EVALUATING STRUCTURAL VALUE

APPLICATIONS IN AN ORGANISATIONAL CONTEXT

A master thesis conducted at the Department of Computer and Information Science and Ericsson Radio Systems AB

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Sammanfattning

Användandet av informationsteknik har under senare år blivit ett allt viktigare ämne för ledningen hos många företag. Av tradition har ledningen fokuserat på materiella tillgångar, men idag måste de lära sig att fokusera och bättre utnyttja det dolda värdet i organisationen. För att göra detta anser vi att det intellektuella värdet, inklusive det strukturella värdet, måste synliggöras. Vi anser också att ett synliggörande av värdet, i syfte att skapa förståelse, är viktigare än försök att mäta värde. Detta eftersom det finns risk för att försök att definiera exakta mått kan medföra en alltför stor förenkling av informationssystemens komplexa påverkan.

Syftet med denna rapport är att etablera en metod för hur det strukturella värde som skapas av en organisations applikationsportfölj kan utvärderas. Som input till metoden fokuserar vi på struktur (informationsteknik) och strategi. På kort sikt måste strategi matcha strukturen, men om organisationen ska överleva på lång sikt måste strukturen följa den övergripande strategin. Detta är orsaken till att strategin hos den undersökta organisationen är så viktig i det presenterade arbetssättet.

I rapporten presenterar vi tre olika strategisynsätt inom området informationssystem; det analytiska, det utvärderande och det kreativa. Forskningen koncentreras på det analytiska och det utvärderande synsättet, eftersom vi anser att forskning om informationssystem saknar värde om inte hänsyn tas till den organisatoriska kontexten.

Rapporten presenterar en struktur i form av en IT-arkitektur, som består av fem element. Data representerar användning, access, kontroll och lagring av data. Kommunikation representerar de möjligheter som skapas av nätverk och elektronisk kommunikation. Databehandling representerar informationsbehandlande hårdvara och operativsystem. Applikationer representerar de applikationer som används i organisationen, funktionerna hos dessa verktyg och metoder för applikationsutveckling. Arbete, slutligen, representerar processer och arbetsrutiner. Det är vår avsikt att IT-arkitekturen ska kunna användas också till annan informationssystemforskning.

I en modell analyseras kopplingarna mellan de fem elementen i IT-arkitekturen, i syfte att synliggöra möjligt värde. Från denna analys tas en enkät fram, avsedd att i ett senare skede användas för samla in information. Som exempel kan relationen mellan elementen Data och Applikationer användas för att påvisa de möjligheter som elektroniska

kopplingar mellan applikationer medför, baserat på att de då använder gemensamt data.

Nästa steg i metoden är att analysera insamlat data för att avgöra om de möjligheter som har påvisats av IT-arkitekturen är i samklang med organisationens strategi. Genom att analysera informationen ur en strategisk synvinkel kan man avgöra hur IT-arkitekturens erbjudna möjligheter utnyttjas, vilket ger indikationer på applikationernas strategiska värde.

För att verifiera och validera metoden har vi genomfört en fältstudie på tio av Ericsson Radio Systems AB:s lokalbolag runt om i världen. Dessa kontaktades på ett strukturerat sätt för att möjliggöra en jämförelse med hög validitet av resultaten från de olika länderna.

Resultaten presenteras för Ericsson i form av en utökad databas som innehåller information om de olika systemen, samt i form av en stor matris där systemen listas per land och delprocess. Resultaten kommer att användas i arbetet med globalisering av processägarskap och för att definiera informationsstrategier, liksom i den direkta kontakten med de lokal bolagen. På grund av att Ericsson anser resultaten var konfidentiella kommer de inte att redovisas i denna rapport.

Vi anser, baserat på våra teoristudier, intervjuer med berörda personer samt resultat och erfarenheter från den utförda fältstudien, att metoden är användbar för informationssystemforskning. Vi anser vidare att metoden väl uppfyller sitt syfte och är ett strukturerat sätt att synliggöra värdet av informationssystem.

Då man studerar en forskares verk är det viktigt att vara medveten om dennes åsikter om vetenskap i allmänhet, liksom hur denne har valt att utföra sitt arbete. Arbetet i denna rapport har på grund av informationssystemforskningens mångfacetterade natur påverkats av flera olika metodiksynsätt. Arbetet visar därmed på inflytande från både positivistiskt och interpretivistiskt perspektiv.

Abstract

The use of Information Technology has during the later years become an increasingly important issue for the management function at many companies. Of tradition managers have focused on tangible assets such as financial reports, but today they must learn to focus and more efficiently benefit from the hidden values of the organisation. To do this we believe that the intellectual value, including the structural value, must be made visible. We also believe that the visualisation, in order to create an understanding, is of higher importance than any attempts to measure the value. This since a distinct measurement might cause a simplification of the impact of information systems.

The purpose of this thesis is to establish a method for how the structural value created by an organisation's application portfolio can be evaluated. As input to the method we focus on structure (i.e. information technology) and strategy. On a short focus of time strategy must match the structure, but if the organisation is to be successful over time the strategy must be created regarding the surroundings, and the structure follow this strategy. This is why the strategy of the researched organisation is of vital importance in our presented method.

In the thesis we present three different approaches to strategy within the information system area; the analytic, the evaluative and the creative. The research is concentrated on combination of the analytic and evaluative approaches, since we believe that information systems research hold no value without regards taken to the organisational context.

