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Understanding IT Usage

- A case study of SKF Nova's Juno project

Abstract

IT-applications that do not come to use is a big problem for companies and organisations. This thesis has been looking on how to support the utilisation process in the establishing of new IT-applications. I have used deep-interviews and literature studies to collect the data. The Technology Acceptance Model (TAM) has been used as a theory model. As case for the study I have used an IT-tool called Juno, developed by SKF Nova, mainly for SKF Service. Through the results of the studies of Juno and with help from TAM I have presented some general conclusions about what can be done to raise the utilisation of IT-applications. External variables developed during the evolution of TAM has been proven useful in the analysis of collected data from interviews in order to determine perceived usefulness and perceived ease-of-use. Management support is one external variable that have been proven to have a big influence to whether an IT-application become accepted and used or not.

Keywords: TAM, acceptance, utilisation, IT usage

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Master Thesis, 20 p

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Göteborg, 4th of June 2004

A handwritten signature in blue ink, appearing to read 'Martin Öhlén', with a long horizontal flourish extending to the right.

Martin Öhlén

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INTRODUCTION

Today computers and the use of them have become more and more important. Computers are part of people's everyday life in a way that they were not only 10-15 years ago. Which demands does this place on the development of new IT-tools? To develop new software is not just to create its functionality. There are a lot of different aspects that influence development. One of today's big challenges is to create IT-applications that people feel useful and easy to use. IT-applications, no matter how good they seem to be, are not worth much for the organisation if they do not become utilised. Software development is costly and time-consuming. The pressure from the associated management, to develop the software quickly and cost-effectively, can sometime lead up to a lessened priority regarding the soft aspects of the process, such as getting organisational acceptance. The development of new IT-applications is often connected to an organisational change, a change in the way to do things. Change is because of the human nature often met by scepticism and fear. Because of this and other effects change has an inherent inertia.

Predicting and explaining system use would have great practical value, both for vendors who would like to assess user demand for new design ideas, and for information systems manager within user organisations who would like to evaluate existing software solutions (Davis 1989). Davis continued to work with that thought and came up with the Technology Acceptance Model (TAM), which is the theory I have worked with in this thesis. TAM was originally made for use on quantitative studies, but this thesis has used TAM as theoretical framework in a qualitative study. To use TAM in this way has been a challenge because not many have done it before and it has therefore been interesting to see how it worked to use TAM with qualitative data. In an investigation of how TAM has developed during the last 18 years, 101 articles published by leading IS¹ journals and conferences were studied. Only three of the 101 articles used a qualitative method.

This thesis has tried to focus on how to support the utilisation process in the establishing of new IT-applications. I have used deep-interviews and literature studies to collect the data. As case for the study I had an IT-tool called Juno, developed by SKF Nova mainly for SKF Service. SKF Nova gave me an opportunity to perform a Master's Thesis under their supervision and with Juno as a Case. A part of the problem was to formulate the question, therefore the first interviews I had was with people that trough their experience could help me to get the input to formulate the question. It is a wide problem area and it has not been easy to formulate on question that contains the ingredients that the case has given me. But the question that I formulated and has tried to solve is: "What can be done to raise the utilisation of IT-applications?"

Even if I have worked at SKF I have tried to have a greater perspective than only the SKF organisation. The fact that the number of end-users available to interview has been so small has of course been a limitation. The number may have been bigger if I had chosen to communicate with all potential users. Now I made the limitation to only talk with people that have tested Juno or in other ways have influenced on Juno's development. This thesis has been done by me alone, which affected the extent of the work due to the limitations in time available.

¹ Information System

Previous research

TAM is the most widely applied theoretical model in the IS field (Lee et al 2003) which mean that very many different researches has been done with TAM as theoretical model. Due to that the theory is so widely applied there are very many different articles written with makes the search for research applicable to my work hard. Here under is an example of how TAM has been applied through three different researches in different areas.

Igbaria et al wrote in 1997 an article named: Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model. That article used TAM as theoretical basis for a pragmatic explanation of key factors affecting personal computing acceptance in small firms. A quantitative study on 358 users was done where intra organisational factors, extra organisational factors, perceived ease of use, perceived usefulness and personal computing acceptance where examined for potential relationships. The results indicated on different variables influenced, particularly management support and external support.

In 2000 Liao & Landery wrote an article for the Hawaii International Conference on System Sciences named: An Empirical Study on Organizational Acceptance of New Informations Systems in a Commercial Bank Environment. The study examined the acceptance of new information systems in commercial bank environments. The modified TAM model was used to examine organizational acceptance, different kinds of satisfaction, perceived usefulness and perceived ease-of-use. The report find that perceived usefulness was a more important determinant on IT acceptance than perceived ease-of-use. The data was collected in a quantitative way where 80 employees were asked. As previous research, the responses indicated that management support is very important for IT success.

Understanding Information Technology Usage: A Test of Competing Models was the title of one of Taylor & Todd's article in 1995 where TAM and two variations of the Theory of Planned Behaviour were compared to assess which model best helps to understand usage of information technology. The study used quantitative data from 786 potential users of a computer resource centre. Behaviour data was collected from 3780 visits to a resource centre over a 12-week period. Theory of Planned Behaviour provided a fuller understanding of behavioural intention by focusing on both design and implementation strategies. The article draws attention to normative and control factors that an organization can work with to facilitate implementations. Those facilitating conditions that the article brings up have been used in several works after that and is one of those external variables of TAM that I will work with later in this thesis.

Report Structure

This report has four major parts. It begins with the method chapter which describes how I have done this work and what choices I have made in terms of scientific perspectives. The next chapter is about the Technology Acceptance Model (TAM), background, descriptions on its contents and its evolution over years when external variables have been added. A short chapter describes the case, Juno, which I have been working with. Thereafter the results chapter retell the results of the interviews that I had. The results are catalogued after the external variables that I found were connected during the data analysis. The discussion uses the external variables to discuss the perceived usefulness and perceived ease-of-use. Perceived usefulness and perceived ease-of-use together with external variables affects the process from usage intention to usage. Finally a summarisation is made over the discussion and conclusions are made.

METHOD

There are many ways to define and solve a problem. Depending on the problem at hand, there are many different methods to choose from. In this part I will try to show different methods to use and which one I have decided to use and why.

Scientific perspective

There are two main views in the philosophy of research design, positivism and phenomenology. I will try to describe them and then motivate my own choice of view.

Positivism

The positivistic idea is that the world exists externally, and that its properties should be measured through objective methods, rather than being inferred subjectively through sensation, reflection or intuition determined (Easterby-Smith et al, 1991). The positivistic idea is good when you work with investigation of human and social behaviour originated as a reaction to metaphysical speculation (Aiken, 1956), or to describe the progress of scientific discoveries in practice, rather than how they are subsequently reconstructed within textbooks and academic journals (Kuhn, 1962). Auguste Comte was one of the early proponents of this view and he said: "... there can be no real knowledge but that which is based on observed facts" (Easterby-Smith et al, 1991).

Phenomenology

The phenomenological idea is that reality is socially constructed rather than objectively determined (Easterby-Smith et al, 1991). This view has grown as a reaction to the application of positivism to the social sciences. The view also says that the stance that the world and 'reality' are not objective and exterior, but they are socially constructed and have been given meaning by people (Husserl, 1946). In social science it is more important to appreciate the different constructions and meaning that people place upon their experience rather than to gather facts and measure how often certain patterns occur. To understand and explain why people have different experiences instead of searching for external causes and fundamental laws to explain their behaviour (Easterby-Smith et al, 1991).

Conclusion

The case, which I mean to study, involves organisations and people. That is typical social science, for which Easterby-Smith et al shows the weakness in the positivistic view. I believe that I as a scientist can not be totally objective in my point of view neither for the input from people I study or from the background I have and the culture that I am a part of. My philosophy of research design is therefore very likely to conform to the phenomenology view.

Collection of Data

The study that has been conducted for this thesis has involved literature review, a conference about user-friendliness and fourteen interviews. Through the fact that I have been doing my work at SKF Nova and because they are the ones who developed Juno, the tool I will study, there has been some ethnographic studies of the environment at SKF Nova.

