



JÖNKÖPING INTERNATIONAL  
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# Virtual Teams

A Five Trigger Approach to Technology Adaptation

Bachelor's study within Informatics

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## Abstract

**Purpose:** The purpose of this report was to find out what made leaders intervene in technology adaptation within virtual teams. A framework of a five trigger model was used to discover the different areas that could trigger intervention. Part of the study also focused to see if it was possible to add other dimensions or extend the model.

**Background:** Virtual team is commonly used in companies nowadays and the evolution of information technology supports this way of working to a great extent. The technology enables companies to use their resources in a more effective way. Since there is an enormously large supply of information communication technologies, the leaders of virtual teams have to put much thinking into which tools and systems to use to be the more efficient and effective.

**Method:** The empirical data in this study was found mainly with library searches and provided the five trigger model. The primary data was collected through non-standardised interviews with leaders from companies that work in virtual teams in projects and their main business processes were concerning information technologies.

**Conclusion:** This study shows that the triggers are depending on the size and structure of the company. For larger and more complex companies, the internal constraint was the most frequent trigger. This trigger concerns the team size and dispersion of the teams. For smaller and less complex companies the most frequent trigger was ICT inadequacy. This trigger includes ineffective use of ICT and lack of ICT knowledge. The difference seem to be because larger companies have a more structured approach to choosing ICT and the smaller companies do not have as great back up if something were to go wrong.

Finally some extensions to the original five trigger model could be established. These were organisational restructurings and organisational imitation which would be an extension to the external constraints trigger. Also a cost trigger extended the ICT inadequacy trigger.

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## **Abbreviations**

DVCS – Desktop Video Conferencing Systems

ICT – Information Communication Technology

ICT KSA – ICT Knowledge, Skills and Ability

MS Planning – Management Systems Planning

IBM – International Business Machines

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# I Introduction

The general topic within this study is virtual teams. Even though it is a fairly new concept it has been researched to a great extent and it can be dealt with in many different ways, therefore a focus on technology adaptation was chosen for this particular study. Virtual teams are highly dependent on technology and with the increasing evolution; this was thought to be an interesting and accurate topic. Virtual teams exist everywhere lately and the authors themselves are using it and have found that it is commonly used in organisational contexts as well.

When it comes to companies though, a different structure and dependence on the technology is needed. In teams where the members never meet each other physically, a well-functioning technology is vital. With the increasing functionalities of technology today, the tools and systems not only has to work, it has to be cheap, fast and easy to use. This is why this study is focusing on what really triggers the choice of technology in the virtual teams.

This is a bachelor thesis in a program called Business and IT Management at Jönköping University. The topic of virtual teams is highly accurate in terms of business and IT management and the focus on technology adaptation gives this study another level of complexity. Virtual teams are a frequent discussed topic in most businesses, especially in the IT area. Since this study is taking the perspective of leadership actions regarding technology adaptation both the IT which is clearly linked with virtual teams, and management perspective is evident.

## I.1 Background

Jack Welch, Chairman and CEO of General Electric once said “The Internet is the Viagra of big business” (Said what, 2010). Indeed Internet is one of the largest inventions of our time, and as with all great inventions this opens up an even greater opportunity for the people living in this world. One aspect that the Internet has facilitated is the work of virtual teams. Virtual team is not a new concept, although the use of the term has increased tremendously the last few years. Depending on the definition of virtual team (see 1.7.1 for our definition) one can claim that they have existed since the telephone came. First military troops using telecommunication can be considered virtual teams. Hoefling (2003) states that in a case of 1000 companies, 950 of these would have implemented virtual work, often using telecommunication.

Using different kinds of technologies when leading project teams is not a great innovation. Telephones and computers has been used in organisational contexts for long, the personal computer came along during 1970s (Ceruzzi, 2003). The urgency of using these kinds of technologies is what has increased during the last couple of years, especially when discussing virtual work since the technology is no longer an assisting tool but a necessity for the work to be performed.

One important aspect when talking about virtual teams is the leadership. The pressure on virtual team leaders is high since there often is no face-to-face contact. Hackman and Johnson (2009) argues that a virtual team leader must accept a less controlled environment, they also provide some guidelines if you are to manage a virtual team. They suggest that one should have task-oriented team building, since work in virtual team often is depending on task performance. Virtual teams do also need a more proactive approach, outline purposes and member roles to create and maintain the structure. Virtual teams need clear guidelines and structure to overcome demographical and geographical issues. Tonnquist (2008) sup-

ports this statement by explaining that an infrastructure for communication is vital in any project work. Thirdly Hackman and Johnson (2009) suggest that a virtual team leader should be a master of communication, technology and channels, which could be the largest difference from a traditional team. This is important since the team is linked through computer-mediated channels.

With all this in mind, it is not surprising that the amount of research within this field is quite substantial and many team leaders and managers today ask themselves the question: How can one lead a virtual team in order to create an effective and successful workplace? This study will examine previous research about virtual teams and compare it with primary data collection about the leadership of present virtual teams.

## **1.2 Problem Discussion**

When working within virtual teams there are several things to consider and the authors have found a substantial amount research on how to best manage virtual teams. Technology adaptation is one of the greatest challenges that researchers frequently come back to, one need to make sure the technology is available, efficient and understood by team members. Malthotra, Majchrzak, Carman and Lott. (2001) and Maznevski and Chudoba (2001) mention the task technology fit to be one thing that contributes to successful performance within virtual teams. One could argue that with the technology available today, working in virtual teams should not be more difficult than in a traditional team.

With the increased development of information and communication technology (ICT) artefacts, the scope of alternatives for leaders to evaluate and choose between becomes larger as well. A leader need to pay attention to when, how and why to implement a certain technology within a project group. Tonnquist (2008) suggests a solution of this by using an information plan as a tool to make sure that the intended group gets the right message at the right point in time. Similarly, Malthotra, Majchrzak and Rosen (2007), draws the conclusion from their seven year research study, that having norms for communication is one of the best ways to establish trust in virtual teams. There are things such as budgets, competition and in-house knowledge that need to be considered when choosing ICT. Since technology and its environment are rapidly changing, one interesting aspect is how the technology is being adapted to the teams.

Mentioned in the previous section was the issue of leadership in virtual teams. Knowing the basics for communication to be able to reach the objectives is vital for a project leader according to Tonnquist (2008), and adding communication only using ICT would increase the pressure on the leader even more. Even though Hackman and Johnson (2009) stated that a virtual team leader must accept a less controlled environment, they argue that one cannot let go of their responsibilities and leave the team alone. This would often lead to frustration and alienation. Virtual teams often operate in project form and Tonnquist (2003) believe that a project leader must be aware of their actions and be able to adapt in order to meet the difference requirements and objectives of different projects.

Hackman and Johnson (2009) have suggested several leadership approaches and the ones that seem to fit virtual team are the ones that use open communication channels, promote discussion and two-way communication between members in the teams. The theory Y approach, originally developed by McGregor (1960), is an approach which views work as a source of satisfaction and emphasizes individual commitment by recognising individual and organisational needs. The opposite, theory X approach suggests that individuals have a general dislike for work and will avoid it if possible; hence a team leader must closely su-

pervise and control the team members. A theory Y approach would be beneficial since a virtual team leader would have major problems supervising all team members closely and the project must be able to go on without a leader watching the employees back at all times.

Previously discussed, two key aspects of virtual team work are the technology and the leadership. These two aspects go very well in hand-in-hand and this study will be focused on what triggers leaders to intervene in ICT changes in a virtual team project. Researches have investigated what technology should be used and how to implement it in a correct way. It should be mentioned that most of this research is quite old, for example Blurton (1999), Lipnack and Stamps (1997) and Sundstrom, Demeuse and Futrell (1990).

### **1.3 Research Question**

From the discussion above, a research questions has been established, addressing the issues of what influences the technology adaptation within a project and to establish whether there are some triggers missing in the model used.

- What triggers virtual team leaders to intervene in the technology adaptation process to increase communication within the team?

### **1.4 Purpose**

The purpose of this study is to investigate what different aspects could influence a virtual team leader when choosing and/or changing the ICT within a project. Since the efficiency and effectiveness of ICT has increased so much the last couple of years, a dual purpose is to see if technology can be a tool to increase team effectiveness. . A five trigger model will be used as a guideline to see different ways of what can influence a leader to implement or make ICT changes within a virtual team.

### **1.5 Delimitations**

Since the resources were limited for this study, some boundaries were set up. First of all the focus was on virtual teams within IT-project groups, since they are working with ICT on a daily basis they will have good knowledge about the tools and systems used. The companies interviewed were narrowed down to only Swedish companies because of geographical-ly issues. The number of interviewees is also limited because of the difficulty to find voluntary leaders to interview.

### **1.6 Disposition**

Section 1: Introduction Here we introduce our subject and we describe different concepts. We also write about problem and limitations of our study.

Section 2: Theoretical Framework The models and theories that will be used in the study will be described in this section, as well as the secondary data collected.

Section 3: Method We describe how we will gather our data and how this study will be written and conducted.

Section 4: Results Presentation of the empirical data and findings.

Section 5:            Here we will present an analysis based on our findings and the use of our  
Analysis            theoretical framework.

Section 6:            This section is used to summarize our study.  
Conclusion

## **I.7    Definitions**

### **I.7.1    Virtual Teams**

Townsend et al. (1997) define virtual teams as “geographically and/or organizationally dispersed co-workers that are assembled using a combination of telecommunications and information technologies to accomplish and organizational task.” Although this definition is quite old, it is well cited in recent literature and is still accurate for this study.