The thesis presents a structure in the form of an IT architecture, that can be viewed as five contributing elements. *Data* represents use, access, control and storage of data. *Communications* represents opportunities created by networks and electronic communications. *Computing* represents the information processing hardware and the operating systems. *Applications* represent the applications used in the organisation, the functions of these tools and the methods of application development. *Work*, finally, represents processes and work routines. It is our intention that the IT-architecture could be used for any kind of information system research.

In a model, the interrelations between the five elements of the IT architecture are analysed in order to find possible value. From this analysis a query, later used to collect needed information, is extracted. For instance the relation between the elements Data and Applications

reveals the possibilities created by electronic communications between applications, providing the means for the use of common data.

The next step in the method is to analyse the collected data in order to understand how the possibilities revealed by the IT-architecture are coherent with the strategy of the organisation. Analysing the collected data from this strategic point of view will reveal how the possibilities created by the IT architecture are utilised and indicate the strategic value of the applications.

In order to verify and validate the method a field study has been executed at Ericsson Radio Systems AB, concentrating on ten local companies around the world. These were contacted in a structured approach to enable a high validity comparison of the results from the different countries.

The results are presented to Ericsson in the form of an extended database, containing information about the different tools, and in the form of a large matrix where the tools are listed by country and sub process. The results will be used in the work with globalising process ownership and defining information strategies, as well as in the direct contacts with the local companies. Due to confidentiality reasons decided by Ericsson, the specific results are not presented in this report.

We believe, based on our theoretical studies, interviews with people concerned and the results and experiences of the performed field study, that the method is well suitable for information systems research. We also believe that it proficiently meets the purpose, being a structured way to make visible the value of information systems.

When reading the work of a researcher it is important to understand his or her views upon science in general, as well as how the researcher has chosen to conduct his work. The work in this particular thesis has however been influenced by several different aspects of methodology, due to the diversified nature of information systems research. The thesis therefore shows signs of both the positivist perspective and the interpretivist perspective.

Preface

The work with this thesis was initiated during 1998 and finished in 1999. Although written during the last part of the second millennium, we hope that the thesis can provide some interesting thoughts and ideas also for the future.

We would like to thank everyone that has contributed to the work with this thesis, with theoretical discussions, with ideas and opinions of the chosen subject, with support and pep talk and, not to forget, with company during the sometimes long coffee and blueberry soup breaks.

Stockholm 1999

Anette Westling Ulf Nordström

Don´t quit

When things go wrong, as they sometimes will,
When the roads you're trudging seems all uphill,
When the funds are low and the debts are high,
And you want to smile, but you have to sigh,
When care is pressing you down a bit;
Rest if you must, but don't you quit.

Life is queer with its twists and turns,
As every one of us sometimes learns,
And many afailure turns about
When he might have won had he stuck it out.
Don't give up though the pace seems slow;
You may succeed with another blow.

Often the goal is nearer than
It seems to a faint and faltering man;
Often the struggler has given up
When he might have captured the victor's cup;
And he learned too late when the night slipped down,
How close he was to the golden crown.

Success is failure turned inside out,
The silver tint of the clouds of doubt
And you never can tell how close you are,
It may be near when it seems afar;
So stick to the fight when you're hardest hit,
It's when things seem worst that you mustn't quit.

(Unknown, from Infinite Insights into Kenpo, Ed Parker, 1983)

Introduction

This chapter opens with a background to the topic of this study, followed by a discussion of the problem area and the purpose of the study. The delimitation of the thesis is presented and a further disposition of the report is given. The chapter is concluded with a brief presentation of the authors.

BACKGROUND

The use of Information Technology (IT) has during the later years become an increasingly important issue for the management function at many companies. Today it is considered almost impossible to manage any kind of business without the support of computers. As companies grow, the need of a functional strategy for how to exploit the possibilities of IT to keep the global organisation together augments.

As the interest in using IT as an enabler for organisations grow, so does the general interest in what has been known as *knowledge management*. Knowledge management is concerned with how to manage the development as well as distribution and use of knowledge within organisations, in other words management of the intellectual capital.

Of tradition managers have focused on tangible assets such as financial reports, but today they must learn to focus and more efficiently benefit from the hidden values of the organisation. To do this we believe that the intellectual value, including the structural value, must be made visible. As a conclusion of this, organisations must learn to efficiently evaluate hidden assets.

DISCUSSION OF THE PROBLEM

As companies grow and expand their business on a global market the need of providing all levels of the organisation with information becomes increasingly important. Enterprise Integration Systems, such as SAP R/3, Baan, and JD Edwards, are designed to support and maintain the information flows in large organisations and are therefore a great temptation to many management functions.

Unfortunately, Enterprise Integration Systems alone can not provide the solution to all problems of a growing organisation. Many authors, among them Davenport (1998), warn that an unprepared and not well thought out approach to acquisition and implementation can be

devastating to the organisation. The medical company FoxMeyer Drug even claims that the implementation of their Enterprise Integration System helped drive the company into bankruptcy. Therefore, Davenport further argues, an organisation must merge the business imperatives and the requirements set by the system to build a foundation for the information strategy. Only then does the strategy have a fair chance of being successful.

When creating the information strategy many influences must be considered. Examining the organisation's structural value, also known as the internal value, is therefore of major importance. The present organisation most likely contains important structural value which might be destroyed if the value creating structures are neglected or forgotten when building the new strategy.