Quantitative versus qualitative methods

There are generally two different methods for tackling a problem, qualitative methods and quantitative methods. The two methods give different results that are appropriate for different problems and situations. The qualitative method is more interested in the individual. Instead of asking what an objective reality looks like it asks the individual how she translates and looks on her reality (Backman, 1998). Qualitative method uses qualitative information like interviews, document analysis and observations.

Questions like whom, how, in what way and why are often used in the qualitative methods (ibid). Quantitative methods use measurement, quantified by mathematics and statistics. They are a result of a numerical observation on which the researcher normally performs a statistical analysis. Questions like how much, how many and how often are commonly used in quantitative methods. (Gottling & Torgnydotter 2002)

With the phenomenological idea as the one closest to my view of science, the qualitative approach and method is the one that I chose to use doing this work. This because that both the phenomenological view and the qualitative method helping to understand the social and individual aspects of the reality. The range of potential interviewees for my study was very small which made a quantitative study impossible to perform.

Literature review

The literature review should give a summary of and a background to the collected knowledge in the area. This will help the author to formulate the problem or to prove the importance of the problem that has been given. The review is also an important tool to show the historical perspective of a problem and to help understand the future. A literature review is also able to give the author different alternatives to parse a problem.

There are some that think that literature reviews are no good in qualitative studies because of the impact the literature has on the researcher. There is a risk that the researcher cannot see beyond previous studies and that he or she because of that reinforces the stereotypes and prejudice that already exists. Some say that a researcher should be set to zero when he goes in to a new project. Other says that some literature review is good to familiarise oneself with the situation (Backman 1998).

I have used literature review to get a perspective on what has been done earlier in the research area. The time I was given and my previous knowledge of the area was not sufficient to avoid the literature review. I do not believe that the risk that I should be influenced in a bad way by the studies is greater than the risk of being badly

influenced by anything else in this research. I hope that my integrity is big enough to overcome this kind of problems.

The practical literature review for this study started after finding out what the study was about. My tutor at the university presented an article about the Technology Acceptance Model (TAM) (Davis 1989) and another article that described the development of TAM during the years that have passed since the inception of the theory (Lee et al 2003). Lee et al's article "The Technology Acceptance model: Past Present, and future" made the fundament for further studies of TAM with its declaration of different studies that have been made and what they have accord to. Lee et al presented a good overview of the extensions to TAM. By following the references I soon found myself overwhelmed with material. The next step was to sort through the material. This culling was done after the understanding of the case that I had at the time. I read the abstract from most of the articles, so that I could go back in the material, if I found it necessary.

Interviews

When it was time to start working with interviews I chose to use in depth interviews performed in a semi-structured way (Easterby-Smith et al, 1991). The semi-structured way to do interviews is to ask open questions and follow up with more questions to make sure that the information was correctly understood. I did not want to limit the interviewees by asking too structured questions, but sought to encourage free reasoning. When doing the interviews I wanted to build on what came up in as good a way as possible. Therefore I almost did not have any question template, only some subjects that I wanted to take up in one way or another. I think this worked pretty well when I carried through the interviews. The people I talked with were good at talking freely. Often small questions were enough to get the interviewee on track.

The interviews were done in two months of Mars and April when I interviewed 14 people from three major areas: SKF IT-management, SKF Nova and SKF Machine Service see table 1. With the goal to get as good a picture of the problem as possible I looked on the problem from three different directions. I talked with SKF IT-management about general problems and conclusions they have made over years about IT-development and establishing of IT-tools. SKF Machine Service was thought about as users of the Juno project. They have their opinion about what happened and what the problem has been. Some of them have tested the demo version of Juno and they shared their opinion about the functionality and how it is to work with. The third and last group that I talked to was the people on SKF Nova, the department where I am doing my thesis. They are the people who have developed the Juno Concept and are marketing it. I also talked with people who have worked on similar projects at SKF Nova, about their experience. The interviews at SKF IT-management and some of the interviews at SKF Nova was not directly connected to the problem that I had but was to help finding the problem and familiarize myself with the company.

**Table 1 – List of the interviewees background
IT Management**

Company	Reason for interview
SKF/eBITS	Manager of an important influence group in SKF with big experience
SKF/eBITS	Recommended to talk with from the Manager of eBITS about the questions I had
EDS/ITAC	Chairman of the IT Architecture Committee (ITAC) employed by EDS who SKF has outsourced their IT-department to
SKF/ITAC	My tutors at SKF Nova recommended me to talk with this person because of his experience and involvement in ITAC
EDS	Has worked a lot with SKF through EDS and have much experience from software development and the problems around it
SKF Machine Service & other directly involved with Juno	
Company	Reason for interview
SKF Service	Key tester and part of the discussions around Juno, is the one that has been working most with Juno
SKF Service	Manager of the group of machine analysts for which Juno was developed
John Crane AB	Former member of the machine analysis group who was a part of the discussions that formed Juno at the beginning of the project
SKF Denmark	Salesman for WindCon who has experience of the Juno case
SKF Nova	
Company	Reason for interview
SKF Nova	Project leader of the Juno project and my tutor at SKF Nova.
SKF Nova	Part of the Condition Monitoring project that preceded Juno. One of the founders of the Juno concept and my tutor at SKF Nova
SKF Nova	Worked a year ago with a project in the same area as my thesis
SKF Nova	Has for over a year worked with a software project that is almost ready to rollout. We talked about his experience of that project and other projects
SKF Nova	Developer of Juno, has been a part of the team around Juno for a long time

The interviews lasted between 20 and 75 minutes. I recorded all interviews and afterwards transcribed it all. The transcription took a lot of time but the documents were very helpful during the rest of the work. The interviews and transcription were done in Swedish. Quotations that I used from the interviews have been translated to English with the goal to catch the meaning of what the interviewee said. Some interpretation was sometimes necessary in order to catch that meaning in English.

Conference about user-friendliness

The 20th of April I was in Stockholm for, what the organisers' referred to as, "Users' day". Organisers of the conference was KTH/CID², VINNOVA³ and LO⁴. Focus for the conference was on what users see as good IT-solutions.

The Users day was split in two parts. In the morning the finalists in this year Users Award presented their contributions. The Users Award is an award to which the users can nominate IT-applications that they use and think is so good that they should be awarded. In the afternoon there were seminars about how users and purchasers influence can contribute to good IT-solutions in the workplace of the future. The seminars also talked about the consequences of IT-use in the work place.

The seminars were very interesting. Even if they maybe did not connect directly to the study that I was doing, they were in the same area of interest and confirmed some of the thoughts that I had about what it is that affect people whether to utilise a IT-application or not..

Data analysis

Easterby-Smith et al. (1991) suggest a method for analysing in-depth interviews. In this theory the researcher goes by feel and intuition, aiming to produce common or contradictory themes and patterns from the data, which can be used as a basis for interpretation. In contrast to quantitative research, the structure used for the analysis first can be derived from the data, which means systematic analysis in order to find themes, patterns, and categories (Hanefors & Undemar, 2001). I chose to use the external variables of TAM as the structure for which I managed the data analysis. Easterby-Smith et al. show a seven-stage model for such analysis:

- *Familiarisation*. When re-reading the interviews you may see new aspects and notice interesting things. The stage is essentially exploratory, where questions begin to be framed.
- *Reflection*. A process of evaluation and critique becomes more evident as the data is evaluated in the light of previous research, academic texts and common sense explanations. Cataloguing is important here so that previous research can be considered and evaluated.
- *Conceptualisation*. At this stage there is usually a set of concepts or variables, which seem to be important for understanding what is going on. The researcher may well come across more concepts which were previously missed, and these can be added to the list.
- *Cataloguing concepts*. Once it is established that the concepts identified do seem to occur in people's explanations, they can be transferred onto cards as a quick reference guide.
- *Recording*. When all the references are known, it will be possible to go back quickly and easily to those places in the data to see what was actually said.
- *Linking*. At this stage the analytical frameworks become clearer. Hypothesis can be based on the evidence, which has been gathered and organised.

