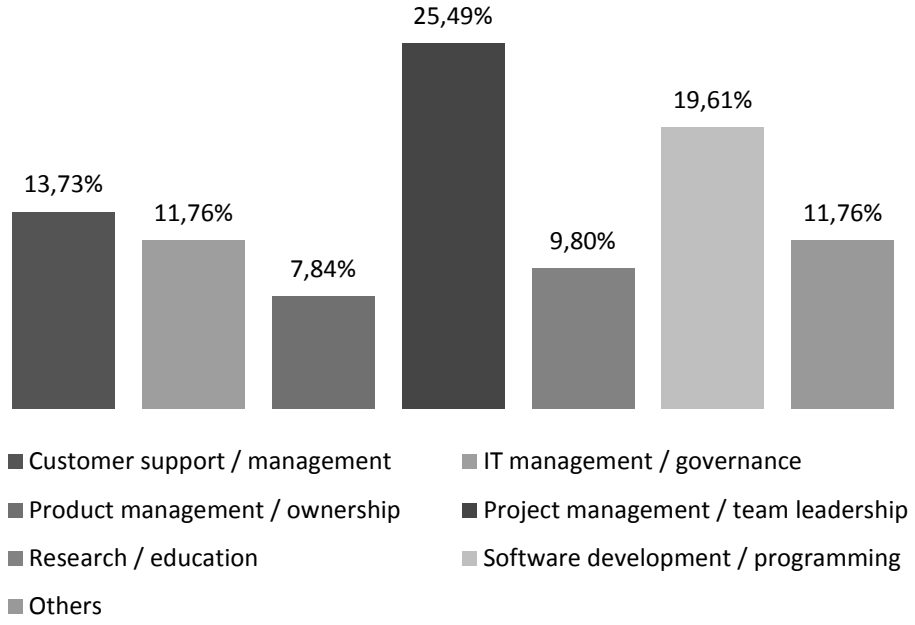

Figure 11: 51 professionals has been participated in the on-line survey

As seen in the above figure, the target audience of the questionnaire were carefully chosen via direct links or communities of practice on LinkedIn, to ensure that received data could directly be linked to the research scope and objectives. From almost 60 responses to the questionnaire, some few have been voided, due to incomplete answers and only 51 complete answers have been chosen to be used as the input to this report.

Data analysis and interpretation has been done using Qualitrics, which is an online service dedicated to academic and business specific researches and data analysis.

4 Findings

After carefully reviewing the results of the survey, some graphs have been created to illustrate the findings and overall outcome in a simplified yet informative pattern. Following section, briefly describes the main outputs resulted in this survey.

4.1 Results

Large portion of respondents to the survey appear to be working in relatively large organizations, where more than 500 employees are working in. However, it has been realized that in most cases, the project teams are relatively small, between 5-10 people in each team, and that could be interpreted as, the chances of having global project teams within the same organization could be high.

Furthermore, it has been realized that agile methodologies, as expected, is indeed being practiced within the software project teams, according to over 50% of answers received. That aside, a significant amount of teams are entirely or partially perform as distributed teams. In addition, it has been realized that a systematic KM or CKM system is barely in place and most organizations are relying on current information management systems and customer relationship management efforts. Nevertheless, results show that there is a demand for such systems in most of project teams.

Majority of project teams identified early phases of the project as a typical time period in which most of communications with customers occur and for those on-going interactions, most of response show weekly communications as a norm with regard to customer communications. When lack of physical interaction between the customers and the project teams could easily be realized, it appears that electronic mediums, including but not limited to emails are the main channel being used for communicating customers and that could be identified as a weakness in currently established information management systems also.

Technical issues seem to be the most communicated thing between the project teams and customers, while future opportunities are seldom being discussed ore realized as a result of such communication.

Majority of responds, highlight the fact that social interaction with customers is indeed a demand for most of the project teams and yet, certain challenges could limit such needs to be addressed. While developing a trustworthy environment in which

both project teams and customers could freely communicate what they need seems to be an area of interest for many organizations, challenges such as geographical locations, cultural differences, and accessibility of information seem to be among the most important challenges which project managers and others in such teams are facing.

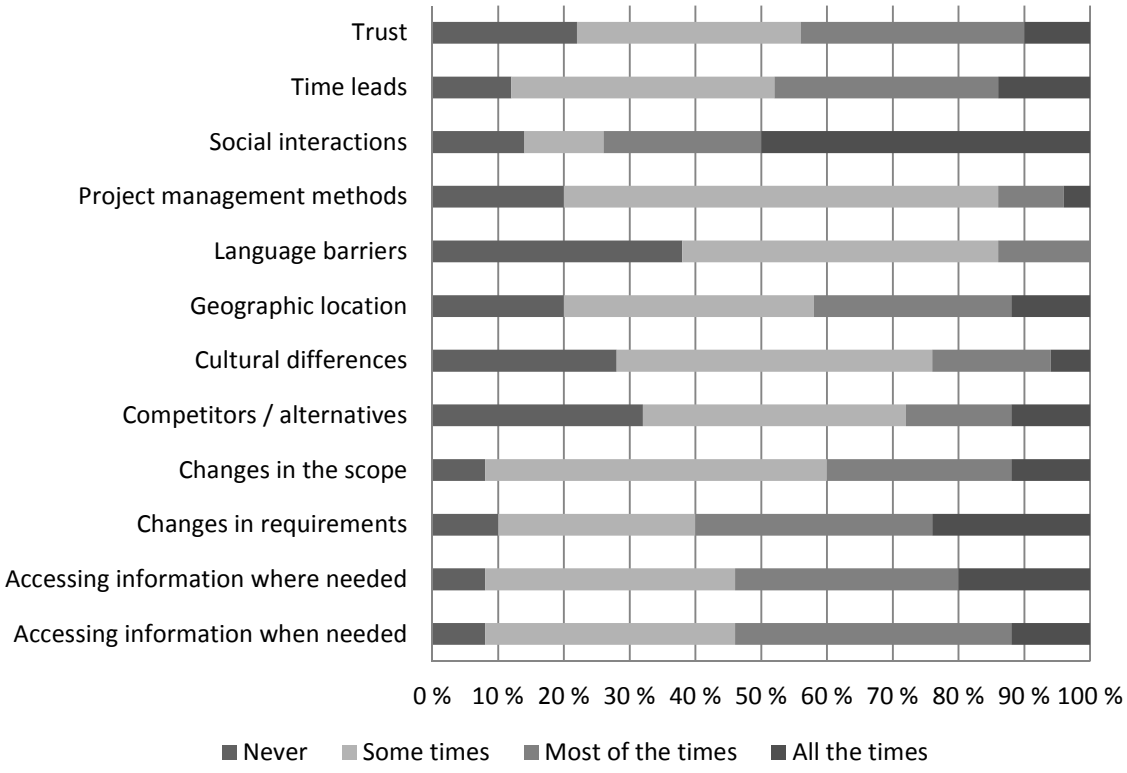

Figure 12: Key challenges in collaboration with customers

As above chart illustrates, social interactions tops the list when identifying key challenges in collaboration with customers and it is logical to see the link between this and other aspects being highlighted.

On the other hand, certain aspects including but not limited to sociability, mobility, agility, reliability and trustworthiness seem to be highly demanded by the project teams, when they have been asked about main attributes to be considered in a CKM system for GSD projects. In addition, most of responses show that a desired system for such purpose is also characterized as a sustainable platform in which customers and the project teams could continuously exchange knowledge and learn from each other, while maintaining the trust and overcoming certain barriers which has been discussed earlier in previous chapters.