The structural value can be defined as procedures, competencies and know-how in an organisation, which are given a permanent form from routines, IT solutions or likewise. This implies that the chosen IT architecture is an important part of the organisation's structural value. When creating an information strategy the IT architecture must therefore be examined in its contributing elements and the interrelations between these elements.

The applications used by the organisation are an important element of the existing IT architecture. Examining the application portfolio and its contribution to the structural value is therefore, we argue, important when recreating an information strategy.

Ericsson Radio System AB is currently undergoing several major projects with the purpose of redesigning and improving the global workflow. The TTC Business Tools department, responsible for providing the global enterprise with adequate business tools, therefore felt the need to examine the current application portfolio. This inventory gives us the opportunity to execute a field study, covering ten local companies in five continents. The inventory aims at mapping the business tools used at the local companies and the structural value of these applications is visualised using the method and a model based on the IT architecture. The field study also serves as a validation of the method and model, where we want to see if it can be used in finding structural value contributed by a specific application, and if it can be communicated over global distances.

PURPOSE OF THE THESIS

The purpose of this thesis is to establish a method for how the structural value created by an organisation's application portfolio can be evaluated.

To fulfil this purpose some questions need to be answered:

- What are the basic input to the method and what are their effect?
- How must an architecture of information technology be designed in order to be useful for information systems research?
- How must a model be designed in order to evaluate the structural value derived from the use of distinct applications?
- How can a query, based on the model, be extracted adjusted to the preconditions set by a field study?

OUTLINE OF THE THESIS

As presented earlier in this chapter the purpose of this thesis is to establish a method for how to evaluate the structural value created by an organisation's application portfolio. The questions necessary to answer in order to fulfil the purpose have also been presented. We will here show the reader how we intend to answer these questions.

The first part of the thesis contains the chapters *Introduction* and *Methodology,* the first explaining the background and purpose of the thesis and the second presenting the chosen path of actions based on the scientific approach decided upon. This gives the reader a background of scientific aspects, as well as an understanding of how these have affected us and our work.

The second part, containing the chapters *The Business Value, The Strategy* and *The Structure,* are intended to answer the first two questions presented in the purpose. They introduce the relation between information technology and the organisation, and discuss how to define and create the business value of information technology. The discussion is expanded to the necessity of combining different approaches in order to reveal hidden value. The last of the three chapters introduces the answer to the second question by presenting the IT architecture that will form the base for the defined model.

This part of the thesis forms the foundation for the method, both by giving the necessary input for how to create the model and query, but also by being part of the method itself. We believe, and will show later

in this thesis, that in order to make a correct and useful evaluation of an application portfolio, it is necessary to have the knowledge of the organisations comprehensive strategy and structure.

An outline of how different parts are adding to the method is presented in Figure 1.

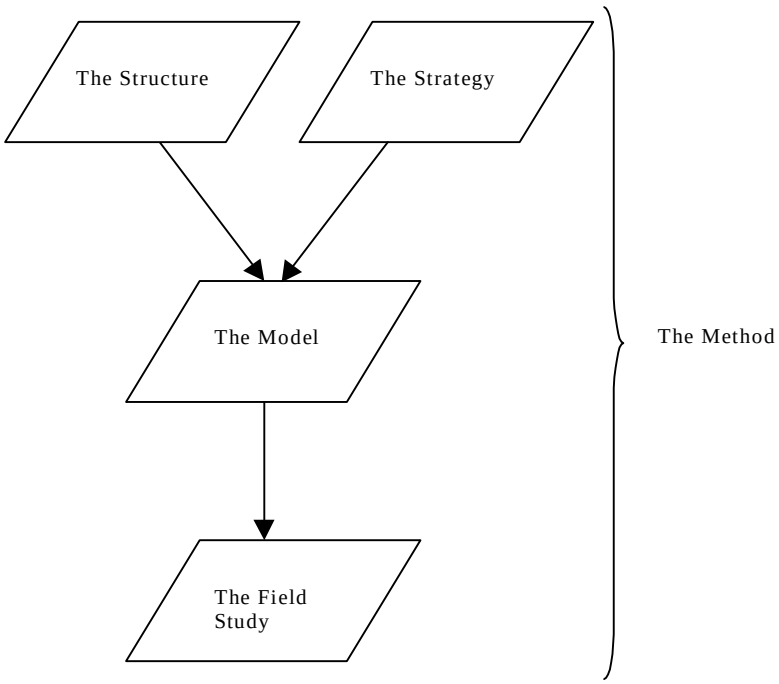


Figure 1 Outline

The chapters *Measuring Value* and *The Model of Evaluation* constitute the third part of the thesis. *Measuring Value* serves as a background to the differences between the concepts measuring and evaluating, and explains why we have decided to focus the model on the concept of creating an understanding rather than on measuring the specific value of the applications. These thoughts are also visible in *The Model of Evaluation*, where the earlier chapters are combined in order to present a model for the understanding of the value of an application. The chapter also presents a specific application of the model in form of a query adjusted to the preconditions set by the research object.

The described third part of the thesis can be considered more specific, and focus the model more than the method. We believe, although, that the model and how it is defined contribute to the understanding of how

the method can be used practically. The fact that the model and query need to be adjusted to the research object gives us the opportunity of performing a field study in order to draw conclusions of the efficiency of the method.