² KTH = Royal Institute of Technology, CID = Centre for User Oriented IT Design

³ Swedish Agency for Innovation Systems

⁴ The Swedish Trade Union Confederation

- *Re-evaluation.* In the light of the comments of others, the researcher may feel that more work is needed in some areas. This stage may go on for a considerable period of time.

After the interviews were finished and I had transcribed them, I started to look through them again to familiarise myself with the text. While I read and reflected through the text I marked the pieces of the text that I felt was useful and moved to another document. I had good help from the external variables of TAM when doing the conceptualisation stage. In the theory chapter I will describe those external variables of TAM that I found able to connect with my data. When I had read through all interviews and had moved all potential useful pieces to other documents I started to bring the different documents together and put the quotations under different headers that I had got from the conceptualisation. I worked a lot with the cataloguing of the concepts to get them placed under correct headers. The catalogued document was then used when I wrote the results chapter of this thesis.

Validity and Reliability

Validity and reliability was originally used in quantitative science, and in that approach there is a number of different methods to assess both validity and reliability (Easterby-Smith et al., 1991). These concepts are harder to use within qualitative research, since the phenomenology view does not view the world as absolute and objective. The question you might ask for validity is "Has the researcher gained full access to the knowledge and meanings of informants?" The corresponding question for reliability is: "will similar observations be made by different researchers on different occasions?"

A possible problem for the validity of this research is that I have been given the task from SKF and have been working at SKF. There is a potential for subjectivity from my side because of that. Hopefully I am aware of the risk and able to keep a distance. My tutors at SKF are both deeply involved in Juno, the case I have studied. Everything they say and the discussions we have about Juno is somewhat coloured by their involvement, most likely this also affected me in my research.

When it comes to the interviews there are things that may have affected the validity and reliability of the research; the selection of people is one, questions that I did or not did ask another. The selection of people to talk to is always questionable, but it is also unclear if you ever will be able to tell whether it was the correct selection or not. For this work it may have been interesting if I had been able to talk with some of the customers who were supposed to work with Juno. During the interviews there was only the interviewee and myself. There is a risk that I missed some things that the interviewee said or that the interviewee answered another question but the one that I asked. To my assistance I had the minidisc, which helped me construct the interviews afterwards.

The Technology Acceptance Model

Introduction to TAM

Fred D. Davis 1986 introduced the Technology Acceptance Model (TAM) in his doctoral dissertation from MIT⁵. In 1989 he publishes an article in MIS Quarterly where his TAM-theory was presented together with a case study using the theory. After the introduction TAM has been the most widely applied theoretical model in the IS field (Lee et al 2003).

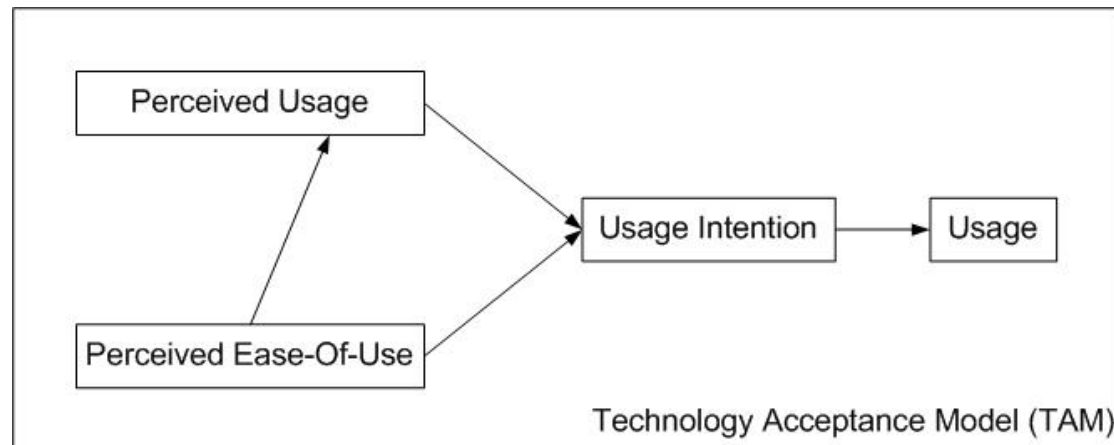


Figure 1: TAM – Technology Acceptance Model (Davis 1989)

TAM builds on two main components: Perceived Usefulness and Perceived Ease-of-use. These together affect the Intention to Use, which anticipates the Usage (see Figure 1). There are also a lot of different additional variables that are added, during the development of the model, to validate the acceptance of a system.

Perceived usefulness (PU)

PU is defined as: "the extent to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989, p. 320). Venkatesh and Davis say that PU consistently has been a strong determinant of usage intentions (Venkatesh & Davis 2000). Some others describe PU, as believing that the technology will help them perform their job better. PU depends on the extent to which an application contributes to the enhancement of the user's performance (taking less time to accomplish a required task, producing higher quality work products, etc.).

Perceived ease-of-use (PEOU)

PEOU is defined as: "the extent to which a person believes that using a particular system would be free from effort" (Davis 1989, p. 320). PEOU is also described as the effort required by the user to take advantage of the application. Most of the concepts of traditional Human Computer Interaction (HCI) research are applicable on PEOU. The PEOU depends on how easy it is to use a program and how well it interfaces with the users.

⁵ Massachusetts Institute of Technology

Comparison between perceived usefulness and perceived ease-of-use

In both of the studies that Davis performed in 1989, usefulness was significantly more strongly linked to usage than was ease of use. Users are driven to adopt an application primarily because of the functions it performs for them, and secondarily for how easy or hard it is to get the system to perform those functions. No amount of ease of use can compensate for a system that does not perform a useful function. A major conclusion of the study Davis performed was that perceived usefulness has a strong correlation with user acceptance and should not be ignored by those attempting to design or implement successful systems. Davis also suggests that ease of use may be an antecedent to usefulness, rather than a parallel, direct determinant of usage.

TAM Development

TAM has been developed and contributed to by a lot of different articles over the years. In 2000 Viswanath Venkatesh and Fred D. Davis wrote the article "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies" where they presented what they referred to as TAM2. The writers refer to TAM2 as "an advance for the theory and a contribution to the foundation for future research aimed at improving our understanding of user adoption behaviour". In 2003 Communications of the Association for Information Systems (CAIS) presented an article written by Lee, Kozar and Larsen named "The Technology Acceptance Model: Past, Present, and Future". The authors have studied 101 articles published by leading IS journals and conferences to examine and summarise the development of TAM made over the last 18 years.

When the authors of the article studied how TAM had developed they divide the progress into four periods: introduction, validation, extension, and elaboration, as shown in Figure 2.

After the introduction of TAM there was a time of expanded research determining what factors affected users beliefs and attitudes towards the IS acceptance decision. As an output from the expanded research, TAM evolved to "provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified" (Davis et al. 1989 cited in Lee et al. 2003). The focus under the model introduction was to attempt to relocate TAM with other technologies and to compare TAM and its origin, TRA (Theory of Reasoned Action) (Lee et al. 2003).

The second period of TAM evolution was the model validation period, in which researchers made a rigorous validation of their measurement instruments, and initiated validation studies of TAM's original instruments. They investigated whether TAM instruments were powerful, consistent, reliable, and valid and they found these properties to hold (Lee et al. 2003).