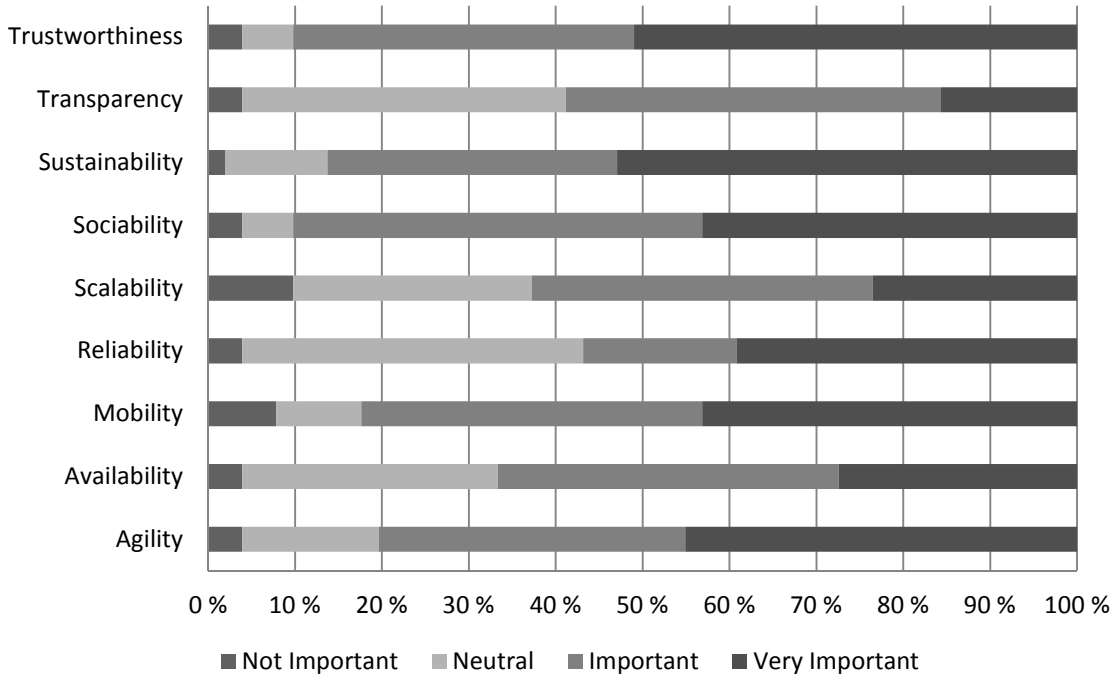

Figure 13: Key attributes to be considered in a CKM system for GSD projects

4.2 **Analysis**

After carefully analysing the outcome of the survey, it has been realized that despite all the differences in the nature of project teams relating to the industry, organization size and project team size, there are certain patterns to be identified and realized.

For instance, as illustrated in the below chart, electronic tools of communication are highly used as the key medium towards communicating with customers:

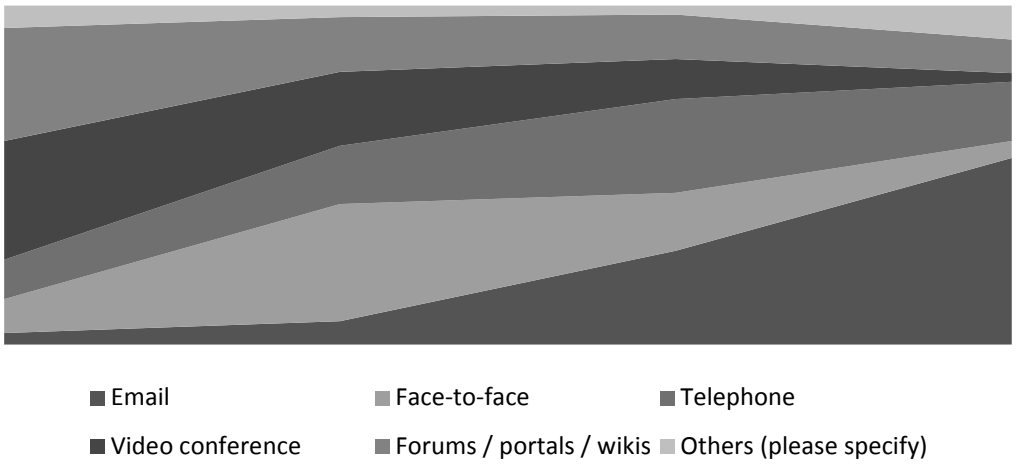

Figure 14: Which of the following media do you use to communicate with your customers?

In addition, many of those whom responded to the questionnaire suggested that knowing more about competitors or future collaborations would be appreciated if being provided by customers:

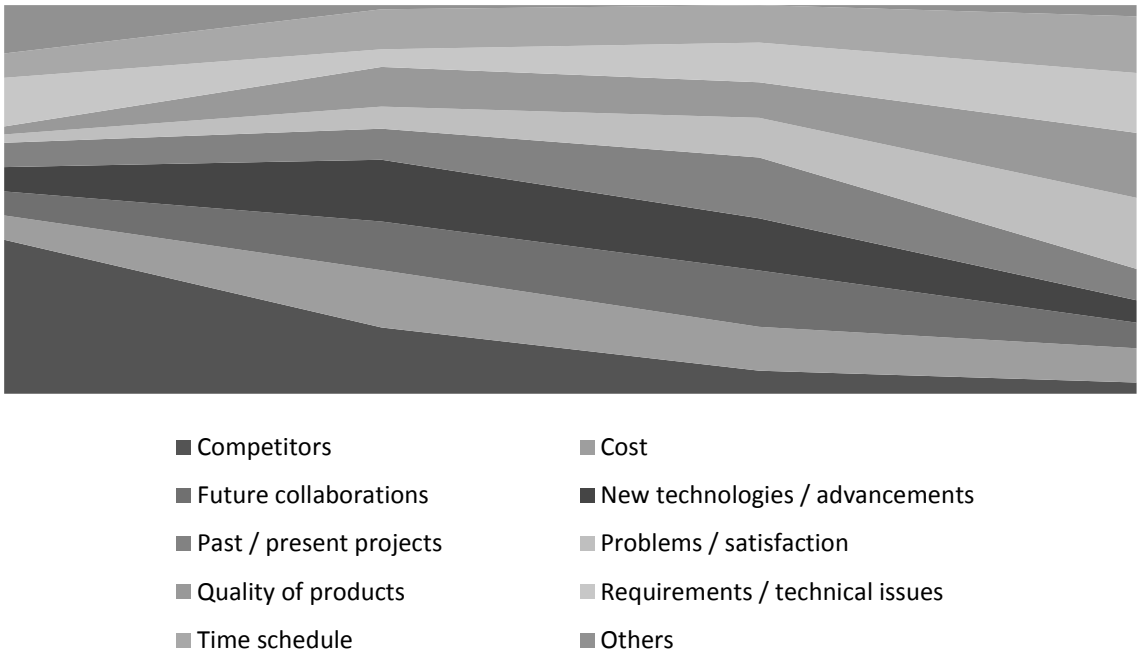

Figure 15: What of the following topics are important / discussed in your interaction with your customers?

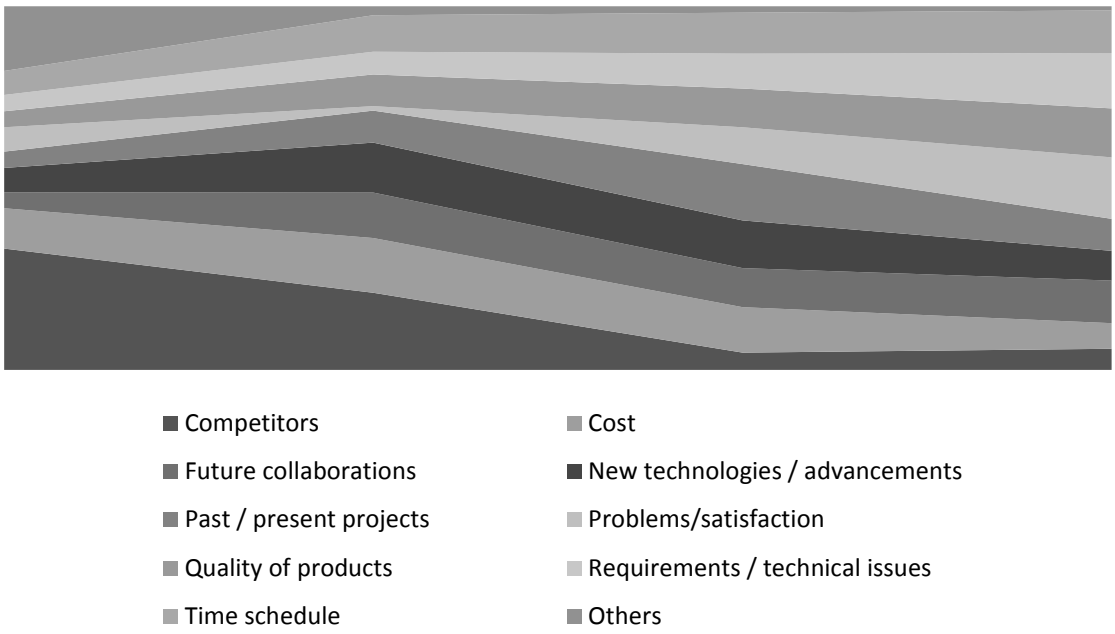

Figure 16: From the information provided by customers, what information is most likely beneficial to you?