The chapter *The Field Study* forms the fourth part of the thesis and contains a brief presentation of the research object; Ericsson Radio Systems AB, Cellular Systems – American standards, as well as a discussion of the performed study and the achieved results.

The three chapters forming the fifth part of the thesis explain how certain effects in the use of the method have arisen. To better understand the upshot of the circumstances under which the field study was executed, the chapter *Communication in Theory and Practise* is included in the thesis. It presents the communication process and the richness of different communication media. This chapter helps the reader to understand how the communication process affects the evaluation, and why these thoughts are important as input to the method.

In *Evaluating the Method* results from the field study as well as further theoretical studies are used to discuss the communication process and the efficiency of the method. The model is analysed as a part of the method, the ingoing parts are discussed and commented, and the model is validated.

The *Conclusions* opens with brief summary of the main contributions of the thesis, and we describe our conclusions on the usability of the method. After this improvements to the method and the model are suggested and a new approach to the interactions during a field study is presented. A generalisation of the model is discussed and finally a change of the strategic approach at Ericsson Radio Systems AB is presented.

The thesis ends with an *Epilogue* with our final thoughts.

DELIMITATION

The ten local companies researched in this thesis are defined by Ericsson Radio Systems AB, the object of our field study, and are therefore predetermined. The reason for this is that in addition to the validation of our theories, Ericsson Radio Systems AB also uses the field study as an inventory. Researching these ten countries is therefore a prerequisite for Ericsson Radio Systems to finance the work.

The thesis will focus on the structural value created by business tools used in a process context and we have chosen to study how structural value can be connected to distinct applications. The reason for this is

that we find this approach interesting, but also because we during the field study had an opportunity to identify a significant number of tools. This consequently gave us the possibility to efficiently validate our research.

Parts of the results will be put in an appendix according to Ericsson Radio System AB's secrecy requirements.

ABOUT THE AUTHORS

When this thesis is written Anette Westling and Ulf Nordström are both graduate students attending the final year at Linköping Institute of Technology, completing their Master of Science degrees in Industrial Engineering and Management.

Ulf Nordström
Anette Westling

Methodology

This chapter aims at giving the reader a picture of what theoretical framework has guided and influenced us in our research. The chapter starts with introducing knowledge and the most common research perspectives, and later our view upon these is presented and discussed. After this our workflow is outlined and finally criticism concerning the chosen methodology ends the chapter.

AN INTRODUCTION TO KNOWLEDGE

The theory of knowledge, or how knowledge is acquired, is often referred to as *epistemology*. The two important areas to focus are the definition of knowledge and how valid knowledge can be acquired. The ancient Greeks considered a classification of knowledge: *doxa*, which was believed to be true, and *episteme*, which was known to be true. Science, the Greeks therefore argued, was the process of transferring doxa to episteme. (Hirschheim 1985)

This definition of knowledge is as valid today as ever but philosophers and researchers have always debated the process of transformation, much because it is a reflection of the social or communal agreement of the times.

THE DIVERSIFIED NATURE OF INFORMATION SYSTEMS RESEARCH

The information system community of researchers is a loosely connected group of people, but with a common goal of advancing the state of knowledge in IT. A paradigm is the dominating way of thinking and working within a specific area of science during a certain period (Mårtensson & Nilstun 1988). The paradigm of choice used by these researchers has shifted over time. We believe that this can be explained by the diversified nature of the research area. Because of its human and social nature, information systems research shares the difficulties of social science (Hirschheim 1985). But because information systems are based on a technological foundation, it also shares difficulties associated with natural science. We therefore believe that an introduction to the most common perspectives on information systems research will be useful before we can argue for the perspectives we have been influenced and guided by during our work.

RESEARCH PERSPECTIVES

The research perspectives we consider being relevant to information systems research are *the positivist perspective*, *the interpretivist perspective* and *the critical social theory perspective*. These are discussed and compared below. These descriptions shall however mostly be seen as a theoretical framework for the construction of the scientific approach.

Many authors has explained and described these perspectives. We have chosen Lee, Klein & Mayer and Ngwenyama as our primary references since we consider them to be easy to understand but also highly reliable. A third and also highly significant reason for us to use them as our primary sources is that they all are information system researchers taking a deep interest in the research perspectives associated with information systems and the question of how to research information systems. Among other common references Alvesson & Sköldberg (1994) *Tolkning och reflektion. Vetenskapsfilosofi och kvalitativ metod*, Studentlitteratur, Lund, Arbnor & Bjerke (1994) *Företagsekonomisk metodlära*, Studentlitteratur, Lund and Mumford (1985): *Research methods in information systems*, Elsevier can be mentioned.

The Positivist Perspective

"The criterion of the scientific status of a theory is that it is falsifiable."

(Sir Karl Popper, philosopher of science)

A researcher acknowledging the positivist perspective uses procedures similar to those used by researchers of physics and biology. Positivism is therefore also known as the natural science model of social science research.

The positivism involves three interrelated sets of logic: the rule of formal logic, the rule of experimental and quasi-experimental design and the rule of hypothetico-deductive logic (Lee 1997).

Rules of formal logic.

When expressing theories, mathematics is distinguished as the ideal form. The rules of mathematics, algebra for instance, can be used not only to relate different theories to others, but also when deriving new theories. (Lee 1997)

Rules of experimental and quasi-experimental design.