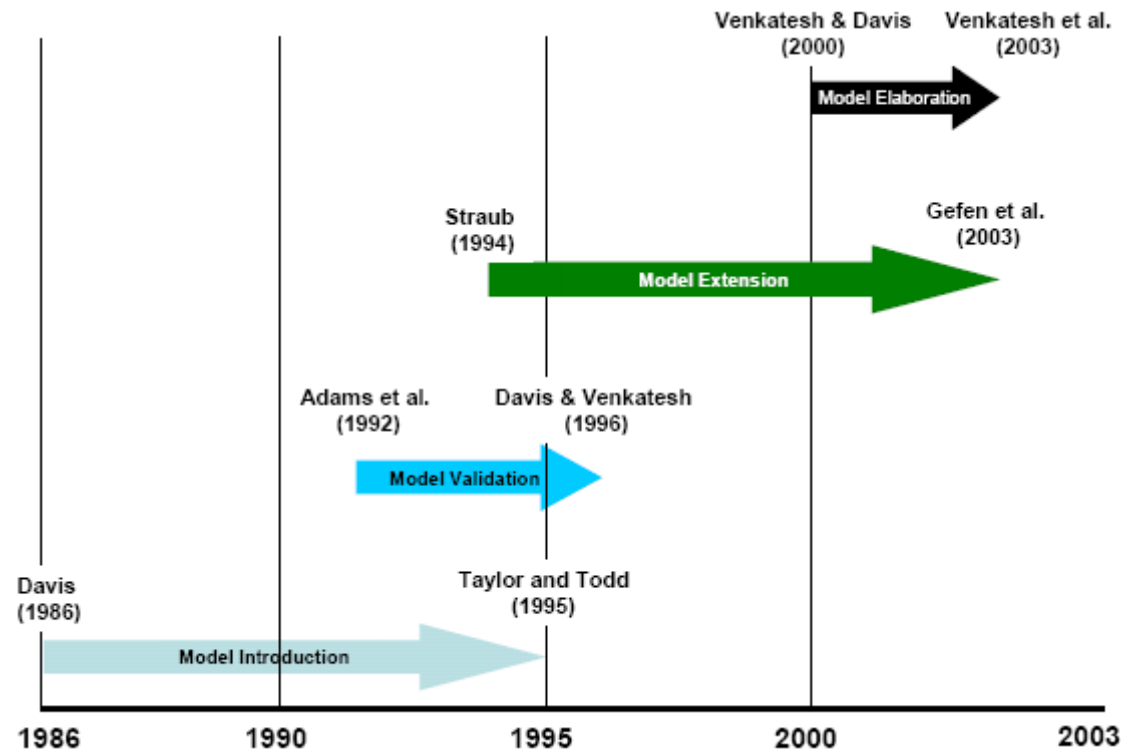


Figure 2: Chronological Progress of TAM Research (Lee et al. 2003)

After validation efforts confirmed the saliency of the measurement instruments, the researchers began to search for external variables of the major TAM elements, PU and PEOU, in an attempt to identify boundary conditions. External variables that came up during this period were training, experience, social influence, computing support, managerial support, etc. Studies during this period developed a “greater understanding (that) may be garnered in expecting the causal relationships among beliefs and their antecedent factors” (Chin & Gopal 1995 cited in Lee et al. 2003).

The last of the four periods is the model elaboration period. In this period the researchers developed the next generation TAM that synthesises the previous effects and resolved the limitations raised by previous studies. In 2000, Venkatesh and Davis introduced TAM2, a new millennium version of the original TAM. It linked up with the previous efforts and clearly defined the external variables of PU and PEOU (Lee et al. 2003).

Development of Tam's external variables

After the introduction of TAM it has been developed by a number of different people that have used the model and added some part. Over time a lot of different aspects have been elucidated. Lee et al (2003) show the different additions and the relationships between the components of the TAM, in an extended TAM diagram, which is shown below in figure 3.

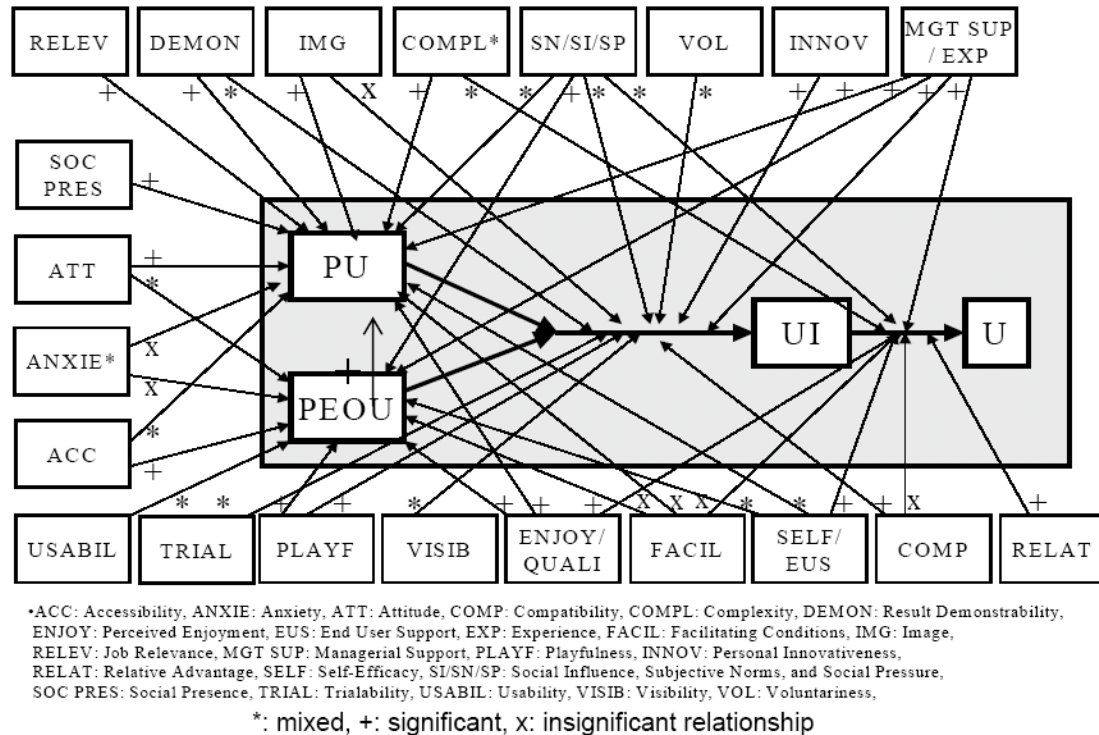


Figure 3: Relationships between External Variables and Major TAM Variables (Lee et al 2003)

In this thesis I have not worked with all these variables but with a subset that I have picked, based on basis from the data that is collected. I have read and studied all of the external variables but I do not use them all therefore I will only describe those variables that I found support for in my interviews during the data analysis.

Relative Advantage, Job Relevance, and System Quality

In the material that I have collected it was very hard to see where the border was between these different variables. The interviewees switched between them as they talked. Therefore I will present the findings from the interviews that are connected with these external variables together. Relative advantage is the degree to which an innovation is perceived as being better than its precursor (Lee et al, 2003) and has been found to have a significant relationship with Usage. Job relevance is the capabilities of a system to enhance an individual's work performance (ibid) and has a significant relationship with perceived usefulness.

System Quality is described as the perception of how well the system performs tasks that match with job goals (Lee et al, 2003). Lee et al. have found that System Quality has a significant relationship with perceived usefulness, perceived ease-of-use, usage intention and usage. System Quality is one of the most used external variables of TAM, the significant relationship that it has been proven to have on all of the original parts of TAM confirms the importance.

Managerial Support

The management support is able to ensure sufficient allocation of resources and acts as a change agent to create a more conducive environment for IS success (Igbaria et al. 1997). Igbaria et al. found Management support to have direct effect on both perceived ease of use and perceived usefulness. A significant indirect effect on usage was also found, mainly through perceived usefulness. In the measure of management support Igbaria et al. refers to the perceived level of general support offered by top management. Individuals were asked to indicate the extent of agreement or management encouragement and allocation of resources. In the discussion Igbaria et al. found that Management support can take a variety of forms such as encouragement to use the system, providing a wider selection of user-friendly software of special use to different jobs, offering educational programs, applying information technology to support a wider variety of business tasks, and encouraging experimentation. Management support is vital according to many models on information systems development, especially when the system is a directive/decision support system (Ericsson & Avdic, 2003).

Prior Experience

To have prior experience and maturity within the area makes it easier to accept new innovations in the area. For an organisation that already is used to utilise IT-tools and has been involved in software projects earlier is it easier to specify demands and through that improve the probability to get an accepted system. Lee et al found that prior experience has a significant effect on perceived usefulness, perceived ease-of-use, usage intention, and usage behaviour.