5 Discussion

Researches confirm that the ability to acquire and exploit existing knowledge into the organization is one of the key driving forces that multinational companies (MNC) could take advantage in order to stay competitive (Gammelgaard, 2010) and the same could be recognized in GSD projects, due to the nature of such projects that are usually being undertaken in MNCs.

Studies show that most international organizations have large rooms for improvement with regard to internal knowledge management systems (Ringel-Bickelmaier & Ringel, 2010) and obviously, managing external knowledge could be additional challenge to overcome. According to Hutzschenreuter & Horstkotte (2010), cultivating and developing a network of partners is a long-term strategy and so is for the case of customers.

As studies confirm, projects in general are "uncertain, complex and unstable, full of tensions, conflict and contradictions" (Swart & Harvey, 2011). Consequently, project managers should have deep, tacit and interconnected knowledge to tackle various issues and lead the project forward.

While "virtual team has been described as the core building block of the virtual organization", a traditional team in contrast, has been described as "a social group of individuals who are collocated and interdependent in their tasks" (Casey, 2010). This could lead us to the fact that lack of social interactions is one of the challenges in projects such as GSDs which basically perform on virtual team basis. It becomes even more complex when virtual teams attempt to engage customers with similar approach. Furthermore, measurement of CKM in general and particularly in GSD projects is a challenging aspect which requires dedicated efforts in developing and maintaining a system which can facilitate a trustworthy environment in which both customers and the project teams could communicate properly and exchange their relative knowledge in an efficient way.

As results of the study show, certain challenges, including but not limited to cultural differences, distributed locations as well as lack of social interaction are among the most significant barriers in establishing a CKM systems.

Recognizing such challenges, the author has realized that certain including certain attributes in a given CKM system for GSD projects could respond to needs of project

teams and potentially could be beneficial to the customers as well. Those attributes could be summarized in the below figure:

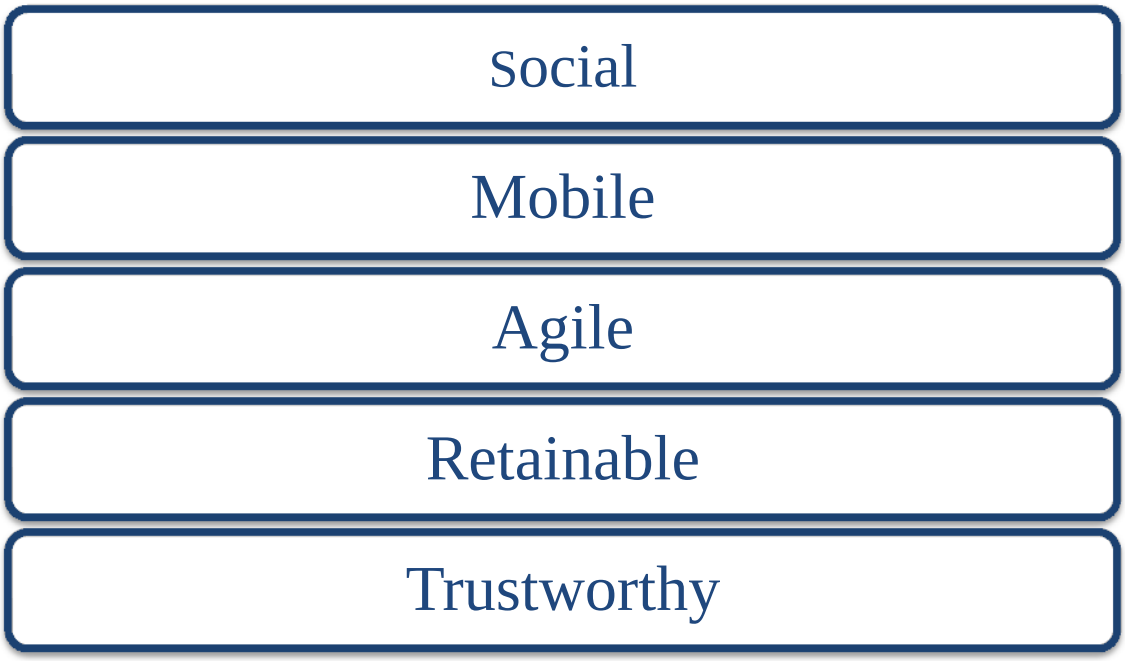

Figure 17: SMART CKM: suggested framework for CKM in GSD projects

As studies show, "most of the efforts that firms devote to external knowledge acquisition are focused on 'socialization', which represents a 25percent of the knowledge capturing activities" (Lopez-Saez, et al., 2010). In fact, studies confirm that socialization has been recognized as one of the key driving forces in acquiring knowledge by organizations and therefore, it is reasonable to conclude that social aspects can play a significant role in CKM practices. The author believes that social interactions could not be in place, without having other elements including trust and sustainability established. That is why the proposed framework consists of social aspects, as well as trustworthiness, retain ability, agility and mobility.

Considering that some researchers believe that in compare to face-to-face communication, the use of networked technologies could actually reduce some of the challenges associated with cultural diversity (Shachaf, 2007), use of electronic channels still seem to have certain downsides, if being used as the only medium of communication among the project teams and customers and replacing the face-to-face social interactions. That being said, in many cases related to GSD projects, using technology-enabled tools seem to be inevitable.

It is also important to recognize the importance of cultural variation which could have significant impact on maintaining a healthy and sustainable CKM system. As below

Impacts		ICT role	Outcomes
Positive impacts of cultural diversity	Leverage diverse knowledge and skills to improve outcomes of decision-making, and to develop a global product	Enable	Improve outcomes of decision-making and performance (compared with collocated homogeneous teams)
	Concurrent engineering to reduce time to market	Enable	Improve performance (time to market)
	Software engineering reduces dependency on how each component functions to improve integration of components	Enable	Improve performance (compared with collocated homogeneous teams)
	Constructive conflict	Enable	Improve outcome of decision-making and performance (compared with collocated homogeneous teams), but reduce satisfaction
Negative impacts of cultural diversity	Differences in non-verbal styles create miscommunication	Eliminate	Improve communication, satisfaction, and performance (compared with face-to-face heterogeneous teams that do not use ICT)
	Differences in verbal style create miscommunication	Mitigate	Improve communication, satisfaction, and performance (compared with face-to-face heterogeneous teams that do not use ICT)
	Language differences create miscommunication due to lack of accuracy	Mitigate	Improve communication, satisfaction, and performance (compared with face-to-face heterogeneous teams that do not use ICT)

Figure 18: Impacts of cultural diversity in distributed teams and the role of ICT, adopted from ((Shachaf, 2007))

figure shows, there are two types of impacts which could be caused by cultural variations and it would certainly be a challenge to reduce the risk of negative ones and take advantage of the positive impacts, in accordance to the CKM main goals and objectives.

Despite all the challenges, developing and maintaining a customer knowledge management system for global software development projects, seem to be helpful to the project teams and potentially to the customers as well.

6 Conclusion

As it was initially clarified, the goal of this research was to explore various perspectives towards customer knowledge management in global software development projects. To achieve this, the following questions have been raised:

- How can KM enhance customers' engagement in GSD projects?
- What are the challenges in retrieving knowledge from customer in GSD projects?
- What are the key characteristics of a successful CKM system in GSDs?