This rule helps researchers ensure that experimental data of the theory in question, is for sure a test the intended theory. When expressing theories positivist researchers often distinguish between dependent and independent variables. When designing experiments one must therefore analyse conflicting variables so that they can be removed or controlled. In the world of mathematics regression analysis can be used for this purpose. (Lee 1997)

Rules of hypothetico-deductive logic.

Inductive research begins with collecting data. Theories are then created from relations found in the data (Merriam 1994 referring to Kenny & Grotlueschen 1980). Researchers using deduction, on the other hand, consciously searches for information confirming previously stated theories. Induction is usually described as moving from the specific to the general, while deduction begins with the general and ends with the specific; arguments based on experience or observation are best expressed inductively, while arguments based on laws, rules, or other widely accepted principles are best expressed deductively. The rule of hypothetico-deductive logic is concerned with whether theories are tested through induction or deduction. Lee (1997) argues that the positivist researcher uses the later. Copi (Lee 1997 referring to Copi 1986, p. 463) states that “Few propositions of science are directly verifiable as true... For the most part they concern unobservable entities, such as molecules and atoms, electrons and protons, chromosomes and genes. Then these conclusions are tested and are found to be either true or false”. Theories in the eyes of a positivist researcher must therefore be falsifiable, testable, refutable or disconfirmable, indicating that a deductive testing is being used. (Lee 1997)

Arbnor & Bjerke (1997) argue that a true positivist perspective in reality is an impossibility. The borders are in reality blurred and they instead argue for the analytic approach. This approach holds most of the characteristics of the positivist perspective but has a greater acceptance of the understanding of knowledge. A true natural scientist, in contrast, shows no acceptance for the understanding, but focuses on explaining knowledge.

The Interpretivist Perspective

"Thus the movement of understanding is constantly from the whole to the part and back to the whole. Our task is to extend in concentric circles the unity of the understood meaning. The harmony of all the details with the whole is the criterion of correct understanding. The failure to achieve this harmony means that understanding has failed."

(Klein & Myers 1998 quoting Gadamer 1976, p. 117)

Much like positivism is sprung from the natural science field, interpretivism involves research procedures often associated with anthropology, sociology, history and hermeneutics.

The distinction between interpretive and qualitative research is often not clearly defined, however in contrast to positivist researchers, interpretive researchers recognise the world of consciousness and humanly created meaning. Klein & Myers (Klein & Myers 1998 referring to Chua 1986) classify research epistemologies into positivist, interpretive and critical and states that qualitative research can be done with either of these stances.

Researchers acknowledging the interpretive perspective of information systems research argues that knowledge of our reality is gained through social constructions such as a common frame of reference. This frame is built up by language, shared meanings, documents, tools and other artefacts. The research therefore focuses on the complexity of human sense making (Klein & Myers 1998) and aims at creating an understanding of the context of the information system and the process whereby the information system influence and is influenced by this context (Lee 1997 referring to Walsham 1993).

In contrast to positivist researchers, interpretive researchers see themselves as instruments of the observation (Lee 1997). Sanday writes (Lee 1997 referring to Sanday 1979, p. 528): “Fieldworkers learn to use themselves as the principle and most reliable instrument of observation, selection, co-ordination, and interpretation. Ethnography as Metraux... says, ‘depends on this highly trained ability to respond – and to respect that response – as a whole person’”

One of the major branches of the interpretive perspective is hermeneutics. Originally hermeneutics refereed to the interpretation of

ancient text, but is nowadays commonly used as an approach to understanding human and organisational behaviour. The main idea behind the perspective is that reading a text provides the model for reading human behaviour (Lee 1997). The idea suggests that the complex whole can be understood from preconceptions of its parts and their interrelationships (Klein & Myers 1998).

When a partial understanding is created, this might lead to a new understanding of parts the researcher previously thought he understood. Rereading these parts might in turn create a new understanding. This reasoning is referred to as the *hermeneutic circle*.

Arbnor & Bjerke (1997) argue that just as there is no true positivist perspective, neither is there a true interpretive perspective. The actors approach presented is however closely related to the interpretive perspective.

The Critical Social Theory Perspective

Critical theory is a social perspective originating from the Institut für Sozialforschung, an institute established in Frankfurt, Germany during 1923. The early work at the institute, primarily focused on the European working class movement, was directed by Carl Grunberg and was based on a Marxism oriented philosophy. In 1930 Max Horkheimer became the new director and during the following years work at the institute was characterised by a synthesis of philosophy and social theory and research. During the following years the term *critical social theory* was coined, partly based on the positivist perspective of research (Lee 1997). In contrast to *the traditional social theory*, critical social theorists believe that researchers can not be mere observers, but that the observer by his presence is influencing and is influenced by the subject of the study. This contradiction in the observation hold in this case a similarity to the Heisenberg uncertainty principle, see Figure 2, stating that a property of an object can not be measured without interacting with it (the object) in some way.

$$\Delta x * \Delta p \succ \frac{h}{2\pi}$$

Δx : uncertainty in position
Δp : uncertainty in momentum
h : constant

Figure 2 *The Heisenberg uncertainty principle*
Source *As articulated by German physicist Werner Heisenberg 1927*

Critical social theory researchers argue that there is a difference in observing nature and people. Inquiries into social activity should

therefore focus on understanding the social context of the actors (Ngwenyama & Lee 1997).