Facilitating Conditions

Facilitating conditions are defined as; the control beliefs relating to resource factors such as time, money, and IT compatibility issue that may constrain usage (Lee et al, 2003). Relationships have been found towards perceived usefulness, perceived ease-of-use and usage even if they were not significant. According to Taylor & Todd (1995) Harry Triandis published the first definitions of facilitating conditions in an article at Nebraska symposium on motivation 1979. The definition by Taylor et al. was: Facilitating conditions reflects the availability of resources needed to engage in behaviour, such as time, money or other specialised resources (Taylor & Todd, 1995).

The Juno Project

In this master's thesis I have been looking on a project at SKF Nova called Juno. Juno was conceptualised in collaboration with the Machine Service department at SKF Service. Juno has its origins from a business evaluation project of a Condition Monitor (CoMo) service offer, in which it became evident that regardless of the character of the other aspects, a general improvement of the interface of the customer relation, would lift the quality and control of the basic customer relation. The first step proposed was to standardise the communication between customers and SKF. Juno handled the problems of communication and document handling that existed and it was possible to run Juno within the existing organisation. Therefore they decided to start a new project that was directed towards the communication part, which was the start of the Juno project.

The Juno concept has been tested for two years, as a pilot to study what functionalities are needed to create a communication platform between end customers and SKF experts, in order to support the communication between them. The pilot was made as a demo site based on an off-the-shelf software from SuperOffice. The software was adapted to fit in the skf.com environment. Some adjustments of the platform were made to better support the clients needs.

To support the delivery of service reports and other documents through the web to end customers, whose computer literacy may be small, a simple user interface was needed. Juno handles sensitive information and therefore security requirements are high compared to e-mailing. By implementing the concept SKF Nova believes they could serve a large amount of users with a solid environment, see table 2.

Table 2 – Values of Juno as defined by SKF Nova

Customer value	SKF value
<ul style="list-style-type: none">• Self-organising chronological information repository• Data stored in a safe way• Increasing service quality• Quicker support response time• Improved dialogue with SKF experts• Instant access to qualified knowledge• Reduced risk of operational breakdowns• High tech image	<ul style="list-style-type: none">• Increased business safety / backup• Increased safety not to loose business relation if individuals move on• Easier hand-off between colleagues• More effective information search through the system handling of standardised report templates• Increased external/internal quality• Reduced stress• High tech image• Less administration gives more time to spend serving customers• Possibility to increase the personal network• Additional communication channel for individual and directed mass communication

The Juno Concept demo with application status has been extensively used by sales people marketing the WindCon⁶ system to wind park owners and toward OEM⁷ customers. The Juno Concept has been shown together with the WindCon system on four industrial fairs during late 2002 and early 2003. It has been concluded that the Juno Concept appeals to the customers. The next step of the Juno process is to propose how to make it a general communicating alternative and to bring Juno from pilot to a part of the SKF infrastructure, according to SKF Nova.

Due to different circumstances the Juno project is so far not generally utilised today. This thesis will work with this as a case to investigate major hurdles and make an inventory of alternative roadmaps. By learning from this case the thesis will try to derive some experience regarding, and come with some recommendations for, future software projects.

The Machine Service department at SKF Service work with service and condition monitoring of the customers machines. The effect of a broken machine is tremendous for a larger manufacturing company. Therefore regular inspections and measurements of machines are very important. Both the measurement and the following reports create documents that are supposed to be delivered to the customer. When this project started the documents were sent to the customers by ordinary mail. That created a lot of extra work for the employees at SKF Service.

SKF Nova is an interdisciplinary department of SKF that has approximately 25 employees. They are located in Chalmers Science Park and their vision for SKF Nova is according to their homepage: "To be the visionary and highly appreciated partner that identifies and develops opportunities generating value to SKF and its customers". SKF Nova has since many years arranged and supervised a high number of Master Theses. In fact, master theses are part not only of their daily business but also of their culture. They run approximately ten master theses projects every year, which means up to 20 students annually (www.nova.skf.com).

⁶ WindCon is a product for condition monitoring mainly for vibration measurement on wind turbines.

⁷ Original Equipment Manufacturer

RESULTS

This section will account for the results of the interviews. I will use the same classification that I have used doing the analysis of the material, that is the external variables from the article TAM: Past, Present, and future (Lee et al. 2003).

Relative Advantage, Job Relevance & System Quality

The Juno concept has a lot of nice thoughts about how it should be to work in it. But how do the people that are directly involved with the system see it?

The system has two main parts, the communication part and the document repository. Even if the thought was that the two parts should be tighter connected, this was not the case in the pilot platform built on SuperOffice. If we start to look on the communication part, there were several positive aspects that the interviewees pointed at. That there is no need to be accessible at the office, that customers could go to the web page for information and there state their questions. The possibility of fast feedback was another aspect that they put forward, even if one respondent expressed that they did not really know the value of it until they had tested it.

The other part was the document/file repository. The vision was to put all reports in one place to give customers possibility to access it, and to help with version control. When documents started accumulating it was necessary to handle it and to use a binder does not work according to one user.

“I think that it will go smoother for these persons. Every time they create a report or make a note they can save it in the same place. So they know that those who should get access to the files also get it. It saves a lot of time...”

The change from manual handling to electronic and the value that you get from placing all your documents on one place is enough to justify the whole project according to one user. Another user is on the same track when he says that it causes problem that they are hard to reach. They saved a lot of reports in paper format, which generating a lot of administration work.

When I talked with yet another user he mentioned that it is important to see to it that there is something for everyone when implementing a system. Even if systems are mostly geared towards the management, it is important to do something for those who are supposed to provide the system with the information.

“Of course you can always order and control the employees, but it’s much better if you have seen it from everybody’s angle”

It appears that not everybody felt that there was something in it for them. One user is a little ambivalent when I ask how he feels about it. He can see some general advantages but also a lot of threats and burdens. When I asked him if he has enough confidence in and experience of Juno so that he could explain the advantages of Juno to a client he said:

“No I haven’t. I couldn’t explain that for any client. I see it as an ordinary file index where you can get your own server space to save information about your machine park or whatever it is on.”

Further on he told me that he did not want to introduce Juno to the customers when he did not feel confident with the system. He said that when he feels that it is boring and messy to use the system he did not want to introduce something that in his opinion did not work.

“In the beginning it was only a big document area that did a double job. To first put it there, and then go back to the ordinary mail system to notify the customer that the report now is ready to read, instead of just mailing the report direct to the customer. I don’t see any value in it if it is only going to be a file handler. The clients probably have good programs and file handlers of their own. It’s their computer literacy that decides whether they use it or not. If we send them an electronic report then they will print it out. It is how I think that the customers feel, that is how I feel myself sometimes”

One user is also uncertain of the value brought by the system. He had difficulties to see where the value is for the clients and for themselves. He thinks that it was hard to estimate the value of saving things at one place. Today storage is really cheap, so he thinks that that argument is irrelevant. The argument that it only is one original he says is gone because software to protect document is available today.

Another user takes the problem one step further when he starts to think of the customer relationship. He says that the customer relationship is very personal and is afraid to lose it or reduce the relationship through the use of this kind of system. But he also sees potential in it for the customer relationship.

“Wherever we are, the clients may call, and then it’s easy for us to go to the web page and get the reports and measurement data. And when you are with the customers you can get old measurement data and calibrations, do the new measurements and then put it all back again.”

In the discussions that formed the Juno concept, there was a goal to reduce the number of administrative steps. In the test platform they feel it as a rise of the number of administrative steps. To add new customers and build up the whole thing required a lot of work. More than they wanted.

When I talked with the people from machine service they had not fully abandoned the old CoMo project. They still have the functionality from that system before their eyes. This might have affected their view of the functionality of Juno. Often in the middle of a sentence when we talked about Juno and the functionalities of it they came up with some functionality of the old CoMo project that they wanted. They have not fully realised or have forgotten that the CoMo functionality is not going to be a part of Juno.