Aiming to respond to these questions, the author has conducted a widespread literature review on global software development, knowledge management as well as customer knowledge management and explored various characteristics of those topics, followed by some of the key challenges in those areas. By choosing an exploratory research method, the author could meet the research's objective of exploring various dynamics which are related to GSD projects and learn about them from those who are facing challenges in real-world scenarios.

As a result of analysing the academic literature and gathered data from industries, certain patterns has been identified in association with the challenges involved in such environments and consequently, some of the key factors which have been demanded and could be helpful in implementation and maintenance of a successful CKM system have been proposed. The answer to the research questions could be summarized as:

- ✓ KM can facilitate customer's involvement in GSD projects, by providing an environment which flow of information and learning process become a natural part of interactions between the project team and customers. Once a trustworthy and sustainable system is cultivated, the level of interaction between the two sides would naturally increase and topics such as technical issues which are usually being discussed could be expanded into future collaboration plans and other knowledge-based partnerships.
- ✓ Some of the key challenges in retrieving knowledge from customer in GSD projects could be summarized as: business concerns, cultural differences, distributed teams, as well as lack of trust. It has been realized though that these challenges could be eased to a certain level, if the CKM system offers more

social interactions between the project teams and customers. Lack of social interactions in fact, could be viewed as the main root cause of those issues.

- ✓ Some of the key characteristics of a successful CKM system in GSDs in the other hand, could be realized as: sociability, mobility, agility, retainability and trustworthiness. The author came to the conclusion that considering these factors in implementation of a customer knowledge management system, could result a sustainable solution that could benefit project teams, by reducing the risk of encountering with potential challenges.

It is important though to mention that the focus of this research was mainly from the project team's perspective and not the customers. In fact, not having inputs from the customers in real projects could be identified as the main limitation of this research and could be considered for future studies. Besides, after careful analysis of the gathered data from various organizations and contrasting them, the author realized that despite all the similarities in certain areas, it could be best if similar research could be conducted on specific industries and preferably on specific organizations to realize more reliable and practical results that address all the challenges.

Overall, it is recommended that project teams invest in development and applying CKM practices. From the project management perspective and according to bodies of knowledge, such efforts could be realized within the scope of project communication management and project integration management, in which there is a room for both knowledge management and customer relationships.

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Gammelgaard, J., 2010. Knowledge retrieval through virtual communities of practice. *Behaviour & Information Technology*, 29(4), p. 349–362.

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8 Appendix

On-line Survey

I'm in the final stages of my studies in International Project Management at Chalmers University of Technology and this on-line survey is intended to be a part of my Master's thesis on "Customer Knowledge Management in Global Software Projects ". Customer knowledge management is a process that is intended to capture, generate and integrate knowledge about and for customers continuously. The aim of this survey is to gain a better understanding about different aspects that might impact how customer knowledge in software development projects is obtained.

Your valuable inputs and experiences concerning customer knowledge management in global software projects are extremely helpful to this research. Thank you very much for helping me out. I really appreciate your time and support.

Which of the following describes your position?

- ❍ Customer support / management
- ❍ IT management / governance
- ❍ Product management / ownership
- ❍ Project management / team leadership
- ❍ Research / education
- ❍ Software development / programming
- ❍ Others (please specify) _____

What is the primary business of your organization?

- ❍ Automotive
- ❍ Energy
- ❍ Research / education
- ❍ Software and services
- ❍ Telecommunications
- ❍ Others (Please specify) _____

Which of the following describes the size of your organization?

- ❍ Less than 50 employees

- ❍ 50-500 employees
- ❍ 500 and more

Which of the following describes the size of your software project team?

- ❍ Less than 5
- ❍ 5-10
- ❍ 11-20
- ❍ More (please specify) _____

Which of the following describes the duration of software projects that your organization is typically involved with?

- ❍ 3-6 months
- ❍ 6-12 months
- ❍ 12-36 months
- ❍ Others (please specify) _____

Which of the following describes the project management methodology that your organization applies?

- ❑ Agile
- ❑ Incremental
- ❑ Kanban
- ❑ Lean
- ❑ PMBOK
- ❑ PROPS / PROPS-C
- ❑ Waterfall
- ❑ Others (Please specify) _____

Which of the following describes the nature of your project teams?

- ❍ Geographically distributed (virtual) teams
- ❍ Traditional (formal) teams
- ❍ Both

Which of the following systems are adopted in your respected organization?

- ❍ Information system management
- ❍ Knowledge management

- ❍ On-line data management
- ❍ None

Which of the following concepts is adopted in your respected organization?

- ❍ Customer knowledge management
- ❍ Customer project management
- ❍ Customer relationship management
- ❍ None

Which of the following could describe the type of customers in your projects?

- ❑ End users (globally)
- ❑ End users (locally/regionally)
- ❑ Other teams / departments (other organizations, e.g. suppliers)
- ❑ Other teams / departments (within the same organization)
- ❑ Others (please specify) _____

Do you have a standard routine for gathering customer requirements?

- ❑ Yes, before the project starts
- ❑ Yes, during the project (weekly / monthly)
- ❑ No, it doesn't apply in our projects
- ❑ Others (Please elaborate) _____

How often do you interact with customers in your on-going projects?

- ❍ Daily basis
- ❍ Weekly basis
- ❍ Monthly basis
- ❍ Start and finish of the projects
- ❍ Others (please specify) _____

How often would you visit or meet customers during the on-going projects?

- ❍ Daily basis
- ❍ Weekly basis
- ❍ Monthly basis
- ❍ Start and finish of the projects
- ❍ Others (please specify) _____

Which of the following media do you use to communicate with your customers? (Please answer all items)

	Never	Some times	Most of the times	All the times
Email	❍	❍	❍	❍
Face-to-face	❍	❍	❍	❍
Telephone	❍	❍	❍	❍
Video conference	❍	❍	❍	❍
Forums / portals / wikis	❍	❍	❍	❍
Others (please specify)	❍	❍	❍	❍

Who is the main contact point towards your customers?

- ❍ IT manager
- ❍ Product manager / owner
- ❍ Project manager / technical lead
- ❍ Software developer / programmer
- ❍ Others (please specify) _____

What of the following topics are important / discussed in your interaction with your customers? (Please answer all items)

	Not important	Neutral	Important	Very important
Competitors	❍	❍	❍	❍
Cost	❍	❍	❍	❍
Future collaborations	❍	❍	❍	❍

New technologies / advancements	❍	❍	❍	❍
Past / present projects	❍	❍	❍	❍
Problems / satisfaction	❍	❍	❍	❍
Quality of products	❍	❍	❍	❍
Requirements / technical issues	❍	❍	❍	❍
Time schedule	❍	❍	❍	❍
Others (please specify)	❍	❍	❍	❍

From the information provided by customers, what information is most likely beneficial to you? (Please answer all items)

	Not very useful	Neutral	Useful	Very useful
Competitors	❍	❍	❍	❍
Cost	❍	❍	❍	❍
Future collaborations	❍	❍	❍	❍
New technologies / advancements	❍	❍	❍	❍
Past / present projects	❍	❍	❍	❍
Problems/satisfaction	❍	❍	❍	❍
Quality of products	❍	❍	❍	❍

Requirements / technical issues	❍	❍	❍	❍
Time schedule	❍	❍	❍	❍
Others (please specify)	❍	❍	❍	❍

In collaboration with customers, which of the followings are most challenging? (Please answer all items)

	Never	Some times	Most of the times	All the times
Accessing information when needed	❍	❍	❍	❍
Accessing information where needed	❍	❍	❍	❍
Changes in requirements	❍	❍	❍	❍
Changes in the scope	❍	❍	❍	❍
Competitors / alternatives	❍	❍	❍	❍
Cultural differences	❍	❍	❍	❍
Geographic location	❍	❍	❍	❍
Language barriers	❍	❍	❍	❍
Project	❍	❍	❍	❍

management methods				
Social interactions	❍	❍	❍	❍
Time leads	❍	❍	❍	❍
Trust	❍	❍	❍	❍
Others (Please specify)	❍	❍	❍	❍

Does your organization benefit from on-line / offline social interactions with customers?

❍ Yes
❍ No

When there is a change in customer requirements / information, when would you prefer to be informed?