### **I.7.2    Traditional Teams**

We are using McDonough, Kahn and Barczak (2001) in this paper to describe a traditional team, their definition is: members working together in the same location and have relatively easy access to face-to-face communication on which they rely as their primary mode of communication.

### **I.7.3    Team**

There are numerous definitions of what a team is and the one the authors use originates from Hackman (1987) which was built on the work of Alderfer (1977). Sundstrom et al (1990) draw similar conclusions of what a team is and state that “A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems, and who manage their relationships across organizational boundaries”.

### **I.7.4    Project Team**

Mankin et al (1996), state that “Project teams are time-limited. They produce one-time outputs, such as a new product or service to market by the company, a new information system, or a new plant.”

### **I.7.5    Leadership**

Leadership is a very broad term that can be used in almost any context; however the authors have decided to go with the definition made by Hackman and Johnson (2009), “Leadership is human (symbolic) communication, which modifies the attitudes and behaviours of others in order to meet shared group goals and needs.”

### **I.7.6    Information and Communication Technologies**

When talking about virtual teams one major aspect is the ICT used. For the purpose of virtual work, it can be defined as: “diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information”, Blurton (2002).

## 2 Theoretical Framework

### 2.1 Introduction to Virtual Teams

Working and leading in a virtual environment proposes a great deal of thinking and strategy building. There are many different challenges, which will be mentioned below. However one should remember that there is a reason for why more and more companies choose to work in virtual teams. Pearlson and Saunders (2009) suggest that diversity can lead to more creative solutions. They also state that working in virtual teams offer advantages such as expanding knowledge beyond team memberships. Other advantages could be to reduce costs of travelling and speed up work processes by “following the sun”, as suggested by Pearlson and Saunders (2009).

#### 2.1.1 Challenges of Virtual Teams

As mentioned earlier, this study considers a virtual team to be geographically and/or organizationally dispersed co-workers that are assembled using a combination of telecommunications and information technologies to accomplish and organizational task. Pearlson and Saunders (2009) have established some challenges for virtual team and these could be used to see what differentiate a virtual team from a traditional team.

First of all, there is the communication challenge. While traditional teams are often located in the same area and time zone, the opposite often occurs for virtual team and this of course makes scheduling more challenging for virtual teams. Traditional teams also have the advantage of using more dynamic communication methods such as facial expressions and gestures which gives a richer communication.

There is also the technology challenge; a virtual team is dependent on technology for project success, which does not have to be the case of a traditional team. Different technologies are often used in the work of traditional teams but it is not vital for survival. Also for a virtual team the group alignment is more dependent on the technology.

Finally Pearlson and Saunders (2009) suggest a diversity challenge. They propose that group identity is easier to form in a traditional team when the members are more homogeneous, and commonalities might facilitate the communication.

However Reed & Knight (2009) has demonstrated three communication-related risks when it comes to working in projects. They wanted to see if the risks were weighting more on the virtual teams. The three risks are lack of or inadequate information, technical connectivity issues that hinder communication and insufficient knowledge transfer.

The result of the research was not what the Reed & Knight (2009) had expected; they believed that the risks would have significant greater impact on the practitioners within virtual teams. However the only risk that actually proved to have a greater impact on virtual teams was the third risk – *Insufficient knowledge transfer*. The authors believe the reason is because of the implicit knowledge that is shared within projects. Implicit knowledge could be seen as undocumented knowledge, which is very difficult to translate into a virtual team. The authors also believe that virtual teams operate more formally than co-located teams and that could be a reason that some implicit knowledge could go missing. Although they do notice that with people getting more trained and experienced with working virtually this risk can be solved.

Workman (2004) suggests that project teams however, geographically dispersed or not, do use e-tools to enhance project work. This study shows that e-mail is the most used and valuable tool for project teams. In this study it is suggested that “face time” can be considered more formal than emailing and voicemail. Although it is stressed that face time could be needed in order to reinforce commitment for the project.

### **2.1.2 Project Leadership**

Leading a project can be very difficult; our definition of a project team is “project teams are time-limited. They produce one-time outputs, such as a new product or service to market by the company, a new information system, or a new plant”, (Mankin et al, 1996). A leader not only needs to focus on aligning the team but also need to do this within a set time frame.

Larson and LaFasto (1989) have established eight strategies essential for effective team performance. They believe that establishing clear and inspiring team goals are essential in order to maximise team outcome. Each member also need to understand their role in the overall functioning of the group, together with this they point out that it is important to assemble competent team members that complement each other in a positive way. The leader should strive for unified commitment of the team, provide a collaborative climate and encourage high standard. The team members, on the other hand, should expect excellence of themselves and their colleagues. Providing external support and recognition is according to Larson and LaFasto (1989) the most critical aspect when determining if a team is efficient or not. The final suggestion is to apply a principled leadership; one should use a transformational leadership style. Hackman and Johnson (2009) describe a transformational leader as “creative, interactive, visionary, empowering and passionate”.

Gido and Clemets (2011) have established some critical success factors for successful project management. The first is the planning and communication that will minimize the occurrence of problems and help solving them. Before the start of the project a well-thought plan should be developed in order to create clear objectives of what is supposed to be accomplished. Involving the sponsors and customers is also critical in order to reach a successful outcome of the project. On-going communication with the customers is vital to achieve customer satisfaction and keep track of expectations.

A key point to project control mentioned by Gido and Clemets (2011) is measure the actual progress towards the expected outcome to see if any corrective actions are necessary. It is of great importance to evaluate every project in order to improve the work next time, make sure to collect feedback from sponsors and customers. Finally, learning and understanding customs and cultures from team members is of great importance especially when it comes to global project teams.

### **2.1.3 Technology within Virtual Teams**

Technology is one of the most vital components when it comes to virtual teams. Shachaf (2007), Biggs (2000), and Malthotra, Majchrzak and Rosen (2007) studies show that it is crucial to adapt the technology to make sure it meets the purpose of the project. Shachaf (2007), go on stating that proper ICT will enable the positive effects and reduce the negative effects when it comes to working in virtual teams. One of the main issues is that implicit knowledge is missing in virtual teams, Shachaf (2007); suggest establishing a chat would give workers a forum for informal and spontaneous communication. She provides examples of this when showing that it is easier to overcome cultural and language barriers when using e-mails and chatting. Biggs (2000) follow up with the importance of educating

the workforce in order to create alignment between the members. Malthora, Majchrzak and Rosen (2007), provides further evidence for this point by stating that norms of how to use the IT must be established in order to create trust, which is the main components for virtual teams to function efficiently.

However these researches do not direct any issues with technology, assuming that the company already knows which kind of technology to use. This indicates that for now, virtual teams is most suitable for companies with expertise technology knowledge, or that an IT consultant should be used to make sure the proper tools are at hand. To conclude, ICT is one main component that must be assessed with great consideration, it also needs to be taught to the members of the team and one should make sure to match the technology with the purpose of the project.

Townsend et al. (1998) propose that a main challenge for virtual teams is to know how to use the technologies in an effective and efficient manner. The choice of what technology to use is not as vital even though he pinpoints that they are fundamental to the business.

## **2.2 The five trigger model**

Thomas and Bostrom (2010) have developed a five trigger model for technology intervention. This model is going to be used in order to find out what triggers affected the leadership of virtual teams, this will provide an insight for today's virtual team leaders in terms of what to look out for.

This model does not consider what technology is used within the virtual teams but what other factors triggers the leader to change or implement a certain technology. Since there are surely much more technology available and there are also several ways to standardise the use of IT the authors believe that these triggers might have changed as well.

The authors will also use this model as a framework to see if there is possible to extend or add another dimension to it. After performing the interviews and analysed the data, a short assessment of the model will be performed.

### **2.2.1 Background**

Thomas and Bostrom (2010) found that previous research indicated that one critical success factor for team interaction was team technology adaptation during projects. They found this to be very consistent for virtual teams since they are hugely dependent on technology in their work. They propose that leaders' intervention, when it comes to technology adaptation, is affected by different triggers in different points in project teamwork. The five trigger model for technology adaptation will be described below and all references within this part origins from Thomas and Bostrom (2010).

They suggest the following five triggers for technology adaptation:

- External Constraint
- Internal Constraint
- ICT Inadequacy
- Trust- and Relationship Inadequacy
- ICT Knowledge, Skills and Abilities (KSA) Inadequacy

## 2.2.1.1 The Five Triggers

### 2.2.1.1.1 External Constraint

The first external constraint trigger represents the external conditions that are imposed on a project. The conditions could be global time line, budget, basic scope, the assignment of the overall leader(s), and the policies of the core organizations that are working together. In Thomas and Bostrom's study, the external constraints occur more than any other trigger, exhibiting itself in all of the interviews and 60 per cent of the incidents. One can conclude that this occurrence suggests that external constraints are a key point in signalling technology adaptation intervention need.

The external constraint trigger can be divided into three sub-dimensions:

- Time Schedule,
- Organizational Policy and
- Upper Management Intervention

The first sub-dimension, time schedules, is concerned with time limits or project schedule imposed on the team. The second sub-dimension, organizational policy, has to do with interference by organizational and larger policy issues. The last sub-dimension, upper management intervention, deals with intentional efforts by upper management to influence change in the project.