When I asked different people what they saw as important matters to create quality systems, the classic things were mentioned such as well-defined specifications, good planning and a dedicated project leader who makes the project go forward. Some

talked about milestones/business gates as an important part to get the possibility to re-direct the project or even close it if they see that it does not develop in the way that they hoped. A problem that some had seen in projects developed in SKF was that the focus was limited. To see the company as an entity and to have knowledge of other parts of the company is important.

When it came to how SKF was dealing with software projects some interviewees said that they thought that SKF was slower than other companies.

*“We are persevering when we have decided to run,
but it can take a while to come to that”*

Even if the projects finally finish there is a problem that it takes too long. One user talked about that the delay is very frustrating and that it affects very many other things in the operations, things that not so often are measured when the cost of delayed projects is calculated.

Reorganisations in both SKF Service and SKF Nova have delayed the project. The workload at SKF Service has also made it take more time.

The Juno project has in many ways been an image-project. It is important for SKF to show that they are at the front lines when it comes to IT. To have the ability to sell services that make it possible for customers to login on a web page where they can get their reports and the dialogue they have had with their contact at SKF, is a big opportunity that the salesmen are not late to take advantage of. A problem was that Juno, which the salesmen showed to a lot of customers as if it already was ready to use, in fact was just a pilot.

“The limiting factor was not the clients but SKF. The clients have said that they have needed this tool for a long time, it was many years ago that they almost demanded this functionality from SKF”

Management Support

When I talked to the people from IT Management they all agreed that the management support is very important to make it possible to develop IT-tools that fulfil the demands, fit the organisation and feel good to use. Something they often came back to was the importance of commitment from the stakeholders. One person says that affected business must be committed, the stakeholders need to have the authority to say that this is what we want, we believe in it. The commitment is correlated to the amount of money that the management assigns the project.

“To put in money and look for the resources needed to be assigned to the project, that’s when you can start to measure. Because it creates a pressure, all the way down in all directions. The more undefined it is from higher stages, no matter in what level, the poorer the result gets”

Management support is explained to be especially important in those areas where it gets more complicated. One person says that the attention that the project has from management is a very, very important factor.

According to one interviewee, SKF strives towards more centralisation in IT-projects they are running. But in smaller departments of SKF, the less centralistic the project is the more isolated it becomes. There are fewer stakeholders involved and often the sizes of the projects are smaller. The interviewee says that it is important to keep the projects small so that you can have short lead-time and good management.

When I asked the manager of the machine analysis group if he felt that they got the resources they needed to go forward with the Juno project he said no, but he saw that the personnel enjoyed working with those things. It brings new thinking and innovation and that was important too.

The machine analysts have a very tight schedule, which I felt too when I tried to get an appointment to meet one specific person. It was very hard to find a time that was convenient for him. When I asked him about the time aspect in the development of Juno he said:

“We got a lot of work to do and unfortunately there is no time to take an active part in that. We got to do our daily work. But if there was time disposed by our management, then it could have been much better. If this was a big success or if we could connect our clients closer, maybe more time would be disposed. But as I said, you only have your free time to work with these things.”

The lack of time had influence on their view of Juno. As one user saw it, it was a burden that took time.

“We get a heavier work load because it is not provided any extra time to work with it. It’s that, there’s no priority on it. If you don’t feel that you get something back, because you always need to get income to our department it becomes another burden and then you’d rather take another job”

When I asked if there was anything that he should have done differently if he had been in the management he said that if he thought that this was a good thing he would have pushed it. Also, another user knows that the lack of time is a big part of the problem.

“We should have created an incentive, an authority so that other could work with the project. If it is not clear from the management that they want to work in this way, then machine analysts will only take what time there is left to improve their work situation.”

Earlier I heard that it was very important to have a strong commitment from the stakeholders. I asked one person who the stakeholders for Juno were but he could not answer. He said that it “has ended up in limbs”. The same thing happened when I asked another person who the owner of Juno is. It is not clear who owns it; the head of SKF Service, gave the ownership to a manager at Nåiden, a company in the service section bought by SKF.

“In principle the head of SKF Service is still the owner, but formally it’s the manager from Nåiden who owns it. But there are some obscurities that are based in some mail where someone had made a lot of carbon copies (cc) to different people and said, “now the manager from Nåiden is taking care of this”. Nothing’s happened since then.”

Prior Experience

I came to talk with one person about the effect of prior experience and he said that introducing new IT-tools for an organisation that have used IT-tools for some years is easier and the result will be much better. The organisation is used to handle the IT-organisation. They know how to specify their demands and they know what obstacles that may appear. Those that have not used IT-tools earlier have a more difficult situation. They do not know how to specify their demands and the IT-organisation does not know which questions to raise. The suppliers need to be observant of these problems and will have to try navigating to the best of their ability.

Even when it comes to the personal ability to start using a new IT-tool, prior experience is important. One person explained how he sees his group of people when it comes to use Juno.

“Everybody here is relatively stereotypic; you get used to an instrument to use. That is the one you work with. Ok, next generation will have much easier to adopt new things. It is a maturity process too. There were no computers when I started working here.”

For the customers that accept the process, with document management, the attitude to the web interface is positive. But those customers that do not will be hard to sell to, according to one person. Previous experience and computer literacy is important for acceptance. H does not believe that there will be any problem for the machine analysts to work with this. It is no harder to create a PDF than to just print it out and send it by mail.

Facilitating Conditions

Every project is directed through the money and resources that it receives. I talked with the interviewees about their experiences of running projects and especially the final phase of the projects. The general custom at SKF is that the projects are not charged with the staff cost of a rollout. The organisations that are to receive the new innovations are not given any additional funds for this; it should fit in their original budget. This creates a possibility for the receiving organisation to say that x is more important than y. A possibility that one person refers to, and that was used during the rollout of the new website skf.com was a central funding. The project created a funding that covered the extra expenditure that the organisation is burdened with due to the need for customisation of the site for different countries. The concept of central funding for projects is something that this person believes would be positive to have in more projects.

“The combination of a good product and a central funding to really roll-out a project is a very good contribution to get a successful roll-out.”

Central funding is a good way to avoid the discussion around financing in the beginning of a project. But if more projects start to work with central funding and a down turn in the economy comes, then everybody in the line and all over the world

react when they become charged with a central cost that they can not influence themselves. Then it is leading to the opposite trend according to one interviewee.

When Juno was to be released as a pilot there were two major restructurings that affected the project. First SKF acquired Nåiden with a lot of restructuring on SKF Service as a consequence. Second SKF Nova, who earlier got all funding from the parent company, was required to finance half of its activities itself. As a result of the changed conditions at SKF, Nova started to look on the Juno project with the goal to get back some of the money that was put into the project. They created a business plan and started to see the Juno project as a product and used the pilot to introduce it to the market.

"The fact that we had serious remarks on the functionality was not taken into consideration. They should make money on it. But then it fails due to lack of functionality. That was in a period when they should have started a more aggressive development period. But they wanted to start to get money from it."

The changed attitude resulted in a lack of inspiration and enthusiasm from Machine Service. When other people tested Juno they asked for more functionality. But there was no money. This had a bad influence on the facilitating conditions.

When it was decided that Juno should be tested on SuperOffice, SKF Nova started to search for a server platform to run the environment on. Not long before this work started SKF had outsourced its IT-department and it was unclear what guidelines they should be following. Neither SKF nor the company they had outsourced to wanted to host the program. The result was that an external hosting company was contracted. If it would have been accepted that the server environment be hosted at SKF Nova, on one of their own servers, the price could have stayed on one tenth of the cost that it now became in reality according to one person.

DISCUSSION

From the data collected, presented, and connected with the external variables in the result chapter I will discuss the effect these values have on the perceived usefulness and perceived ease-of-use. Those two together will affect the intention of usage, which affects the usage according to TAM.

Perceived Usefulness

I will start to look on perceived usefulness. The perceived usefulness has been found to be affected by job relevance, system quality, management support, and prior experience, see figure 4. So how was the perceived usefulness of Juno?