❍ ASAP
❍ In the next meeting
❍ In the next product release
❍ Other (Please specify) _____

When there is a change in project conditions, when would your customer prefer to be informed?

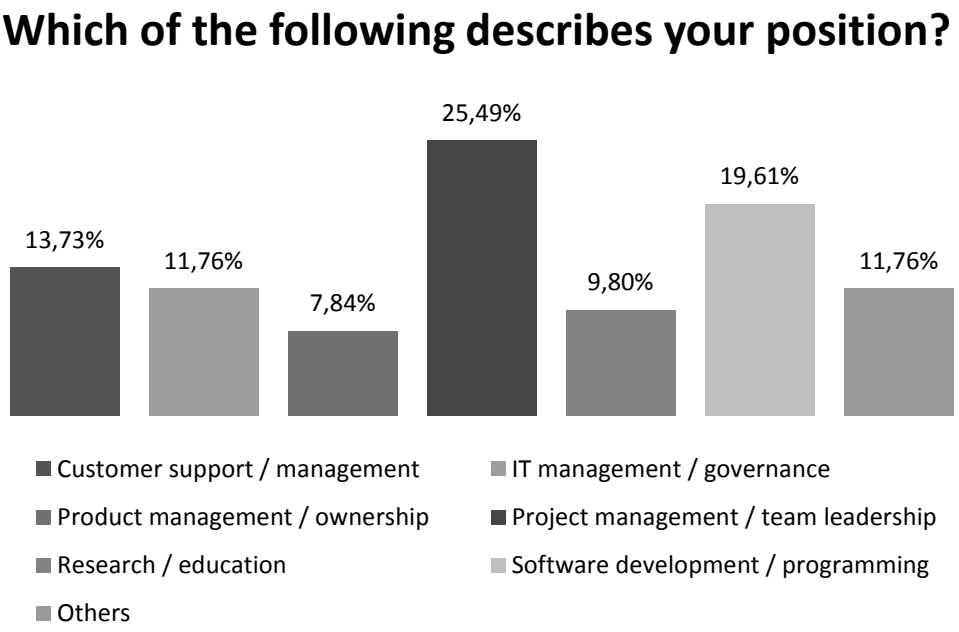
❍ ASAP
❍ In the next meeting
❍ In the next product release
❍ Other (Please specify) _____

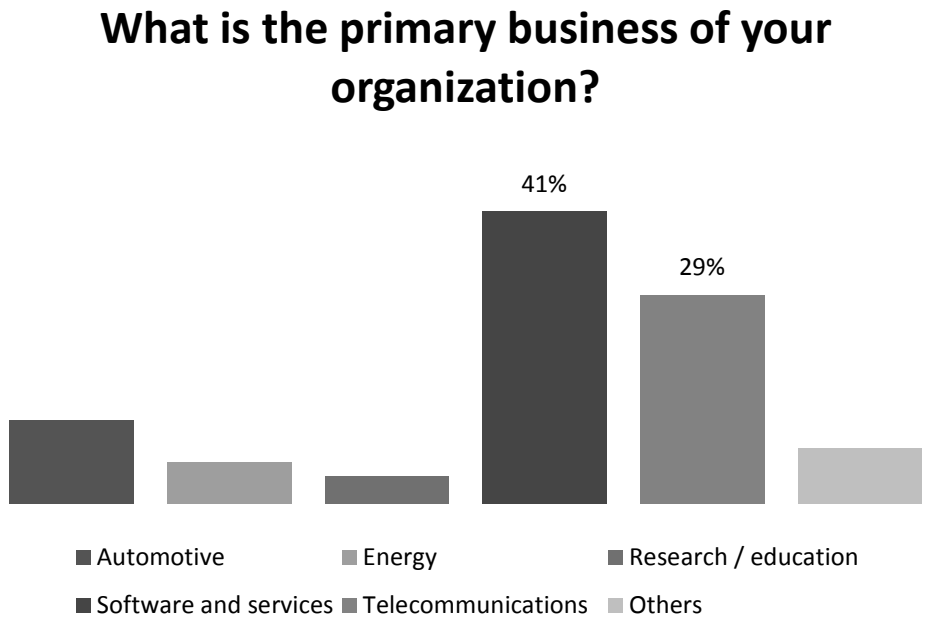
Which of the following characteristics would you suggest to be considered in a system designed specifically for customer knowledge management? (Please answer all items)

	Not important	Neutral	Important	Very important
Agility	❍	❍	❍	❍
Availability	❍	❍	❍	❍
Mobility	❍	❍	❍	❍
Reliability	❍	❍	❍	❍
Scalability	❍	❍	❍	❍
Sociability	❍	❍	❍	❍
Sustainability	❍	❍	❍	❍
Transparency	❍	❍	❍	❍
Trustworthiness	❍	❍	❍	❍

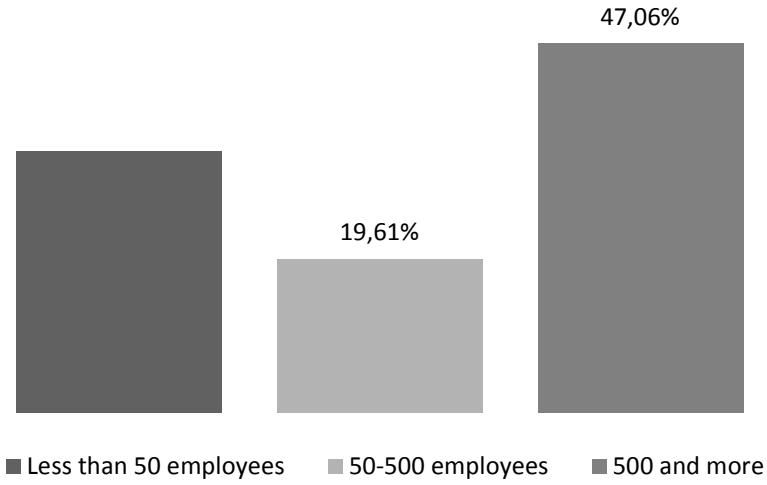
Survey results

Company profile

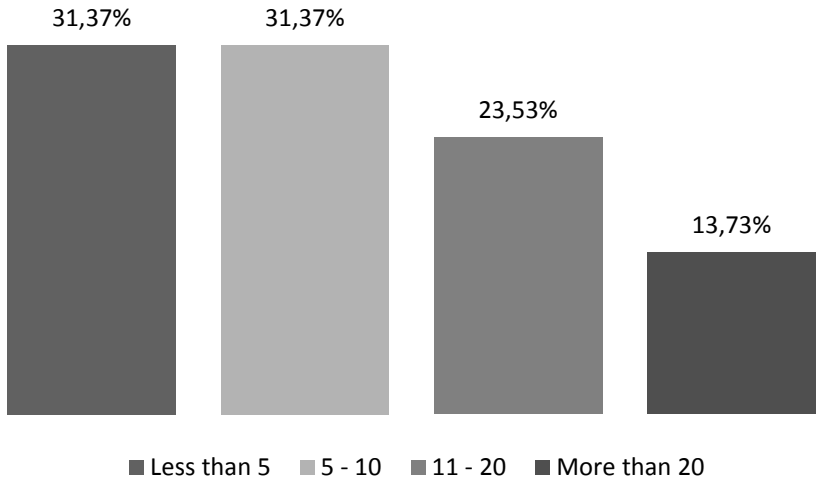




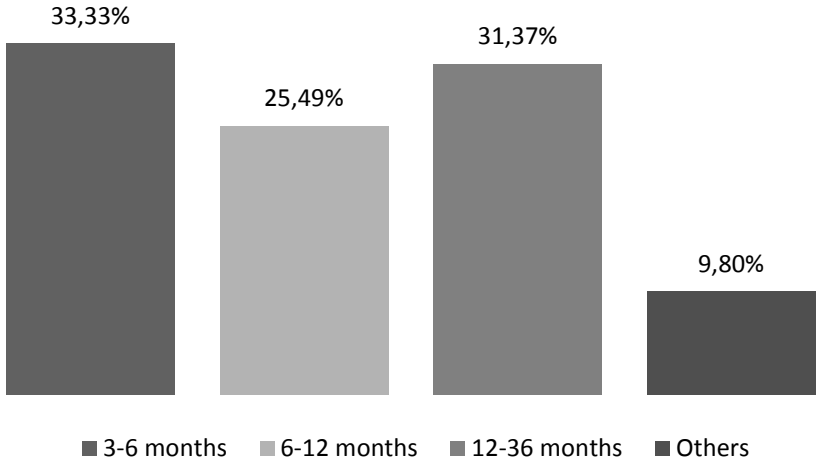
Which of the following describes the size of your organization?