### 2.2.1.1.2 Internal Constraint

Internal constraints consist of internal project conditions needed in order to implement the project as defined by the core scope and organizations involved. The internal constraint refers to the existing discussions about virtual teams and the complications of virtually and distributed, global composition of teams. It is clarified that the internal constraint trigger can be divided into three sub-dimensions;

- Dispersion
- Team Size
- Demographics

The internal constraints results from Thomas and Bostrom's research indicated that virtual team leaders would benefit from better guidance on how to access and handle the impact of dispersion, team size, and cross-cultural issues on technology requirements. On-going evaluations, which should take place monthly and even more frequently, is needed in order to look at the technology adaptation interventions that might be needed.

While external constraints may emerge by surprise due to forces outside the project, the internal constraints are visible as a project proceeds and should be easier to predict and avoid through proactive project planning and management.

### 2.2.1.1.3 ICT Inadequacy

ICT inadequacy consists of emergent understanding of how a given technology either partially or completely fails to serve a task-related need during team interaction. ICT inadequacy has to sub-divisions:

- ICT used ineffectively
- Lack of ICT knowledge

The first sub-dimension, ICT used ineffectively, is when an ICT is not working. This might be due to availability and reliability issues, not enough capacity, or lack of interoperability. The second sub-dimension, lack of ICT knowledge, is an ICT feature or whole tool was missing and could not be handled by existing ICTs.

#### 2.2.1.1.4 Trust and Relationship Inadequacy

Just like the external constraints, this issue is not originating from the technology structure. This issue is concerned with misunderstandings and attitude problems on a personal level from the team members. This category is divided into three dimensions:

- Communication was not working in general
- Intra-team conflict arose and could not be solved by members on their own
- Trust between members soured and damaged relations

That the communication was not working in general could be as easy as one colleague just stopped answering emails which of course is crucial for the communication to function. This usually would lead to dimension number two that conflicts arises in the group and the leader needs to step in, sometimes doing this by changing the technology structure. This trigger were somewhat surprising to the authors the problem itself is not originated from the technology.

#### 2.2.1.1.5 ICT Knowledge, Skills and Ability Inadequacy

This trigger focuses of the inability to use ICT in an efficient and effective manner and also the lack of skills and knowledge possessed by team members. There were two dimensions to this trigger as well:

- A tool was workable but not effective in the way members were understanding it or using it
- Evidence that team members lacked knowledge or experience to use a tool

The first dimension was the problem with members failing to use ICT according to the standards but with the leader explaining what the problem was and how it was caused the percentage decreased drastically. As with the second dimension team members did not know how to use the ICT or that they did not know about some of the features of the system.

## 2.3 Triggers found in previous research

Lipnack and Stamps (1997) wrote a guide on how virtual teams can develop and use their “group-intelligence”. When first choosing technology in the initial state of the team development, there seem to be mostly internal triggers affecting the choice of technology. However during the virtual work Lipnack and Stamps (1997) does not mention anything about updating or adopting the technology accordingly, hence one can consider that the change of technology was not as rapid as today and it was not necessary for a team to function.

In Beise et al (2004) in their research has come to the conclusion that some communication technology is better than others. When they discuss the least useful tools within virtual

work, it seemed that it was mostly the ICT KSA inadequacy and the trust and relationship inadequacy that was the problem. They described Management Systems (MS) planning only to be used within the initial part of the project to be left after the project was running. This could be seen as the leaders and employees did not have enough knowledge about the system and this could be a trigger for the leader to change from this technology to a more easily used system, in this study they give intranets as an example of a useful way to share project information.

Beise et al. (2004) also talks about the ineffectiveness of emails at times and that would be a general communication issue rather than ICT issues and therefore this would fit into the category of trust and relationship inadequacy.

## **3 Methods**

### **3.1 Research Philosophy**

The original plan for this research project was to include both qualitative and quantitative data in the collection process. According to Tashakkori and Teddlie (1998) one should study what is of interest of you and if not interested in debates about truth and reality, the pragmatism philosophy would be suitable.

Saunders, Lewis and Thornhill (2007) argue that a pragmatism philosophy has the focus on the research question. This means that either a positivist or interpretivist philosophy can be used. This is suggested to be a practical approach, which suited our intentions using interviews and trying to establish relationships with the model used. This is an ontological position, which means that this raises questions about the way the world operates which is aligned with our study; we want to see how different aspects could influence a virtual team leader when choosing and/or changing the ICT within a project. Saunders et al. (2007) mention that many devotees of the ontological approach are within the management and business fields which also gives us confident to use this philosophy.

### **3.2 Research Approach**

Choosing the right research approach is vital for the whole research project. Deduction and Induction are the two key research approaches to choose from and build your theory around. The deduction approach involves testing of a theoretical proposal by the employment of a research strategy specifically designed for the purpose of its testing (Saunders et al., 2007). Saunders et al. (2007) also explain that the deductive approach is used more within natural sciences research.

The inductions approach, on the other hand, involves the development of a theory as a result of thorough observation of empirical data. It is also stated that the induction approach is a good approach if you want to gain understanding of the way humans interpreted their social world (Saunders et al. 2007). The induction approach seems more suiting for the authors' research because of the lack of testing made in the research. The authors are examining and exploring virtual teams and there is no real need of a hypothesis. The research is also a narrow research with few subjects to investigate which Saunders et al. (2007) support to be more suiting with an inductive approach.

A negative side of choosing an inductive approach is that the deductive research can be a faster way to complete a research Saunders et al. (2007). It is mainly the data collection and analysis that takes time with induction and this was tried to be seen to as soon as possible. Another disadvantage of using an inductive approach is the risk of getting no responses of interviews and questionnaires. The authors focused on getting respondents early in the research in order to minimize this chance.

The authors decided to use a qualitative method in our research. Qualitative research is concerned with all non-numeric data or data that has not been quantified and be part of all different research strategies (Saunders et al, 2007). Researchers using an inductive approach are more likely to use a qualitative data and a variety of methods to collect data in order to establish different views of a phenomenon (Easterby-Smith, Thorpe, Lowe, 2002).

The authors believed that using a qualitative method would be beneficial for the study, since the qualitative method is more suiting with the great amount of text-based data col-

lected. Silverman (2006) confirms this and state that quantitative method is used in research that is handling larger samples than qualitative methods.

### **3.3 Strategy**

The authors conducted an exploratory research because the intention is to find out what is happening within the leadership in virtual teams. Referring to Robson (2002) an exploratory study is to find out “what is happening; to seek new insights; to ask questions and to assess phenomena in a new light”. Saunders et al. (2007) state that there are three ways to conduct an exploratory research; searching literature, interviewing experts, and the use of focus group interviews. The authors used literature search and interviewing experts in the study. The authors decided to skip focus groups interviews due to time limitations and the lack of benefits it would give to the study.

#### **3.3.1 Case study**

The authors conducted a case study in order to collect the primary and secondary data. According to Robson (2002) a case study is “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence”. A case study has the ability to generate answers to “what”, “why”, and “how” questions and are therefore mostly used in explanatory and exploratory research (Saunders et al, 2007).

There are four different case study strategies; singles case, multiple case, holistic case and embedded case. A multiple case is when you look at more than one case and compare the cases in order to find results that occur in multiple cases (Yin, 2003). The authors utilized a multiple case strategy, where different organisations were analysed and compared.

The case approach was most suiting for this study because what the authors studied a real life example. Saunders et al. (2007) explain that in a case study the researchers presumably need to use and triangulate several sources of data. The authors did not use the triangulation due to lack of time and difficulties finding respondents.

##### **3.3.1.1 Literature review**

First of all literature reviews will be performed in order to collect secondary data; this will provide a good background, not only for the research but also theories and methods to rely upon. This literature review was also made in order to present empirical data to compare with the research findings.

In the literature review secondary and tertiary literature sources were used to find our empirical data. No primary literature sources were chosen for this part, because it was difficult to find and the authors believed the empirical data found was sufficient.

In order to conduct this literature review the authors used:

- Journals
- Newspaper articles
- Books

JULIA (Jonkoping’s Library Service) and Google Scholar were the primary databases used to find these articles.

### 3.3.1.2 Interviews

The interview technique used was non-standardised, one-to-one, face-to-face interviews. In addition to the face-to-face interview the authors thought a non-standardised, one-to-one telephone interview could be a good alternative if either the interviewee or the authors had a hard time to find a time or location for the interview. The face-to-face interview was the authors' first choice and the telephone interview a decent alternative.

Both the telephone interview and in-depth interviews were semi-structured which is when the researchers' have a list of themes and questions that should be covered, but these may vary from interview to interview (Saunders et al, 2007). The questions remained the same under all of the interviews in order to ensure the reliability and validity. Some spontaneous questions were added in some interviews, to further look into a certain subject. The order of the questions asked differed between interviews, much due to the flow of the interview and what was being covered at that moment. The questions asked in the interviews were open-ended and probing and allowed the respondents to speak freely about subjects investigated.

The interview was structured into two main parts. The first part consisted of general questions regarding the interviewee and general questions about virtual teams. This part was thought to give the researchers more information about virtual teams and get an understanding of the interviewee's knowledge of virtual teams. The second part of the interview was built up of questions concentrated on the "Five Trigger Model". The questions were divided into the five different sub-categories focusing on the five triggers.