Jurgen Habermas has with a framework for critical social theory had a great impact on the information systems discipline, and has gained recognition from many information systems scholars (Ngwenyama & Lee 1997 referring to Habermas 1979, 1984, 1987). This framework differs from the positivist perspective the theory originally came from in the following ways (Ngwenyama & Lee 1997):

- It is sensitive to the lifeworlds of the organisational actors and is oriented to interpreting and mapping the meanings of their actions from their perspective.
- It adopts pluralistic methods of inquiry such as participation, observation, and the analysis of contextual data.
- It does not separate (as would the laboratory experiments of positivism) the subjects of inquiry from the organisational context within which they are situated.
- It recognises that the organisational context is not only important to meaning construction, but to social activity as well (Ngwenyama & Lee 1997 referring to Ngwenyama 1991).

BUILDING THE SCIENTIFIC APPROACH

"Do not follow where the path may lead. Go instead where there is no path and leave a trail."

(Unknown)

Different perspectives on methodology hold different assumptions of reality. In this thesis we argue that a positivist perspective, yet influenced by the interpretative and critical social theory, is best suited.

When starting our research we had only little knowledge of what to expect to be the outcome of our work. We therefore considered it more appropriate not to delimit our work at an early stage, but instead to build an architecture for the future work using the positivist thoughts of information systems research. From this architecture the initial model was created inspired by the ideas presented by Arbnor and Bjerke (1997). These ideas are presented below as the systems approach.

Later our theoretical frame of reference was extended based on critical elements distinguished during the field study. We noticed a need to show recognition to the social context our research is affected by, a context not easily described or measured nor falsifiable as true or false, right or wrong and therefore considered using inspiration from the interpretive perspective for the evaluation.

We also find ourselves inspired by the social critical theory. In our research we have an interest in affecting the ten local companies, for instance promoting the TTC process to those countries where it is not yet recognised. As researchers we therefore must be aware of our influence.

The model presented will therefore show signs of influences not usually associated with true positivist research. Information systems research is much to dependent of subjective variables to be easily classified and we argue that the business value can not be sufficiently focused without accepting this subjectiveness.

The positivist perspective argues for finding causal relations between elements. In reality this goal is however not commonly reached. Unlike in true natural sciences like physics and chemistry, isolating the elements is not possible and the researcher does not have enough knowledge of the researched area to explicitly explain the relations, in terms of cause and effect. (Andersson 1982)

Researchers using an interpretive perspective do not search for the same explanations as the positivist researcher. Instead his scope is to create understanding of the topic. (Andersson 1982)

These two are to be considered two completely opposing perspectives. However, both need to be compromised to be practically useful to information systems researchers. They are different ideals to be reached for, but not fully realised (Andersson 1982). Andersson further argues that all practical research is a compromise, although the different perspectives affect how the research process is executed.

The systems approach is suggested by Arbnor & Bjerke (1997) and emphasises relations much like the positivist perspective. A social context can, Arbnor & Bjerke argues, be looked upon as a system made up by a number of components and the mutual relations between these components. Thus the outcome of the system can, if well constructed, be greater than what is expected when examining the parts individually. Consider for instance a selected football team composed not of the individually best players but of those playing best together. We therefore argue that the creation of knowledge presented by Arbnor & Bjerke not can be explained using the positivist perspective alone.

Andersson (1982) argues that the positivist researcher is forced to accept the preconditions set by the society, or the context the system exists within. The approach can therefore be considered influenced also by the interpretive perspective where knowledge is created interpreting the relations.

Following this reasoning we can find a scientific approach well suited for researching information systems in the global Ericsson environment.

WORKFLOW IN PRACTICE

A question of great concern is whether qualitative or quantitative methods of data collection are being used as the foundation for qualitative research. We argue that a combination can be used, and that it in fact can be used with great success. This will bring forth relevance but also give a wider basis for the research. We also argue that it is of importance to be aware of this during the collection and to use the collected data in accordance with this scope.

Significant to qualitative research is (Holme & Solvang 1991):

- A closeness to the object of the study.
- The documentation is descriptive and based on the researcher's experiences from the inquiry.
- The collected data is further not to be quantifiable.

In the case of the field study executed the geographical distances is great, but in this case more significant distance is based on common/not common frames of reference and the possibilities to mediate understanding. These distances are therefore principally delimited by the available information technology. The information collected is in parts quantifiable, but the significance of any statistical analysis must be considered low. A combination of qualitative and quantitative research is therefore to be considered more appropriate.

Outline of the Workflow

The research can be subdivided into clearly distinguishable phases. These phases have in some cases been overlapping in time. During this overlapping they have been interacting with each other in a mutual relationship. There have also been times when we found ourselves forced to step back one or more phases.

This thesis, as well as many others, has evolved through substantial theoretical studies, not only as an initial phase limited in time but

throughout the entire process of writing the thesis. This is illustrated in the outline of the workflow, see Figure 3.