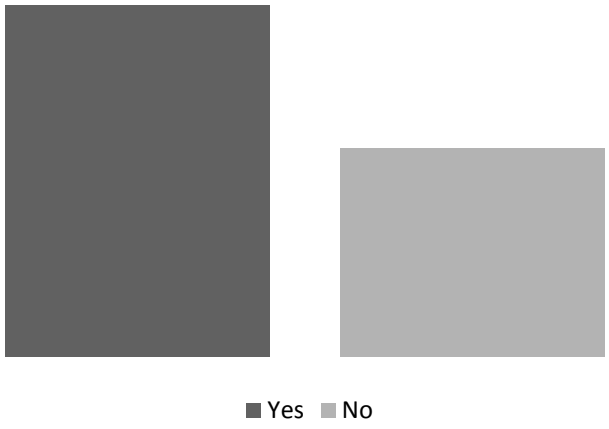
Which of the following describes the size of your software project team?



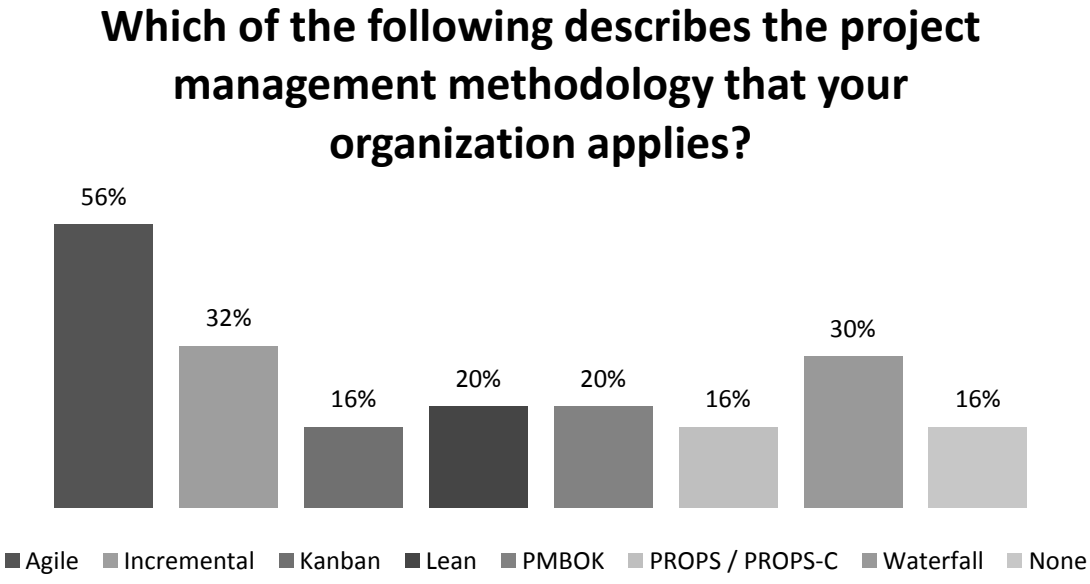
Which of the following describes the duration of software projects that your organization is typically involved with?

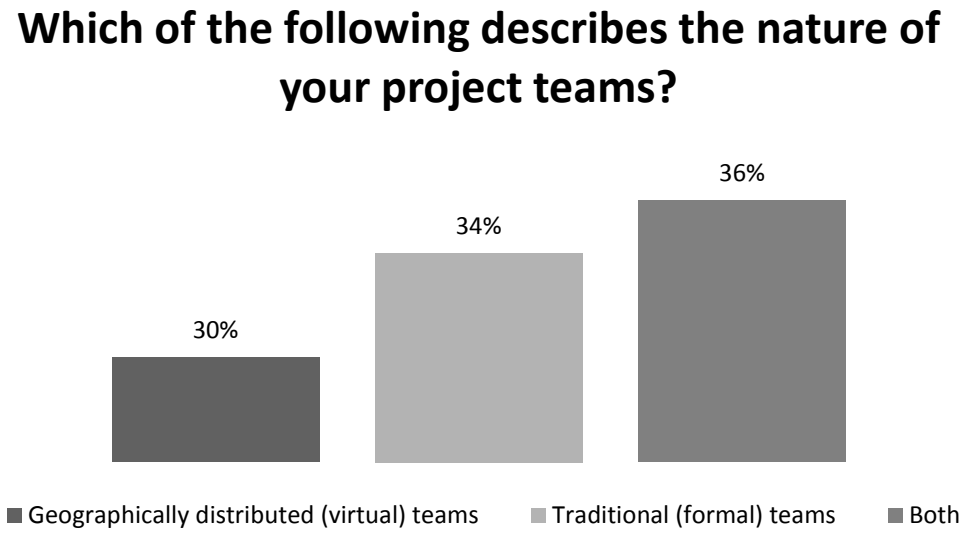


Does your organization benefit from on-line / offline social interactions with customers?