The authors used a respondent interview technique which means that the interviewers guide the interview and the interviewee will respond to the questions asked by the researchers (Robson, 2002). The authors believe that this will give us a more in-depth knowledge and the possibility to get more out of our interview. The authors believed in-depth interviews and semi-structured telephoned interviews would be helpful to our research approach which was exploratory.

The authors chose to record the interviews in order to gather as much information as possible from the interviews. Important findings were also written down during the interview, much due to the will to emphasise the importance of that subject. The interviewee was asked for approval of the recording before it was commenced. After the interview was done, the recordings were closely reviewed and a summary of the interview was written.

## 3.4 Choices

The only primary data collection technique used in this study was interviews. However some qualitative data analysis procedures were performed in order to make sense of the secondary data collected. This means that this study was a multi-method qualitative study Saunders et al. (2007). The reason only qualitative was used was because the purpose was to see what influences behaviour of the leaders in virtual teams. A quantitative study that primarily uses numerical data Saunders et al. (2007) could not provide a valid result. Primary reason for using only to interviews was partly because of the difficulty to find enough leaders in virtual teams to answer a questionnaire that was the plan in the beginning of the study, but also that the information gained from the interviews would be sufficient if it could be backed up by secondary data.

### **3.5 Time horizons**

Since the purpose of this study was to see what triggers leaders to technology adaptation, this was a cross-sectional study. A cross-sectional study is according to Saunders et al. (2007) when you study a particulate phenomenon at a particular point in time. Since all the respondents were currently working in a virtual team. However some questions asked were about the development of virtual team work from previous years, so one could see glimpses of a longitudinal study. Longitudinal study is when one studies change and development over time Saunders et al. (2007).

### **3.6 Data collection**

The data collection will consist of a primary collection that will include interviewing people within the subject and secondary data collection by searching of the existing literature. This is good because the literature search will give us an introduction to the subject but will also help to validate the conclusions drawn from the subject.

A negative aspect of only using interviews as primary data collection is that the amount of people included in the study will not be substantial. It will provide more in-depth knowledge but only from a few people's perspectives.

#### **3.6.1 Sampling**

A purposive, non-probability technique was applied; also known as judgemental sampling technique, when deciding which companies and employees to interview. Saunders et al. (2007) explain that "purposive or judgemental sampling enables you to use your judgement to select cases that will best enable you to answer your research question(s) and to meet your objectives". This means that the entire population was not known, and you may be able to generalise from a non-probability sample but not on statistical grounds. Saunders et al. (2007) claims that this method is frequently used in case studies and since this is the strategy chose, this was considered a reliable sampling technique.

The sampling the authors performed was in order to find companies that works within IT consulting industry. Since a subgroup has been chosen (IT consulting companies) one can argue that a homogeneous sampling is used. This focuses on one group with similar members, such as the virtual team leaders. According to Saunders et al. (2007) this enables the authors to study this particular group in depth.

All the interviewees were Swedish, and therefore all interviews were performed in Swedish and have been translated for the purpose of this report. To get different perspectives on the matter, the companies within this study has a great variety of size. It ranges from a company with about half a million employees, to a small consulting company.

### **3.7 Data Analysis**

The five trigger model was found during the secondary data analysis and the choice of using that model was because it covers a new spectrum of the field which has not been investigated before. The model is quite broad and will provide the opportunity to see the technology adaptation from a different perspective then what one might be used to.

Since this is an inductive study, the analysis method for the primary data collected will use a interpretivist view which, according to Saunders et al. (2007) usually are less structured. An approach called data display and analysis, based on the work of Miles and Huberman (1994) was used. As a part of this process is data reduction in which the interviews was

summarised and compared with the five trigger model in order to find out similarities and differences.

Next is data display in which a summary of each interview was written and divided into different categories according to the triggers from the model. This process included searching to find some of the triggers from the five trigger model to see if they were used within these projects, but we were also seeking to find new triggers that had come up in recent years. This enabled an identification of patterns and relationships of and between the leaders.

Miles and Huberman (1994) describe the analysis of qualitative data as an interpretative process, although their approach could be seen as highly structured and systematic one. In this study the conclusions was drawn upon the summaries made and the result can be read in the analysis. The same method was used for the second research question although the focus was not on establishing relationships but rather key themes and trends used by the leaders.

After established the triggers found in the primary data collection, we tried to compare it to the triggers found in the secondary data collection to see whether there were any similarities with the triggers and try to establish how the choice of technology has evolved over time.

### **3.8 Validity and Reliability Considerations**

In terms of interviews and qualitative research, reliability is concerned with whether other researchers would reveal similar information as the premier researcher (Haley and Rawlinson, 1994). Validity, on the other hand, is concerned with how accurate the data collected through data collection methods is to what it is intended to be (Saunders et al, 2007).

There are several biases that can occur when conducting an interview, which can affect the validity and reliability of the findings. One of these biases is the interviewer bias which is when the interviewer influence's the interviewee with comments, tone or non-verbal behaviour. Bias can also be found in lack of trust between interviewer and interviewee, lack in credibility and that information may be limited (Saunders et al, 2007).

To ensure validity and reliability the authors asked several people to look through the questions we had planned. This worked as a pilot test which according to Saunders et al. (2007) helps establish content validity and enables adjustments of both structure and questions. The first interview conducted by the authors also worked as a partial pilot test. Questions that were not understood by the interviewee were removed and not used in later interviews.

The use of audio-recording was mentioned in the part "Interviews" (3.3.3). This was done to strengthen the validity of our interviews and data collection. The authors believed only note taking would cause a possible problem to capture all data from the interview. With having a recorded interview, the authors had the possibility to go through the interview several times to capture the most important data.

## **4 Empirical data from Interviews**

### **4.1 Company presentations**

#### **4.1.1 Sogeti**

Sogeti Sverige AB is a consultant organisation, specializing in local professional IT services. The organisation is geographically situated close to the local technical decision-makers of large companies, and are located at 21 Swedish locations with a total of about 1 000 employees. Sogeti is a global organisation and has 20 000 employees in 15 countries. Sogeti offer their clients a full range of technological IT knowledge and expertise. Sogeti are a leading provider of professional technology services, specializing in Application Management, Infrastructure Management, High-Tech Engineering and Testing (Sogeti, 2011).

#### **4.1.2 Skye AB & Kongsberg Automotive**

Skye AB is a consulting organisation, concentrating on business development and product development processes. Skye AB primarily focus is on the context of business systems, consulting operations are conducted in the IT field. In addition to this Skye AB also concentrate on the administration of securities and related business (Wedoo, 2010).

Kongsberg Automotive is an organisation which is a global provider of engineering, design, and manufacture of seat comfort, driver and motion control systems, fluid assemblies, and industrial driver interface products. Kongsberg Automotive's product line contains several different advanced systems. Kongsberg Automotive's main targets are the automotive, commercial vehicle and industrial markets (Kongsberg Automotive, 2011).

#### **4.1.3 Calm Sea AB**

Calm Sea AB was founded in 2010 and offers sales and marketing support of IT products in the Nordic market. Since March 2010 Calm Sea represents BakBone Software, a global supplier of professional data protection software, in the Nordic Countries. BakBone Software was acquired by Quest Software in the spring of 2010. Calm Sea AB is privately owned and is located in Stockholm, Sweden (Calm Sea, 2010)

#### **4.1.4 IBM and IBM Svenska AB**

IBM is the world leader in information handling. IBM has more than 350,000 employees and thousands of technology and business partners worldwide. IBM is a globally integrated company that operates across borders in order to give their customers access to the combined expertise of their worldwide organization (IBM, 2011).

### **4.2 Interview with Peter Österlund, Sogeti Sverige**

The first interview performed was with Peter Österlund, who has worked and managed several virtual teams in his fifteen years within this Sogeti.

#### **4.2.1 General information**

He believes a virtual team can be many different things, but agrees with the definition in this paper (see definition 1.7.1). The reason they work with virtual teams within this company is because they want to develop competence and work with it in the company. Virtual teams have been used a long time within Sogeti but have been more noticeable since 2000, mainly because of the technological improvements. The main advantage of working in vir-

tual teams is that it is possible to take care of the competence within the company. A negative aspect is that it is a less controlled environment and virtual process can lose prioritisation for a local assignment. Communication is less efficient in a virtual environment; team members' lose face-to-face contact and informal talking is less evident. He believes that it is much easier to work in a traditional team.

It is easier to share information nowadays. Sogeti has one global collaboration portal, TeamPark, which is used for file sharing, chat and working on projects. This was developed two years ago to replace a more traditional intranet that was not very collaborative focused. They also have a project portal that is used only for projects within the company. To keep track of the latest technology, Sogeti has a shared market/communication department. There are no clear plans for technology use but the upper management tries to convince employees to use TeamPark as much as possible.

## **4.2.2 In depth questions**

### **4.2.2.1 External constraints**

Time and money affect the choice of ICT to a certain extent; small projects for example might not need to use TeamPark. The project leaders are the ones in charge of setting up projects and convey the policies to the teams, usually by uploading for example quality plans. The upper management does not decide which systems to use but try to push the common systems to the employees at the company.

### **4.2.2.2 Internal constraints**

Mr. Österlund believes there is no maximum number for a virtual team; the general thinking seems to be that the more people within the team, the better. On the other hand, if the team is working tightly and continuously it is easier to have fewer members. Mr. Österlund believes that the more people in the team, the more people can access the latest information and therefore have more advantages. There is no real strategy or thinking of how to overcome demographical barriers but they try to have a great age difference within the project teams so that the level of experience varies.