SKF Nova has studied the usefulness and they think that there is a big potential in the Juno concept. The people that I talked to at machine service (MS) also see the Juno concept as useful, but they have some doubts about the platform that the pilot is implemented on. There are some things that they agreed could have a positive impact on their work situation. Reports and measurement data will be easier to access. To have only one original report is also a good thing. When more and more data measurements and reports are added there will be a need for a way to handle it. The communication part where the customers can discuss the report or measured data with MS is seen as a possibility for a better service for the customers. The dialogues are stored and both parties can go back and reread if they are unsure what they wrote to each other. The customers get the possibility to get fast feedback on the reports. A problem, as MS sees it, is to measure the value they get from using the system. When Juno was first developed they printed the reports and sent them by mail. Today they send it by email and through that a big saving is already made. The value of faster feedback and the other effects of the communication tool are also hard to know anything about until it is tested. The job relevance of the system is seen as pretty good even if they are not sure of the value it will bring. There is also a difference in view between different interviewees.

The perceived usefulness for the staff at MS is reduced due to their picture of what they wanted. When SKF Nova worked with the CoMo project they liked the functionality and design of it very much. A problem is that they seem to never have let go of that system. When they started to ask for more functionality in Juno it was functions that had been in the CoMo system they asked for. When you ask what they think of Juno they relate to what they thought about the CoMo project. Their prior experience of a, in their eyes, better system is affecting their view of Juno's system quality. The CoMo project had special functions connected directly to their service whereas Juno 'only' contains the general foundation for that service. Due to that, their perceived usefulness was reduced.

Other more abstract problems that affect the perceived usefulness are those who belong to organisational matters. To go through and create an application that will have the functionality in reality that was presented earlier, the organisation needs to have people that support it. The support from management is very important. When Juno was developed and until they started the pilot of Juno, MS had a boss that believed in the system and encouraged his staff to take time for it. But just before the

pilot of Juno should start there were organisational changes that ended up with that the boss that had supported Juno was replaced. The new boss did not show the same interest in Juno. As a consequence, the Juno pilot was not started in time and SKF Nova felt that they did not have anyone to communicate with regarding the Juno pilot and the people at MS lost their enthusiasm.

There is a group of users that I have not had access to, the customer users. Their view of the system is only what I have heard from the salesman. The picture I have got about the customers is that they want the system, that some almost have required it. According to some of the interviewees the customers computer literacy is not very good and he thinks that they probably will print the report and put it in a binder even if they got it electronically. This lack of prior experience are according to previous research affecting the perceived usefulness in a negative way, but if they need the system because of its functionality the job relevance may compensate for the lack of prior experience. This is probably pretty different depending on customers.

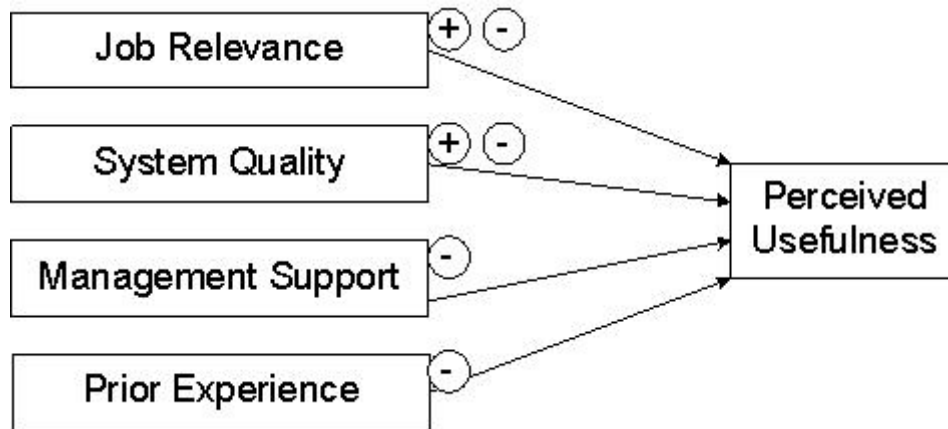


Figure 4 – external variables that affect perceived usefulness

Let us summarise the perceived usefulness of Juno by looking on how the external variables are affecting it (see figure 4). The job relevance is pretty good if you ask the users at MS even if the management is not sure about the value of it. The system quality could have been better. Probably most of the problems lie in the SuperOffice platform that Juno is built on. On the other hand, the purpose with Juno pilot was to evaluate the effect of putting these functions together not to test platform software. Today there are much better platforms to build on according to evaluations done by SKF Nova. The management support has not been very good after the reorganisation at MS. A higher commitment from all levels of management is desirable. At least there should be an owner who feels for the project and is ready to support it. Prior experience of computers is pretty good at MS, but unfortunately they got their picture of what they want of Juno from the functionality that the CoMo system had. The sum of the perceived usefulness is that there are good things in it but the lack of support from management and the quality of the pilots functions make for a negative perceived usefulness.

Perceived Ease-Of-Use

Perceived ease-of-use together with perceived usage affect the intention to use and is affected by the external variables system quality, management support, and prior experience (see figure 5).

When I asked the users at machine service (MS) what they thought about the user friendliness of Juno they said that it is a little bit messy. MS thinks that it requires a lot of work to add new customers to the system. The double work, to both work in Juno and the mail program, is also annoying. How much of the problems that are related to the platform is hard to say, but probably pretty much. Since SuperOffice is the only platform that is tested to act as host for the Juno concept, the relation and ease-of-use of that one is the only thing I can go on. The system quality in the ease-of-use perspective was not that good.

The management support has in earlier research been found to have an effect on perceived ease-of-use. I do not really see the dependency in this case, but since the management support may affect the amount of effort that a person feels that using the system mean, that probably has an influence even here. The management support has earlier been proven not to have been very good in this case. Probably it also has a negative impact on the perceived effort of the persons that are required to use the system too.

When SKF Nova developed the pilot platform for Juno they took an off-the-shelf product and changed the layout to fit the skf.com environment. The fact that SuperOffice is a standard product of course affects the look and feel of the system. But ease-of-use is not only the design; it is how users manage to handle it. How hard/easy it is to use it. The salesman that I talked to thinks that those that have accepted the process of Juno will have no problem using the system. But he also said that the customers are two or three steps behind, that SKF is well positioned when it comes to IT. But if it is as the salesman said that the clients are two to three steps behind, how does that affect their ability to use the software? What demands for the software does that involve? Probably the needs of a system that is easy to use are bigger. Prior experience is hard to say anything general about, on one hand they say that users will not have any problem with using it, on the other they say that the customers are several steps behind when it comes to IT. As before, this probably depends on whom you talk to. The personal computer literacy is very important.

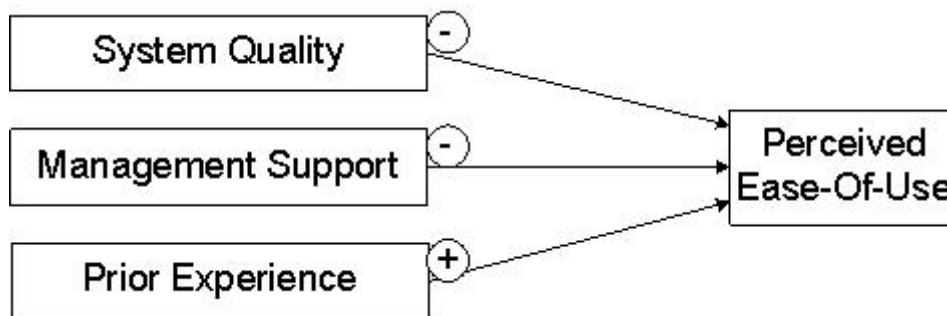


Figure 5 - external variables that affect perceived ease-of-use

To summarise the perceived ease-of-use of Juno, let us look on the external variables affecting the case (see figure 5). The system quality was not so good, probably due to the shortcomings of SuperOffice. Users felt that there were several details that did not work very well. The management support has earlier been proven to have weaknesses, which affects the PEOU negatively. Prior experience has an effect on the user's computer literacy. If the computer literacy is low there is an even greater pressure on the systems usability. The level of PEOU is not certain, since there is only one user that I have interviewed, but the general feeling is that even if prior experience might have a positive influence, the management support and system quality brings PEOU down.