Project Management / Teams



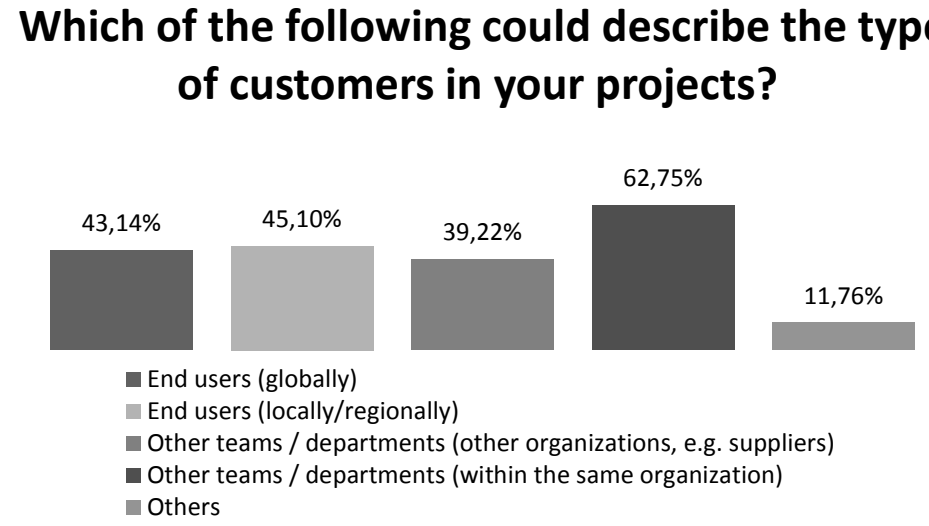


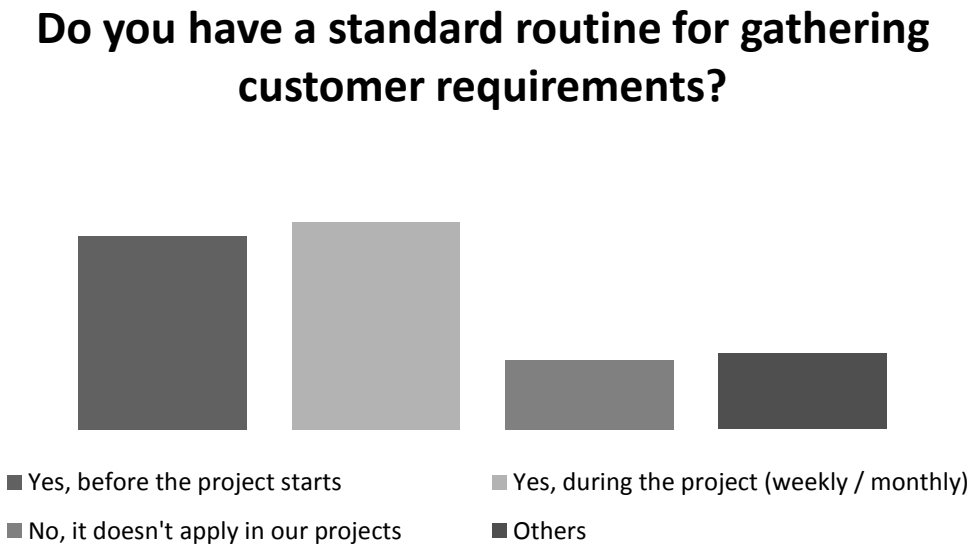
Systems

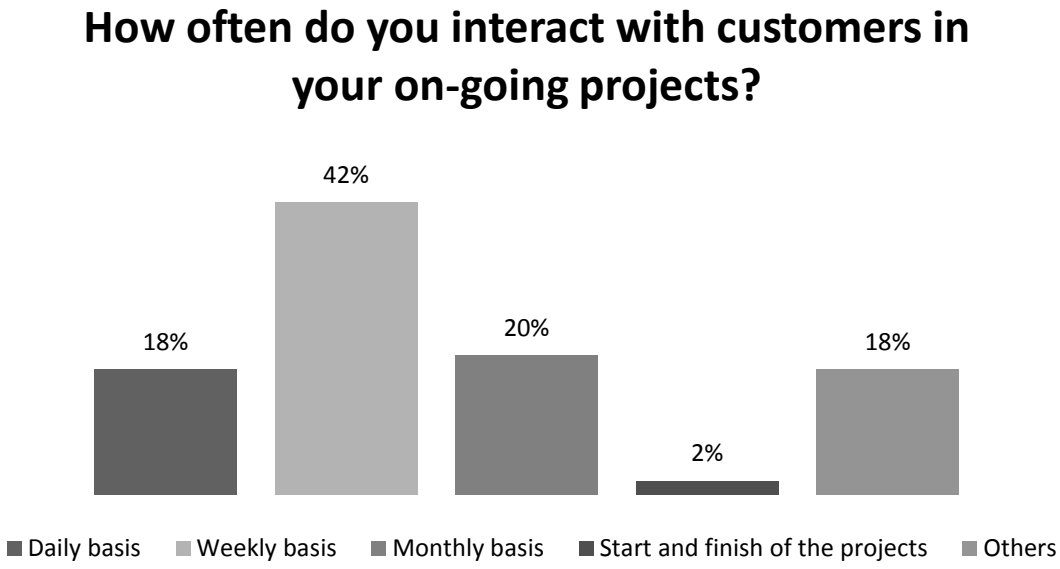

Which of the following systems are adopted in your respected organization?
Information system management
Knowledge management
On-line data management
None

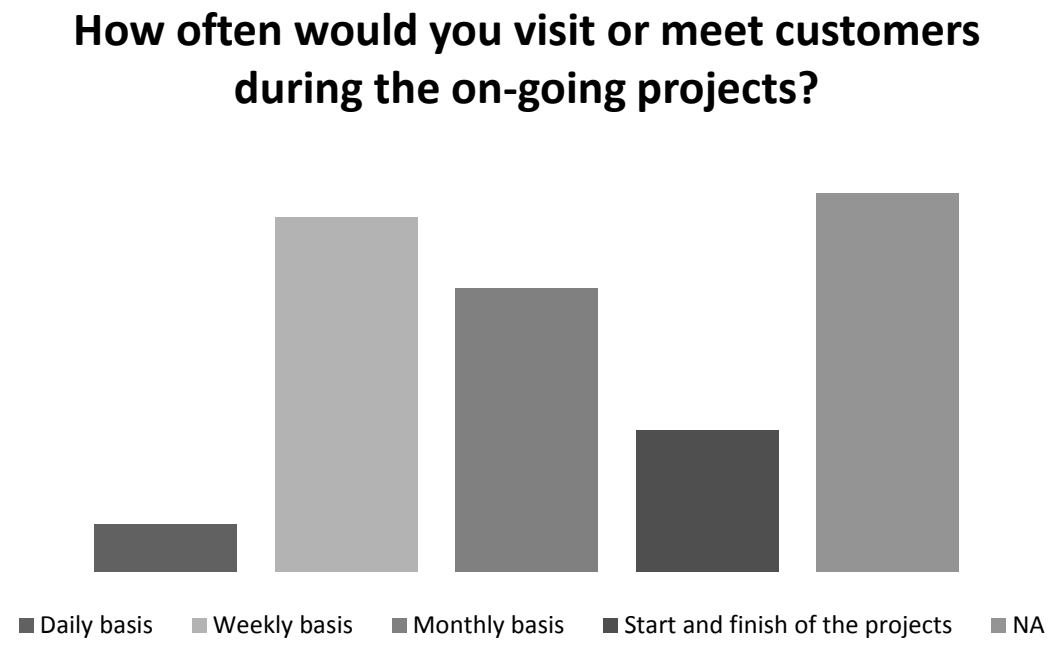

Which of the following concepts is adopted in your respected organization?
14%
32%
36%
18%
Customer knowledge management
Customer project management
Customer relationship management
None

Customers

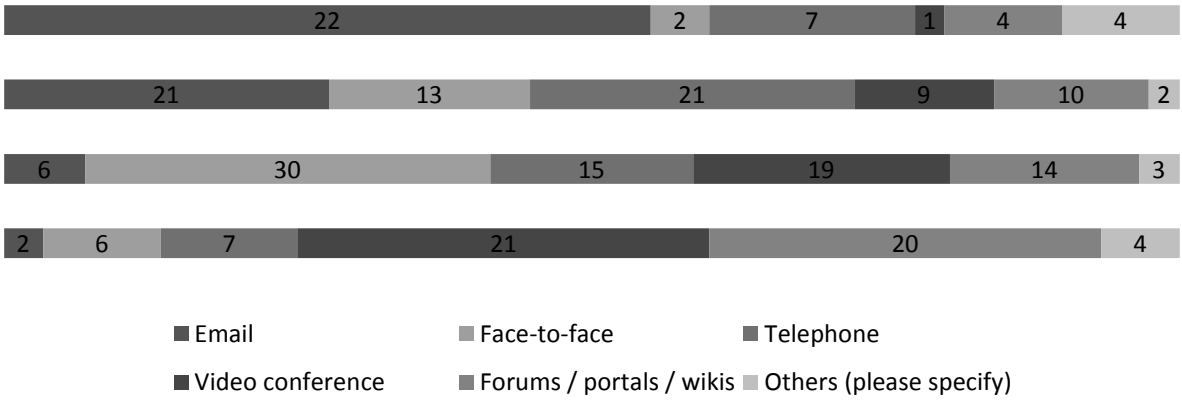

Which of the following could describe the type of customers in your projects?
43,14%
45,10%
39,22%
62,75%
11,76%
End users (globally)
End users (locally/regionally)
Other teams / departments (other organizations, e.g. suppliers)
Other teams / departments (within the same organization)
Others


Do you have a standard routine for gathering customer requirements?
Yes, before the project starts
Yes, during the project (weekly / monthly)
No, it doesn't apply in our projects
Others

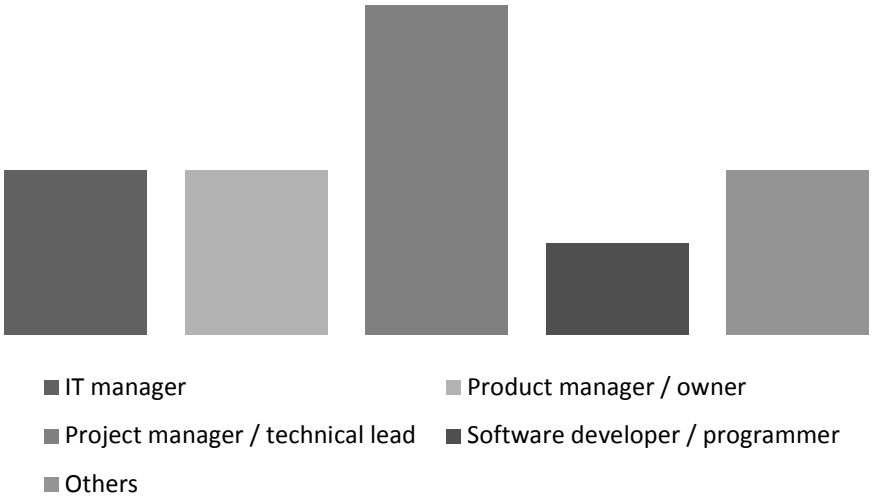

How often do you interact with customers in your on-going projects?
42%
18%
20%
2%
18%
Daily basis
Weekly basis
Monthly basis
Start and finish of the projects
Others