### **4.2.2.3 ICT Inadequacy**

There are guidelines to make sure that the ICT is used as effectively as possible, when a new employee starts at the company an introduction and training is compulsory to teach the systems that are used by the company.

### **4.2.2.4 Trust and relationship inadequacy**

The employees rarely affect the choice of ICT, although sometimes it can be adapted to the workers if someone thinks it is too difficult. There is no specific policy for solving conflicts within a project, when working virtually. It can also be a challenge to discover conflicts.

### **4.2.2.5 ICT KSA Inadequacy**

If someone does not know how to use a tool or a system, TeamPark has some "super users" who can help, if not, the project leader should be able to clear things out. TeamPark was created from a survey by the users at the company and has been adapted to those wishes. However there are always things that are missing and that could have worked better.

## **4.3 Interview with Per Högberg, Skye AB**

Per Högberg has great experience of working with virtual teams. He first started to work with virtual teams at Kongsberg Automotive 1999 and has continued to do so for several years at two different companies. He worked with virtual teams before 1999 as well, but it was more ad-hoc driven.

### **4.3.1 General information**

Mr. Högberg defines a virtual team as a workgroup which works tightly together, but are situated on different locations. To be classified as a virtual team, a phone call now and then is not enough, one have to work as a team. A virtual team only meets occasionally in order to familiarize with each other.

At Kongsberg Automotive they worked in a team of ten people, they worked with both projects and operations and were tightly coupled. Mr. Högberg mentions that it is important that the members appreciate work to become more effective. When external people were added to the team they expressed that the team was functioning very well.

The positive aspects Mr. Högberg recognised with virtual teams were the availability and speed which generated quick and efficient collaboration. The negative aspects were that some people could be uncomfortable with working anonymously and therefore the work suffers. Mr. Högberg states that “coffee breaks build group dynamics” and therefore the group dynamic in virtual teams are not as effective. Mr. Högberg believes that the exchange of information is better in a virtual team than in traditional teams. Due to the fact that people need to exchange a great amount of information in order to keep up the collaboration.

The technologies used are mainly telephone and split screens, and the software being used is Netmeeting. Mr. Högberg mentions Skype as a function that is being more commonly used today. He gives an example of working with phone solutions, in which they installed a central telephone line which they could simply call a number which automatically join a teleconference that was being held within the company. The ICT strategy is to have technology which would function at all times and in this case the concept was split screens and telephone.

### **4.3.2 In depth questions**

#### **4.3.2.1 External constraints**

Time and budget were issues that force solutions to be created such as Wedex, an internally created solution. The organizational policy made the team physically meet every sixth meeting, in order to maintain a physical relationship. A simple technology makes it easier for everyone to follow the work, including upper management.

#### **4.3.2.2 Internal constraints**

To make sure that the members communicated as effectively as possible relationship building is the major aspect Kongsberg focused on. The company has great age diversity within the team, and the elderly workers are the most drives the development.

### **4.3.2.3 ICT inadequacy**

ICT effectiveness was solved by using as simple programs as possible. Maximum two clicks was the concept and everyone should have access to telephone meetings. This simple technology also lowered the difficulty for members to learn the systems. Although the members got a substantial amount of training before starting the project.

### **4.3.2.4 Trust and relationship inadequacy**

The members that had not worked out the technology issues were often the people who had trouble with communication. Solving a conflict is a concern for the leaders. Mr. Högberg believes that ICT can help recover a damaged relationship but it depends on how badly damaged the relationship is.

### **4.3.2.5 ICT KSA Inadequacy**

If a member does not know how to use the system, one has to provide the right prerequisites to make sure he/she can learn. Mr. Högberg's final statement is that the technology adaptation is a combination of ICT and people, one cannot just take consideration one part, and it is different from time to time.

## **4.4 Interview with Bengt Leksell, Calm Sea AB**

Bengt Leksell works as a representative in the Scandinavian countries for an English company called Quest Software. He is not employed by Quest Software, but from the companies perspective he is seen as a part of the company but is working as a separate unit. He has been working there for one year.

He is part of the sales and marketing organization of the company. Marketing and technical support divisions consist of 40 people. They are situated in England, Benelux, Scandinavia and South Africa and the Middle East. These divisions are part of a bigger company which was until January 2011 known as BakBone Software, but now go under the name Quest Software. Mr. Leksell has access to their data systems. This is somewhat different from our previous interviews since Mr. Leksell is an external part of Quest Software and he is not the one deciding which ICT to use. Although we believed this interview is still valid because he is still working within a virtual team and could give us some different aspects of the technology adaptation.

### **4.4.1 General Information**

Mr. Leksell defines a virtual team as a temporary composed group of people that can be from different environments, areas or companies that work towards the same goal either long-term or short-term. Mr. Leksell believes a positive aspect of a virtual team is that he can work by himself, in collaboration with Quest Software. The negative is that it is difficult to have a close connection to the organisations you are working with or for.

He has access to the history of the sales, the internal databases and the CRM system that tracks customers, which is an advantage because he would not have access to this if he was not working in a virtual team. He feels like he works as if he would be part of a traditional organization. Earlier he was part of this company and was part of a traditional team as well as a traditional organization. When he compares these he did not have access to these databases and CRM systems. He believes that sharing this CRM database makes a more detailed database and it is easier to share.

The system/medium that he and Quest Software use is called Sales Force and is a commercial product, a classic CRM system. It has been used for 3-4 years. The CRM system can also be used as a planning instrument for forecasts, where you can add planned sales. Where they estimate the possibility that they will fulfil their sales goals. The information flow works well. The problem is when people do not update the databases. He does not follow any developments of new products and updates; he works with what is given to him.

## **4.4.2 In depth questions**

### **4.4.2.1 External constraints**

Mr. Leksell handles his time and budget by himself, but he has expectations from Quest Software on how much is expected to be sold in Scandinavia. He does not receive a budget from Quest Software, which limits what he can do. Mr. Leksell believes that having a policy is important and that to have a dialogue in order to have the same message to partners and customers as you have with your employees. He was taught in how to make sales and strategies when he started within the company.

The upper management do not really influence his work. He has a person which he reports to and he works with other people that are on the technical divisions.

### **4.4.2.2 Internal constraints**

Mr. Leksell has virtually worked with people from different countries for several years and has realized that there are lots of different attitudes and ways to work. He believes the best way is to “mind your p’s and q’s”. He believes that elderly people see possibilities of new tools and effective products; this is probably much due to experience they possess.

### **4.4.2.3 ICT inadequacy**

To ensure that ICT is used as efficient as possible he believes that it is vital to update as soon as you have made any changes. If people do not update the database, then other people cannot benefit from the information. To ensure that everyone has enough competencies to use the CRM and databases, Quest Software work with internal learning. They receive a password to the system and then PowerPoint presentation which demonstrates how the system works.

### **4.4.2.4 Trust and relationship inadequacy**

Mr. Leksell believes that communicational issues affect the choice of ICT and that it is the management who should decide how they should do things. He also believes that the individual should not influence the choice of new updates or software due to unwillingness to learn. To avoid/solve conflicts within a virtual team, he believes that the solution is to have initial meetings in the beginning of a new virtual team. He believes it is hard to build up trust to a person you have never met.

### **4.4.2.5 ICT KSA Inadequacy**

If a person does not know how to use ICT in the best way, Mr. Leksell believes that a walkthrough with that person should be made. You have to talk with that person one-to-one in order to solve this.

## 4.5 Interview with Per-Olof Lindquist

The final interview was performed with Per-Olof Lindquist, executive architect at IBM. He has been with IBM for 8 years, before that he has experience from a Swedish bank company. He works with IBM's outsourcing, where they handle the management and production of their customers IT environments.

### 4.5.1 General information

Lindquist defines a virtual team as a team that is not physically at the same place. He also states the importance of defining a team, who would be a group of people working together with the same task. In the case of a project team, they work at a specific task to achieve a goal and then the team will resolve. Lindquist appreciate that he has been working with virtual teams about 15 years, although there has been a significant increase the last five years. IBM which is a large global company need to work with virtual teams in order to use the competencies within the company, flying people around the world would be too costly and time consuming.

The amount of people who work in each team varies, but the average is around 20-25 people in each team. The amount of people in each team is due to how many people a leader usually manages. In project and other focus areas the teams can be as large as 40-50 people.

Mr. Lindquist believes that the most distinctive advantage of working in virtual teams is that you can get in contact with the person who is the most skilled in and area you need assistance. Another advantage is that virtual teams enable you to use other resources which are cheaper in other parts of the world.

According to Mr. Lindquist a major challenge, in any team, is communication. Virtual teams lose parts of the communication which is some situations are needed. Using just the voice makes it more difficult to communicate with people from other countries, because it is harder to handle barriers between countries. It is more efficient to communicate face-to-face, due to the fact that it is easier to comprehend differences. Since most communication is done in English, language deficiencies make it harder to communicate with each other.

Exchanging information in the right way is another challenge according to Mr. Lindquist. He believes that IBM's information exchange works, in general, quite good. How well the communication and information exchange works is very dependent on the individual team members of the virtual team.

IBM invests approximately 6 billion dollars in research and a large part of it goes to communication and collaboration research. IBM are active at developing their own products and ways to work. Mr. Lindquist also explains that IBM are part of the growth and development of virtual teams in general in the world.