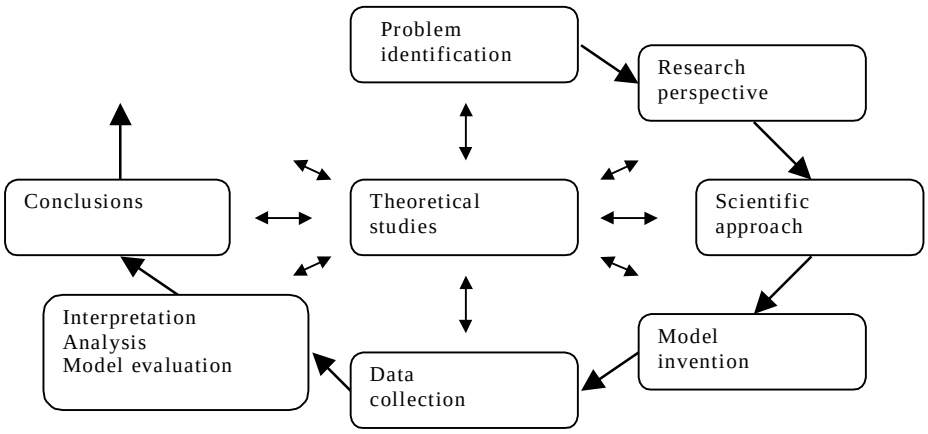


Figure 3 Outline of the workflow

Each step in the workflow is described below.

Theoretical Studies

The theoretical studies are the foundation and inspiration for our work throughout the entire workflow. Initially our theoretical study focuses on creating an understanding of the information systems research process and an adequate overview of business tools supporting processes, but as our knowledge grows and we build new theses the theoretical framework is expanded.

It is our opinion that recently published books and articles are to a high degree influenced by the common frame of references among today's researchers and often attempts to break new ground only in areas considered modern. When searching for publications concerning trivial areas, such as systems analysis, we find that reading publications from five to ten years back in time has in parts given us the greatest input. This time period can however in many cases of information systems research feel very long considering the technological improvements reached meanwhile.

Problem Identification, Research Perspective and Scientific Approach

The very first step in all research is to identify a suitable problem area. This choice of scope is partly made in close contact with Ericsson Radio

System AB. In combination with defining the scope, research perspectives are considered and a scientific approach created.

Model Invention

Based on the theoretical framework an information technology architecture is created.

Building on the architecture as well as the previous studies of structural value and theories of communication a model is then created. The model includes the query to be sent to the local companies. The positivist perspective influences the model, and the criteria are forced to be falsifiable or limited to a range from high to low. This aims at making the query designed to be communicated over great geographic distances and differences in the social contexts.

Data Collection

During this phase the field study in executed. The object of the study is Ericsson Radio Systems AB, Cellular systems – American standard (RMOA). The field study is presented and discussed in the chapter The Field Study.

Considering our choice of research perspective we believe that a structured approach, in this case based on the process description, is important.

Interpretation, Analysis and Model Evaluation

When interpreting the data methods of collecting foremost the nature of the gathering, being both qualitative and quantitative, needs to be recognised. The data is collected with a methodology associated with the positivist perspective.

When analysing the data we do not believe the data should be forced into a matrix. Instead we believe the validity of the data is better preserved when it is evaluated with inspiration from the interpretative perspective.

The interpretative perspective will also be used when evaluating the model.

As discussed below the criteria of truth, reliability and validity, must be acknowledged during the analysis.

Conclusions

Using the theoretical study and experiences from the data collection the communication process as well as the enhanced model is evaluated. This will answer questions raised in the purpose and discussion of the problem.

CRITICISM CONCERNING THE METHODOLOGY

Criteria of Truth

The need of verification should be acknowledged during all research and for a study to hold credibility to its readers, the criteria of truth comes to be of vital importance.

Reliability is concerned with the consistency in the research and can be focused by asking the question "will the study give the same results if it were to be conducted again?".

Reliability is a very important criterion in natural sciences as well as in positivistic research. The goal for these researchers, as described above, is to explain, not to explicitly understand. Theories presented must be in accordance with the rules of hypothetico-deductive logic, thereby being falsifiable as well as testable. Therefore the reliability of the theories must be complete if they are to be accepted.

For the interpretivist, on the other hand, reliability is a criterion not applicable. Theories presented are highly depending on the interpretations made by the unique researcher. These theories can seldom be classified as true or false, and the concept of recreating results is therefore irrelevant.

Validity regards whether or not the method (or research perspective) of choice really measures the subject intended. In an attempt to explain validity, the term can be subdivided into four types, building on one another (Trochim 1997). These subtypes and their correlation are shown below in Figure 4.

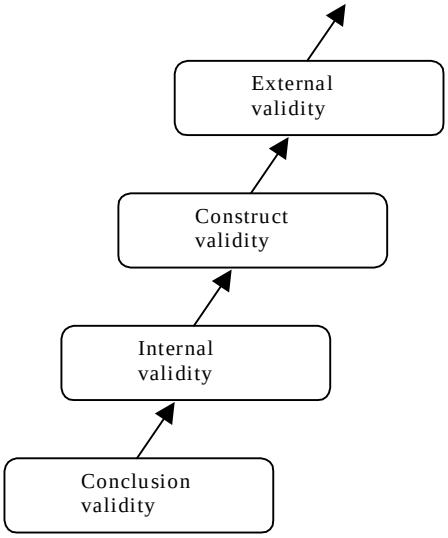


Figure 4 Cumulative validity.
Source: Visualisation of Trochim 1997

Conclusion validity is focused by addressing the question "is there a relationship between the variables studied?". *Internal validity* is concerned with whether this relationship is causal. Assuming that there is a causal relationship, if the research actually is focused on the addressed subject and the results from this subject and no other, *construct validity* exists. If finally the executed study can be generalised to include a wider scope, the research also holds *external validity*. Thus the theory can be considered trustworthy to all outside observers.