How often would you visit or meet customers during the on-going projects?
Daily basis
Weekly basis
Monthly basis
Start and finish of the projects
NA

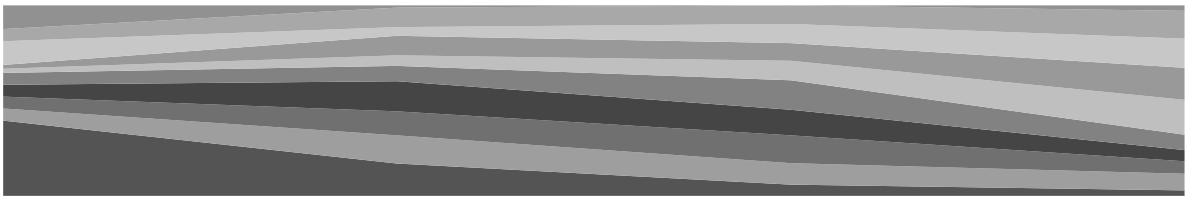
Which of the following media do you use to communicate with your customers?



Who is the main contact point towards your customers?

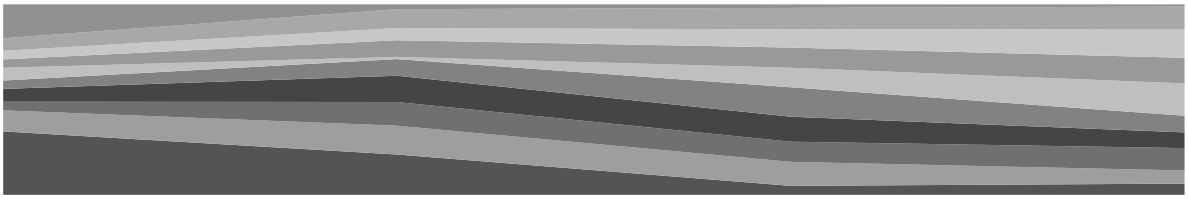


What of the following topics are important / discussed in your interaction with your customers?



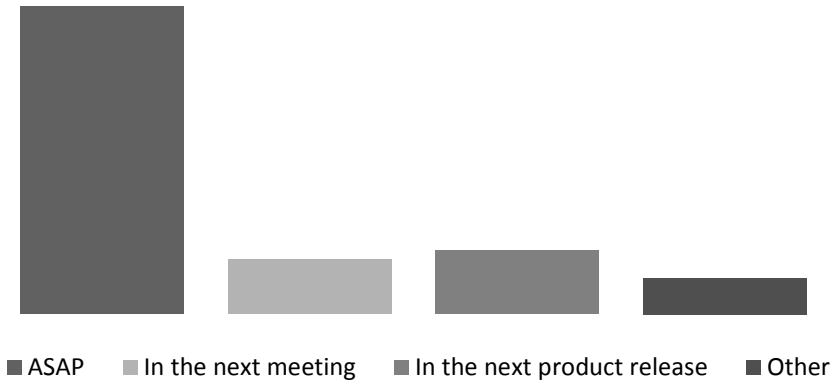
- Competitors
- Cost
- Future collaborations
- New technologies / advancements
- Past / present projects
- Problems / satisfaction
- Quality of products
- Requirements / technical issues
- Time schedule
- Others

From the information provided by customers, what information is most likely beneficial to you?

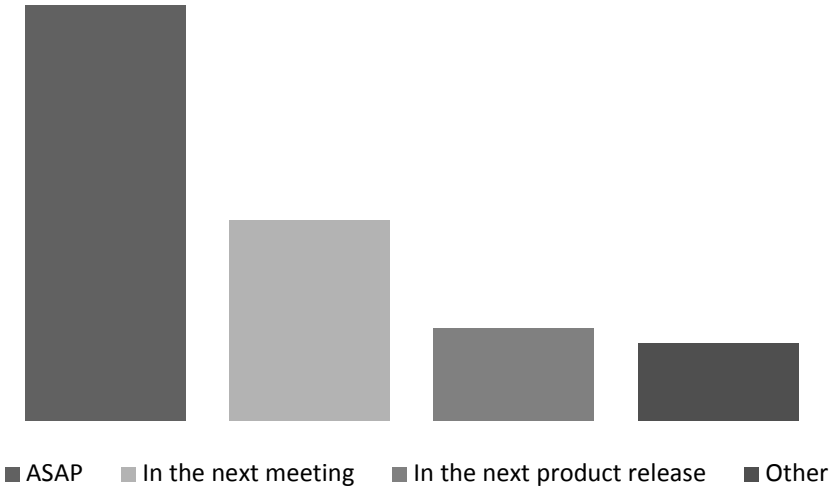


- Competitors
- Cost
- Future collaborations
- New technologies / advancements
- Past / present projects
- Problems/satisfaction
- Quality of products
- Requirements / technical issues
- Time schedule
- Others

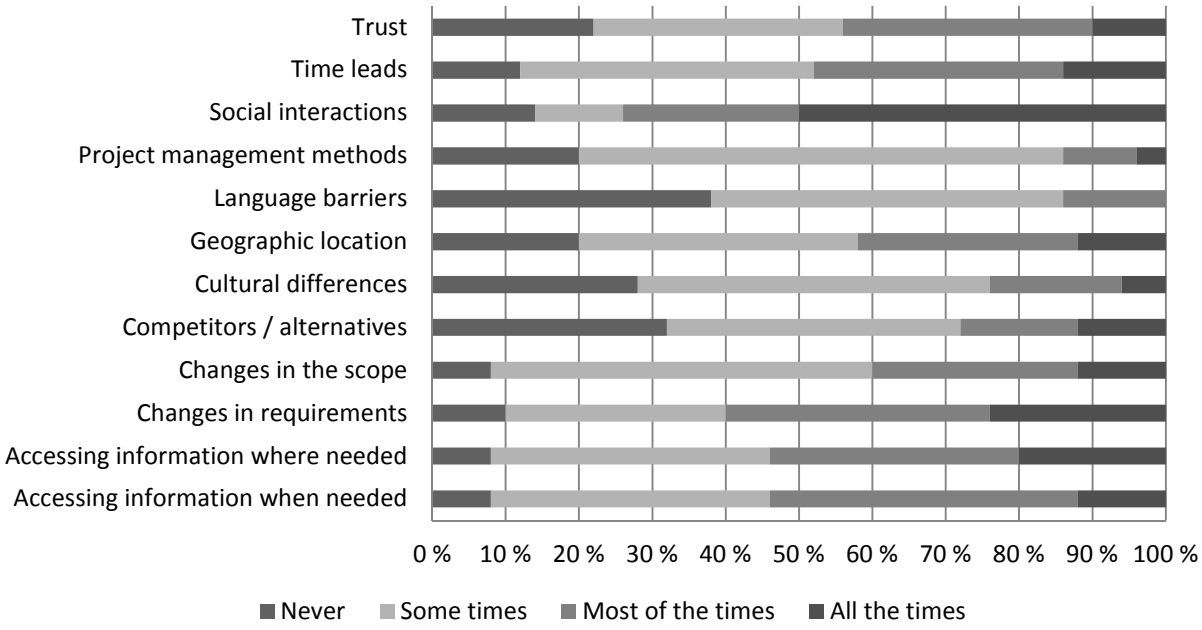
When there is a change in customer requirements / information, when would you prefer to be informed?



When there is a change in customer requirements / information, when would your customer prefer to be informed?



In collaboration with customers, which of the followings are most challenging?



Which of the following characteristics would you suggest to be considered in a system designed specifically for customer knowledge management ?