IBM works with several different ICT tools. There are several tools just for information sharing, so they do not have to send information to each other, everyone should have access to the information within IBM. Chat is used in most virtual teams and Mr. Lindquist believes it is good because everything gets documented and it is possible to go back and check what was written. They also use telephone communication, mostly voice-over-ip. They rarely use video; it is mostly used during presentations. They used to use Second Life, but it has subsided a bit lately.

IBM recently changed their distributor of their telephone conference systems. The strategically analysed which partners they should have and from this make new arrangements and

deals. Updates of products and services occur each quarter. The factors that influence these decisions are cost, efficiency, and that the product and service meet the requirements IBM have.

Within different project at IBM they have a given strategy on which technology is supposed to be used. They have several official tools on how to share information and how to communicate. The international communication at IBM is done through Same Time, a chat application, and information sources where they share information. IBM has both a short and long-term strategy for this, and how employees communicate is one of the main areas that IBM focuses on. IBM annually conduct studies on communication, and which changes have been made within the organisation. All employees are involved and can help this process.

## **4.5.2 In depth questions**

### **4.5.2.1 External constraints**

IBM are following a traditional model for IT projects in general, where they document the issues, develop a suggested solution and from that a project/recourse plan is developed. In terms of budget, IBM looks at the value of solving a problem versus the costs of doing it. Mr. Lindquist believe that IBM are well organised in the structure of IT projects in comparison to a few years back.

For each project made, there is a project definition. Most projects start with a project kick off, where all this information is communicated to the team members. This is also uploaded together with all other information about the project. If this is not communicated in the initial state, one might often have to go back and do corrections.

To succeed with a project there is often an external sponsor involved, which takes ownership of the project. The sponsor should help if there are any problems within the project or if any corrections needs to be made, but this person is not necessarily involved in the project. The sponsor also makes sure that the project follows the provided time and budget, which varies between different projects. The size of the project, and costs and complexity depend on the leader's individuality.

### **4.5.2.2 Internal Constraints**

One part of the project plan is covering the communication; the project leader is responsible to make sure that the communication works. There are no other models apart from the communication plan, which is expected to work. In a virtual team, Mr. Lindquist believes that there is no real maximum of people that can be part but they are trying to keep to the 20-25 people. It is definitely more complicated to communicate when there are more people.

IBM has a well-established intellectual system for barriers like these, for project leaders and for employees who travel frequently. There are descriptions of stereotypes from different countries and regions to study, available to everyone in the company. It is important to keep the communication simple, a basic concept for IBM. There are communication norms such as not using slang and offensive language. Documenting all communication is also an important aspect.

### **4.5.2.3 ICT inadequacy**

Everyone that is employed receive training for how to use the tools. There are internal rules for how one should behave towards other people, and how to use the communication

tools in the organisation. The rules are updated regularly. The global CIO office provides education plans for communication and collaborations. IBM has a well-structured communications program, global information packages and courses.

Within the teams there is no direct follow up program, the collaboration is expected to work. If the communication does not work it gets obvious quite quickly. The team leader is the one responsible to make sure that the communication works effectively.

One need to adapt the technology to the individual, it all depends on how you want people to communicate. Depending on the situation chat, email or telephone can be used to simplify the communication. There is a strategy for how IBM wants people to communicate; most important is to document why a decision is made. Email is not normally a good communication strategy since it is a passive communication tool. Employees normally start with chat to decide what mediums to use in the project. There are blind and deaf employees working at IBM and these employees must be considered as well.

#### **4.5.2.4 Trust and relationship inadequacy**

The team leader is responsible to solve the conflicts; this is not much different from how it is solve in traditional teams. Conflicts are always solved by phone, or in person if possible, and not via chat or email. It is important to make sure that each individual get to speak their mind and that everything is understood by all involved in the conflict. The conflicts are solved through personal dialogue and are classified as confidential conversations.

To rebuild a damaged relationship, IBM focuses on reaching an understanding by everyone. Sometimes it is not possible and one needs to consider whether it is better to remove one of the conflicting persons from the team.

#### **4.5.2.5 ICT KSA Inadequacy**

IBM assure that the individual get enough training necessary to be able to work, although in situations where the time limit is very tight, one need to consider taking in another worker to support.

The employees need to adapt to the work environment but at the same time we are conducting research to make the technology easier to use for the employees. Mr. Lindquist is convinced that there is going to be a huge transformation of the interface of IT systems. He believes the current interfaces of IT systems are obsolete and not efficient. Mr. Lindquist believes that voice interfaces and visual tools will play a major part in the future. The globalisation and development in the world has to be taken into consideration because the competition is getting tougher. Mr. Lindquist believes that effective communication is built on personal relationships and the being able to physically meet is more efficient.

## **5 Analysis**

### **5.1 General analysis**

The general perception of what a virtual team is for the interviewees were similar. In simple terms, a team composed of people situated in different places and connected through some sort of ICT. However, the problem to find respondents for this study demonstrates that there are several companies that does not realise that they are working in virtual teams.

The interviewees thoughts on the advantages of virtual teams differed from each other a bit and the authors believe this has to do with what kind of organisations the interviewee is from and how large the organisation is. Comparing the interviewees' suggested advantages to those suggested by Pearlson and Saunders (2009) shows a close resemblance of the same advantages. One benefit that was mentioned by the interviewees was the possibility to share information more efficient, allocating employees, and a better shared knowledge within the organisation. Pearlson and Saunders (2009) suggested that working in virtual teams offer advantages such as expanding knowledge beyond team memberships and reduced costs of travelling and speed up work processes.

The disadvantages with virtual teams according to our interviewees were the lack of face-to-face meetings and the difficulties with communication that can arise. Shachaf (2007) and Reed & Knight (2009) both state that working in virtual teams you lose important implicit knowledge. All of our interviewees agreed upon that face-to-face meetings are efficient due to many different aspects. This shows that having a personal relationship with the people you work with is quite important. Mr. Lindquist mentioned that point in his interview and this seems to be true.

The interviewees all agreed that it is easier to share information nowadays. Workman (2004) suggests that email is the most commonly used tool in projects. However among our respondents the use of file-sharing software was more common than emailing. They also thought that the exchange of information is better in virtual teams than in traditional teams. Mr. Lindquist has a theory that how well the communication and information exchange works is dependent on the individual team members. The authors believe that the interviewees overall perception of virtual teams were that they are more efficient to work in than traditional, but requires more effort.

### **5.2 External Constraints**

For most of our respondents, the time and budget were directly affecting the choice of technology when it comes to virtual teams. This is not surprising, time and budget are vital resources for any project work and since technology is quite expensive a minor project might not be need to invest in high technology systems. The only one that did not feel affected by time and budget was Mr. Leksell. This is not surprising since he works mostly for himself so he is the one in charge of his own time and budget. Mr. Högberg explains that time and budget does not only influence the technology adaptation but they can also force issues to arise and therefore force new solutions to be created.

One thing that was surprising to the authors was the lack of upper management influence on the ICT. The four respondents explain that the upper management does not decide what ICT is to be used. IBM is the only one where the upper management has the right to intervene in the technology adaptation. However Mr. Lindquist means that it is very dependent on the individual characteristics of the manager. Sogeti have an official system,

TeamPark that upper management is trying to mediate to the employees. Mr. Österlund mentioned that even though TeamPark is Sogeti's official tools, it is not always used by everyone.

The organisational policy was difficult to find information about during the interviews and therefore it is difficult to establish a pattern. The authors assume that legal issues affect the work in teams although it is probably already a part of the organisation and therefore is not a thing discussed when it comes to virtual teams. To elaborate further, the authors believe that convey an organizational policy is done continuously within an organisation, and not specifically for virtual teams.

For the external constraints, there is a clear sign that the time and budget is the most frequently occurring issue. The upper management does not seem to have a great impact on the technology adaptation, although it seem like the larger organisations, like IBM, have a more structured approach to the technology set up. Therefore the upper management in these organisations is more involved in the choice of ICT. The authors believe that large organisations, IBM is close to half a million employees, need rules and regulations in order for the organisation to function efficiently.

### **5.3 Internal Constraints**

From the people we have interviewed we can draw a conclusion that there is no ideal number of people that can be involved in a virtual team. Mr. Österlund explained that he believes that there is no maximal number of people that can work in each team. At Sogeti the main goal with the virtual teams is to get an efficient sharing of competences and to make information available to everyone. Sogeti's view differs from what Mr. Lindquist and IBM believe. At IBM they consider an efficiently working virtual team should consist of 20-25 people.

All of the interviewees explained that there is great age diversity within the virtual teams. One could think that it would be the young people within the organisations that are anxious to follow IT developments and technology updates, but both Mr. Leksell and Mr. Högberg explained that it is rather the senior employees who were driving the IT change within their organisations. Both Mr. Leksell and Mr. Högberg believe that the senior employees have the experience to see business opportunities from ICT. The authors thought that the ICT would have to be adapted to the senior employees, in order to make it more efficient.

Mr. Lindquist explained that IBM has intellectual system, which helps employees to investigate any stereotypes and norms that exist in certain cultures and parts of the world. This system is set up in order to simplify the teamwork over borders. The other three interviewees explained that they also worked over borders, but do not have or need such a system. A system like this is beneficial for IBM due to the fact that IBM is a multi-national corporation and numerous virtual team constellations are set up between countries.