Usage Intention & Usage

When perceived usefulness and perceived ease-of-use are defined, they together affect usage intention. The usage intention can be seen as a process towards usage where several external variables influence (see figure 6). Facilitating conditions, system quality, management support, relative advantage and prior experience is those external variables that I have support for in the material from the interviews.

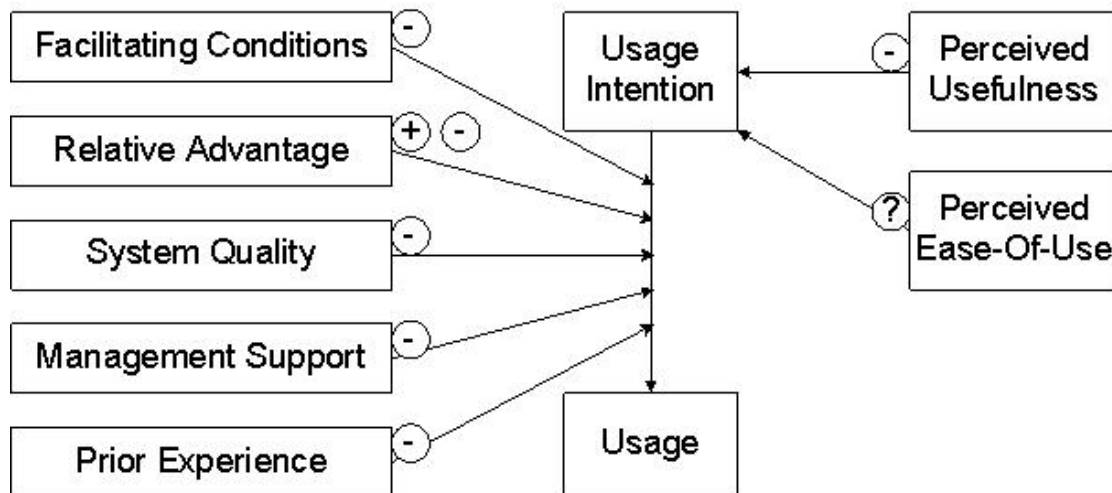


Figure 6 - variables that affect usage intention and usage

According to Davis (1989): users are driven to adopt an application primarily because of the functions it performs for them, and secondarily for how easy or hard it is to get the system to perform those functions. The perceived usefulness was pretty good if you look on the concepts of Juno but not so good when the pilot platform and management support were added to the judgment. Perceived ease-of-use was hard to say so much about, due to the small selection, the pilot platform and management support lowered the rating even if a large part of the judgement is individual to the user.

The facilitating conditions and management support have affected the intention to use in many ways. One of the reasons why the users have not started to use Juno is the heavy workload that they have. In order to succeed, the users will have to be given resources in the form of time and money to test and work with the system. In this case, users have had to use their spare-time to test and work with Juno. When there is no spare-time they will not work with the system. This condition is very frustrating for both the users and SKF Nova. Managers that allow time for the project is of vital importance.

Due to lack of management support and maybe because of the users prior experience the users have not felt that they are ready to use the system. They are divided between theory and practice. In theory they think that the system has many functions that would be helpful, but in practice they do not want to use the system. It is not clear how much depends on the quality of the pilot platform and how much depends on their unwillingness to use a new system. Due to this situation, users have made sporadic attempts to use the system but have come to a standstill.

The problem of usage intent is not only on the users side. SKF Nova influence too, in different ways. One example is the process when SKF Nova went through the reorganisation, from being fully paid from SKF centrally to having to finance half of its actions themselves. As an effect, they started to look for places where they could earn money and their eyes fell on the Juno project where they had invested a lot of money. So they introduced Juno into the market as a general IT-tool that could be useful in many different situations. The different approach from SKF Nova towards Juno and MS after that resulted in a lack of interest from MS-users. They thought that instead of marketing Juno as a product they should have finished Juno so that it fulfilled their demands. This all affected the facilitating conditions, which gradually has affected the intention to use.

Many problems have their ground in the economic conditions. A possible solution may be central funding of projects. The resources for the users to work with the system are given from the project. This way of working was tested during the work for skf.com when they customised the homepages for different countries all over the world. It would be interesting to evaluate and test working with central funding in more projects to see what the results would be. This should have a positive influence on facilitating conditions, and if management approves a central funding they will probably be interested in how the project works and through that give support for the project.

Summary

So what have we learnt from the Juno case? What could have been done differently and what recommendations for the future can be given based on the Juno project? We have seen that it has been possible to map different views to the external variables and through them see how PEOU, PU, UI and U have been affected. TAM is mostly used for quantitative data but I think that the concepts and the experience that have been gained through the massive use of TAM over the last 15 years has made it possible to use the TAM model even for qualitative studies. This study has had a very small number of users, which makes general conclusions about TAM usage hard to draw.

The experience that has been gained through the case of Juno is that management support is important. The management support and facilitating conditions have been found connected through the resources added to a project. When adding resources to a project, the managers become harder committed to the project and the facilitating conditions are improved, which helps develop qualitative systems. The external variables prior experience, job relevance, and relative advantage have also been used to understand the case and have brought valuable knowledge.

Regarding Juno, the experience can be summarized to have pointed to the importance of good management support. Also that the prior experience have affected them in different ways, good because of the relatively good computer literacy they have, bad because of their vision of the system that they have kept from the CoMo system. The different reorganisations at both SKF Nova and MS have affected the facilitating conditions in a negative way. How much of the direct job relevance and system quality problems that the users have had comments on are related the SuperOffice platform is hard to say, but it has had influence.

Although not stated in such terms by SKF Nova, the Juno pilot was a project to test the perceived usefulness of the system. This makes the mapping to TAM straightforward. The Juno pilot was never, however, intended to test the other TAM component – perceived ease-of-use – and it was therefore no surprise that the project scored badly in this respect. The mapping to TAM was also more difficult.

Management support is needed to be able to implement a system and an implementation is needed to estimate the value. The dilemma is that management need to see the value before the give their support. A general conclusion is that it is crucial for such projects to communicate the role and purpose of each step in the development process. A test of perceived usefulness must not be mistaken for a final solution, particularly so since perceived usefulness involves such a broad mix of aspects from IT development, business development, and human behaviour.

CONCLUSION

With the knowledge of the Juno project, I have come to some conclusions about what can be done to raise the utilisation of IT-applications?

Regarding Juno, my conclusions are that:

- A better platform than SuperOffice will be needed.
- The concept has potential but the communication to the users about the values of the concept should be better.
- The ownership of Juno must be defined properly.
- The managers should pay more attention and give sufficient support regarding resources and encouragement.
- Communication is a hard but important part. It is important to involve the users in the process and make sure that you speak the same language
- Central funding is a possibility that should be tested further in order to improve the facilitating conditions and strengthen the commitment from owners and stakeholders which affect the management support.

The general conclusions that I have made are:

- Management support is important both when it comes to giving the proper resources to encourage the staff and be explicit that the system is something that management believe in. If management and stakeholders commit to a project, its potential of success will be much higher. It is also important that the ownership of the project is well defined.
- It is possible to use TAM even for qualitative studies even if it sometimes was hard to correctly categorise answers from the interviewees. This as an affect of the semi-structural way that I choose for the interviews.
- The external variables were usable in order to help determining the perceived usefulness, perceived ease-of-use, usage intention, and usage that TAM presents.
- Where Lee et al. found only an insignificant relationship between facilitating conditions and the TAM variables; this study has found that relationship to be unambiguous. The border between facilitating conditions and management support is however not very clear, as a consequence facilitating conditions are only discussed in the process between usage intention and usage.

Further research:

- To continue to work with TAM with qualitative data should be interesting. Connecting TAM with other theories in order to compare and see which theory that is best to use in which situations is also something I want to see more of.

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