The difference between the interviewees and their respective organisations differ significantly. The general interpretation the authors get from comparing the organisations in terms of internal constraints is that IBM has one way and the three other organisations are more similar. The authors believe that IBM's size and organisational culture is the big difference in why a difference can be made. IBM is by far the largest organisations included in this study, and have thousands of virtual teams within the organisation. Having a large organisation like this enables IBM to devote more time and resources on research and devel-

opment of virtual teams. Research and development results in tools like the intellectual system set up to assist their employees.

The three other organisations are smaller, and therefore the need for systems and research might not be as vital in order to make the virtual teams to function. In the case of these organisations, the virtual teams are more consistent in terms of size and constellations which make systems like this are not needed at the same extent.

## **5.4 ICT Inadequacy**

The ICT inadequacy does not, surprisingly, have a visible influence on the virtual teams. Since the teams are dependent on technology to function, a missing feature or ineffective ICT could be a disaster for a virtual team. Here most respondents seem to have their own solution to avoid this inadequacy.

At Sogeti for example, even though they have TeamPark, if the leaders believed functions were missing or it did not work in a preferred way, they decided to choose another ICT. The reason why they developed TeamPark in the first place was that the old intranet was not collaborative focused enough.

The general idea among our respondents seems to be that the ICT should be as simple as possible, no advanced functions that require major training for the employees. Mr. Högborg for example mentioned that a maximum of two clicks was a concept within one the companies he worked for. The authors believe this philosophy is a realistic and worthy goal to have. It enables employees to quickly establish a connection with other employees and get to work faster.

IBM the company with most structure around projects. They usually start the communication with chat, and from there they decide what medium is appropriate for the particular project, thereafter a project plan is developed and distributed to the team.

Mr. Leksell stresses the importance of keeping systems up-to-date and the importance of saving updates as soon as changes have been made.

Finding a pattern within this category is quite difficult since most of the respondents have different ways of trying to overcome this issue. Although one thing can be established, everyone needs to overcome this issue and using the right ICT is probably the most vital part of a virtual team. Shachaf earlier mentioned that the technology is the most important cornerstone within a virtual team and our findings does support this statement. One can also conclude that using ICT that is easy and reliable is vital in order for the virtual teams to work. Working with new technically advanced solutions can be beneficial, but it seems that choosing reliable and well-tried technology usually works best.

Another aspect the authors believe is important to bring forward from this section is the importance of being ambiguous when working with ICT in virtual teams. If the ICT for some reason does not work, there are numerous other ways work can commence. The authors believe it is vital for organisations to have alternative communication tools to use in the case of an ICT shortage.

## **5.5 Trust & Relationship Inadequacy**

The trust and relationship inadequacy is an interesting approach since it is not directly connected to the technology. Conflicts of different sizes arises in most teams at some time, Mr. Österlund pinpoints that it can be difficult to realise conflicts in virtual teams since they usually are less controlled by the team leader.

All of the respondents mention that in order to establish a good relationship and trust, one has to meet physically. Mr. Leksell says that one should have an initial meeting before and Mr. Lindquist supports this by explaining that the projects at IBM usually starts with a kick-off, if geographically possible, where everyone gets to meet physically. Mr. Högberg takes this discussion further by explaining that his company has a policy that every sixth meeting has to be physical.

The solving of the conflicts in IBM is handled just like in traditional teams. Conflicts are always solved by telephone, if a face-to-face meeting is not possible, to get direct communication; sometimes even a local manager can be involved to give comfort to the involved. Mr. Österlund adds to this by mentioning that solving conflicts in virtual teams is no different from how it is done within the traditional team.

It does not seem to be that trust and relationship inadequacy pushes technology adaptation much. Mr. Högberg believes that ICT can be used to rebuild a damaged relationship. Mr. Högberg takes this discussion further by stating that communication problems in general can create technology issues and this might push the technology adaption. Mr. Leksell supports this by saying that communicational issues affect the choice of ICT. This is recognisable from Beise et al. (2004) who suggested that the difficulty of using technologies derived from ineffective communication skills in the first place.

In conclusion, trust and relationship issues are usually personal problems which are best solved by direct discussions and should be dealt with immediately. Some respondents believe ICT can be used to rebuild a damaged relationship. Think of a problem where a chat escalates, this can force the members to move to telephone discussion which is a more direct way of discussing and this could help the members to be more considerate. ICT can also be the source of communication issues. If someone in the team does not communicate according to set standards this could easily turn into other members getting upset.

It is also fundamental to remember the importance of having physical meetings. Most of the interviewees mentioned that in order to build effective and efficient team work, initial meetings for a virtual team needs to be held. This can be linked with Shachaf (2007) statement about the greatest challenge of a virtual team is the missing out on implicit knowledge transfer. The authors believe that through a face-to-face meeting employees can see what their co-workers actually look in real life instead of their chat name or just their voice. This strengthens Workman's (2004) statement about using face-time to reinforce commitment.

## **5.6 ICT KSA Inadequacy**

When talking about this perspective, all of our respondents made the point that it is important to provide sufficient training for the employees to understand the tools and systems used. The interviewees all agree that if a member does not have enough skills or knowledge to use the systems, one need to provide training instead of changing the system. These answers were expected because the cost of giving one person training is obviously cheaper than implement new tools and teach all of the people within the team. Already in

2000 Biggs wrote about the importance of educating the members of virtual teams in order to work effective and efficient.

Our final question to the respondents was whether they consider themselves to adapt the technology to the people or the people to the technology. Mr. Högberg stated that technology adaptation is a combination of ICT and people. Mr. Lindquist join this idea by explaining that it is important to teach the employees how the systems work but IBM as a leader in this area spend a great amount of money each year on research and development which could be thought of as a way to adapt the technology to the people. Mr. Österlund also believes that it is a combination but they prefer to provide training than to change the ICT. At IBM, they would rather change the person than the ICT if something is not working. However Mr. Leksell states that there should not be any individual preferences when it comes to technology adaptation. He rather believes that the people should be adapted to the technology, and that there should not be any resistance to ICT due to not wanting to learn.

Even though this seems to be an important aspect of virtual team work, because of all the emphasis on training and education, the authors believe that this is not a major trigger for technology adaptation. Earlier the authors mentioned in this report were that former projects had started off using complex tools and systems which they had to change towards easier systems eventually. This gives an understanding till why our respondent emphasise the ease of use for the ICT.

## **5.7 Main Trigger**

Finding one main trigger became quite difficult after this analysis since companies have different needs, structures and prioritisation. However a distinction between larger companies (more than 15 000 employees) and the smaller was found and a main trigger for small and large organisations was decided.

### **5.7.1 Small organisations**

Lipnack and Stamps (1997) believe that in the initial state there were only internal triggers affecting the choice of technology. The authors believe that this is true and can be applied for large organisations like IBM and Sogeti, but the authors have a different view regarding smaller organisations. The smaller companies which in this case would be Skye AB, Konsberg and Calm Sea AB expressed the importance of the ease of technology used. Accordingly, the largest trigger within these companies was the ICT Inadequacy. Smaller companies like these will have smaller budgets and less space for errors. The structure of these companies is also much less complex than in the larger companies. This means that they do not have any formal restrictions or regulations of what tools or systems to use. It opens up a possibility to choose from a wider supply of tools but the risk of breakdowns and security also increases.

We earlier mentioned ICT KSA inadequacy to be the largest trigger because in previous researched literature it seemed like they started off with one system that was left, because leaders and managers did not know how to use it and then implemented easier tools to use.

Smaller companies obviously have fewer routines about recovery and usually no safety net if something goes wrong. This is not surprisingly increasing the fear of breakdowns and the importance of crude systems becomes understandable.

ICT is as noted many times in this study is one of the major corner stones in a virtual team. One could consider this to be the largest trigger by far; however the fact that the ICT is working is vital for a team and is not a part of the considerations in this study. Merely this study is trying to figure out what makes a leader take the actions to adapt the technologies within a team. Larger companies usually have some restrictions of guidelines for what ICT to use and ineffectively used ICT is not affecting them as much as these smaller companies.

If a system has availability issues, not enough capacity or interoperability it is much easier for a less complex company to exchange the ICT than if one are to go in and change restrictions and guidelines for what could be thousands employees. Larger organisations often have standardised platforms and intranets which they at times not even control themselves because it is outsourced for example. This makes it difficult to create customized tools and this is why smaller companies more often act upon problem like ICT missing features or tools.

The lack of resources is another aspect that might make the ICT effectiveness more critical to smaller companies. One would prefer to change and ineffective system before breakdown to avoid the costs of rebuilding this system. Smaller companies rarely choose to outsourcing because they are specialised in their specific area. Since all companies participating in this study are IT focused, one can consider them to be experts within the field which will give them the capability and interest in exchanging ineffective ICT.

### **5.7.2 Large organisations**

The larger organisations the authors interviewed were IBM and Sogeti. The authors believe that the main trigger for larger organisations like these is the “Internal Constraints”. The reason why the authors conceive this trigger to be the most important for large organisations is that having a huge organisation like IBM or Sogeti, effective leadership is vital in order for the organisation to function. The authors think that internal constraints like dispersion, team size and demographics have greater effect on large organisations than small organisations simply because they are more people to have in consideration. The more employees that are part of an organisation, the more rules and regulations are needed in order for the teams to work effectively.

Dispersion is a key issue when having virtual teams within organisations like these. The dispersion differs greatly between these two organisations, but the fact that not being able to be at the same place is shared. The authors believe that the dispersion of the teams affect the choice of ICT within these organisations because of the wide spread of employees they have. Some employees might be situated in are of the world where there is a less developed internet connection or IT environment over all. This makes the choice of ICT for team leaders more difficult.

Dispersion between employees also mean that they can be situated in different parts of the world and therefore in another time zone. Virtual team leaders have to manage their teams and the ICT in a way that work can be done. The authors believe that regular communication is the key for a virtual team to be successful, and working within different time zones makes this challenging.

The team size is another important aspect that team leaders within these organisations have to have in consideration. The authors believe that having a large organisation does not necessarily mean having larger teams working together, but it is more likely. Deciding how many people need to be in each team is an essential part of making an effective virtual team. The two large organisations we interviewed had different opinions on how many

should be in each team, but both agree on that long-term virtual teams work better with fewer members in the team. The authors believe that ICT leaders have to adjust the ICT to the team size in the sense that the more employees that are part of a team the simpler ICT can be used due to the fact that less communication can be done.

The authors believe that the virtual team sizes should not differ from a traditional team size. A traditional team can only have a certain amount of people as well in order to function efficiently. Having a virtual team merged together through ICT makes this process more difficult.

The last aspect that affects the team leaders' decision is the demographics of these organisations. The authors regard the diversity or multiculturalism the main obstacle for team leaders to have in consideration. Gido and Clemets (2011) believe it is of great importance to learn and understand customs and cultures for team members, especially when it comes to global project teams. The authors believe that this is of great importance in order to achieve efficient teamwork. IBM has a great solution to this with their intelligence system, customized just for this specific area. Pearlson and Saunders (2009) suggested that diversity can lead to more creative solutions, but virtual teams within these organisations can be composed of people from all over the world, which mean numerous different cultural differences.

Team leaders of virtual teams have to consider the cultural differences and preferences in order to make the virtual teams work. Not being able to talk face-to-face can lead various misunderstandings within the teams and choosing a medium that fits everyone is a challenge. Shachaf (2007) suggest using chat enables workers to use a forum for informal and spontaneous communication. Shachaf also believe it is easier to overcome cultural and language barriers when using e-mails and chatting. Mr. Lindquist explained during our interview that IBM has employees with disabilities within the organisations. The authors conclude that larger organisations are more likely to have a higher rate of disable people. A disability like deafness or blindness triggers team leaders to choose an ICT tool or medium that is manageable for the particular disability.

## **5.8 New trigger analysis**

The authors believe that the Five Trigger Model is a thorough and well thought-out model which incorporates the most vital triggers for team leaders in virtual teams. However, the authors regard some new sub-dimensions could be added to the model. The authors suggest a sub-dimension to the external constraints, that covers changes in organisational structure and/or changes in the organisation in general can be added. With this sub-dimension the model can incorporate changes that are made and see how these triggers virtual team leaders in the long-run. Mergers and acquisitions might force existing virtual teams to change in terms of ICT usage. This sub-division is not possible something frequently happening in virtual teams although when an organisational restructure is happening, it will have a great impact on the virtual teams.

Another sub-dimension the authors thought can be added is concerning other organisations in the business environment. This will also extend the external constraints approach. The authors believe that organisations, especially smaller organisations, look at how other organisations use ICT and how they work in virtual teams. The authors believe that successful organisations are often imitated by smaller organisations. Although this is quite common in most markets, it is a dangerous trigger. When imitating others it is usually difficult to make sure that the systems meet the needs for your organisation. Although

The cost of using some systems is one other thing that can affect the technology adaptation. This would be an extension to the ICT inadequacy. If an old system becomes too expensive to use, this will trigger the leader to change to a more cost effective solution. This is quite common if one has used the same system for quite a while and one has not thought of evaluating the cost of running the system. In the rapid evolution of information technologies, new cost efficient solutions are coming continuously. One should take into consideration that the analysis of the company and researching for new solutions is a cost as well and the cost of running the system should be outstanding for this trigger to be considered.

## 6 Conclusions

This report has studied different aspects of what possibly could trigger a virtual team leader to adapt the use of technology within an IT project. The focus on IT came from the thoughts that those should be the ones with most expertise when it comes to what technology to use. A five trigger model was found in the literature search and it became the base for this study. The main purpose became to find out which trigger is the most important in today's rapidly changing environment.

The five trigger model has five different approaches that can lead to technology adaptation. These are external constraints that include things like budget, time and governmental legislations. Internal constraints is the second one and include diversity, number of people and composition of teams. The third is ICT inadequacy and is concerned with lack of ICT knowledge and inefficient use of ICT. Trust and relationship inadequacy covers a personal level such as communication not working, team conflicts and trust issues. The final approach is called ICT KSA inadequacy and focuses on the inability of team members to use ICT in an efficient and effective way.

Four interviews with different sized companies were performed in order to try establishing what the most important trigger was. The triggers vary a bit depending on the size and structure of the company. For large companies with a more complex the most critical trigger is internal constraints. This mainly because of the dispersion that often comes with larger organisations and there are numerous employees to take into consideration. For smaller less complex organisations, the ICT inadequacy trigger is thought to have greatest impact. The authors believe that smaller companies are more dependent on efficient and effective systems and they usually have less backup if something goes wrong.

The trust and relationship- and ICT KSA inadequacy is clearly the two triggers that influence technology adaptation the least. All the companies agreed that instead of changing technology one should build relations the same way as in traditional teams. If the proper knowledge and skills are possessed it is better to teach the requirements rather than changing the system.

Another part of this study was to search for additional triggers that could complement the existing five trigger model. Although the authors believed that the model already covered most areas around virtual teams, some extensions were established. Organisational restructuring is the first one and would be a sub-dimension to external constraints. This one concerns restructurings within the company and those kinds of changes can surely trigger a leader to technology intervention. Secondly and also a part of the external constraints is the imitation in which the leader gets triggered by another organisation that is using a system successfully. Thirdly, systems cost would be a sub-dimension to the ICT inadequacy. In this approach the cost of using a system becomes too high for the company and that will trigger the leader to adaptation.

### 6.1 Reflection on the research process

The purpose of the study was to investigate what different aspects could influence a virtual team leader when choosing and/or changing the ICT within a project. The authors conceive that a satisfactory result was achieved. The results collected were reasonable and the research questions were answered in an acceptable way. The study made was under a quite short time-limit which made the authors limit the size of the research and the amount of data collected.

The answers received were mixed in the sense that some were expected and some were surprising. The data collected from the interviews were good, however the study would have been more efficient if the authors could have interviewed more people. The reason for not having additional interviewees has been mentioned before, lack of time and difficulties finding people willing to participate in an interview. The authors believe were many organisations that in fact work in virtual teams, but are not familiar with the definition. Retrospectively, a better explanation from the authors when contacting organisations could have led to more respondents.

The authors wanted to use both interviews and questionnaires in order to use triangulation but due to the time limit and respondents issue this was not possible. The authors made a self-administered, delivery and collection questionnaire which was meant to be distributed to the employees of the virtual team managers we interviewed. This would have beneficial in order to assure reliability and validity.

## **6.2 Suggestions for future research**

Some guidelines for future research have been established. First of all there could be interesting in seeing the evolution of the trigger from a longer timeline. So using cases studies and see what triggered leaders to technology adaptation for example ten years ago, and what are the difference between these triggers and the ones found today. This could enable an understanding of the triggers, help establish new triggers and maybe help to predict what could triggers leaders in the future.

It could also be interesting to do this study from a team member perspective. Although the team members are not the ones making the decisions about technology adaptation they might have thoughts and ideas about why technology is changed or updated. Comparing the team member and leader perspectives would be beneficial to establish the leaders' communication to the team members

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## **8 Appendix**

### **8.1 Interview**

#### **QUESTIONS TO THE PERSON:**

How many years have you worked within the company?

#### **GENERAL ABOUT VIRTUAL TEAMS**

1. How would you define a Virtual Team?
2. How long have you been working in Virtual Teams?
3. How many people work in each team?
4. Positive aspects with working in a Virtual Team?
5. Negative aspects with working in a Virtual Team?
6. Do you believe it would be better or more efficient to work in a traditional team? In what way?
7. How well do you think the exchange of information works?
8. The technology is under constant improvement or change, how do you follow the development of new programs/updates? Could you give an example?
9. What kind of ICT do you use? What factors influenced this decision?
10. When did you last update or change ICT? Could you explain why?
11. Do you have a plan/strategy for which technology that is supposed to be used in a project?

#### **EXTERNAL CONSTRAINTS**

1. Does time and budget influence your choice of ICT in a Virtual Team Project?
2. How do you convey your organizational policy to the group members of a virtual team?
3. How do upper management influence the work within a Virtual Team project?

#### **INTERNAL CONSTRAINTS**

1. How can you manage the communication so that it works as effective as possible?
2. How do you cope with demographical barriers like culture, age and experience?

#### **ICT INADEQUACY**

1. How do you make sure that ICT is used as effectively as possible?
2. How do you ensure that the members have enough competencies to use your system and mediums?

**TRUST & RELATIONSHIP INADEQUACY**

1. Can communication problems between members affect the choice of ICT?
2. How do you solve conflicts between members?
3. Can ICT be used to rebuild a damaged relationship between two or more members?

**ICT KSA INADEQUACY**

1. What would you do if you notice that members do not know how systems are used in the best way?
2. Do you adapt the technology according to the employees or the employees to the technology?