By using an independent architecture as the foundation of the evaluation and designing the model to be simple and easy to explain using the chosen media of communication, we believe that it is possible to reach at least a construct validity. External validity can be reached, as in the case of reliability, by seeking patterns on a high level of abstraction and careful use of the theories in our frame of reference. The validity will be further addressed in the chapter Evaluating the Method.

The criteria of truth will be recognised during the entire work with this thesis and will be the foundation of the evaluation of the method and model, see chapter Evaluating the Method.

Building the Model

The strive for reliability is affecting all researchers inspired by the positivist perspective. Having initially chosen a positivist perspective it is important for us to use a structured and logical approach, thereby insuring high reliability. Before creating the model we felt a need to classify the area of research in order to approach it in a logic way. The creation of a model is also an attempt to use formal logic describing an area otherwise not easily explained.

For the interpretation of the results from a field study using the model, we have, as previously stated, adopted the systems approach. Using a perspective different from true positivism results become dependable of whom is conducting the research, the place of the research and the time of the research. These circumstances can never be fully recreated, and the concept of reliability consequently becomes less important.

Empirical Study

Though we consider the use of surveys the best choice of collecting data through the field study, this method has several major disadvantages. A survey may force the interviewee to generalise the answers and the possibility of detecting reluctance to answering is less. This reluctance will in many cases effect the given answers and will thereby lower the validity of the research. The interviewees may be unwilling to share information such as "trade secrets", try to stand out as better than he or she really is in comparison with others or try to give the answers he or she expects the interviewer wants.

Misinterpretations may arise due to unclear communication from both the interviewer and the interviewee, but by designing the query to be as simple as possible these misinterpretations can be minimised. We therefore consider this the best way of reaching the result.

The quality of interviews conducted by telephone or e-mail is lower than a personal interview. The main disadvantage is not the interview itself, but the risk of missing the opportunity of following up possible uncertainties (Lekvall & Wahlbin 1993). Since we during the research had the possibility to follow up with further questions to clarify uncertainties and misunderstandings, some of these problems were eliminated. This is discussed further in the chapter Communication in Theory and Practice.

Analysis of the Collected Data

A crucial variable when it comes to studies like this is how much the analyst is generalising the conclusions. The model used in this study, as

well as the methodology, is the base for the conclusions, but these are also influenced by our own interpretations. The risk with this approach is that the amount of data that the researcher is basing his opinion on is insufficient, and thereby leads in the wrong direction. We have been aware of this problem during the work with this thesis, and have tried to always base an opinion on as many sources as possible.

It can be argued that the methods and techniques used in a qualitative analysis to a certain extent are only vaguely structured and specified. This is however in the nature of such analysis. The interpretation of the results is based on the analyst, and therefore subjective. According to Lekvall & Wahlbin (1993), this can also regard quantitative analysis, since also data in the shape of numbers has to be analysed and interpreted.

CHAPTER SUMMARY

When reading the work of a researcher it is important to understand his or her views upon science in general, as well as how the researcher has chosen to conduct his work. The work in this particular thesis has however been influenced by several different aspects of methodology, due to the diversified nature of information systems research. The thesis therefore shows signs of both the positivist perspective and the interpretivist perspective.

When deciding on the workflow of how the research was conducted both qualitative and quantitative aspects were considered. During the entire process theoretical studies were an important part, repeatedly being of great importance, but the distinguishable phases were (in sequential order): Problem identification, Research perspective, Scientific approach, Model invention, Data collection, Interpretation, Analysis & Model Invention and finally Conclusions.

Ulf Nordström
Anette Westling

The Business Value

This chapter explains why it today is of greater importance than before to visualise the hidden assets of an organisation.

The chapter defines the so popular term *business value* and also discusses how business value can be created. All this is of course made from an information technology perspective.

The chapter is intended to present the background to our method, and explains why we believe that a tight connection between information technology and its organisational context is of major importance in any type of information systems research.

"You can see the computer age everywhere but in the productivity statistics."

(Robert Solow 1987)

INFORMATION TECHNOLOGY AND THE ORGANISATION

We believe that one of the keystones in the foundation for information systems research is the researcher's view of the relationship between information systems and the organisation activities. The two oppositions in this relationship are *separation* and *integration*.

The systems, stand-alone, hold no value to the organisation and a separation may therefore shift focus from relationship to technical aspect of information systems. An integrated view can on the other hand wrongly stress inflexibility in the ways of working. In our view information systems should therefore be considered being enablers for organisational activities and neither separated nor integrated.

This perspective where information technology supports the organisation activities is illustrated in Figure 5, shown below.

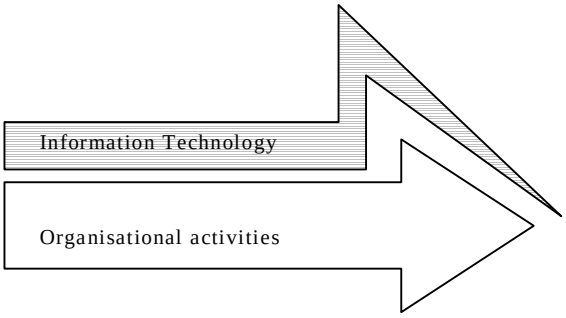


Figure 5 Information systems and organisation activity

As a conclusion of this, Information Technology must in research be seen as part of the organisational context. We argue that researching IT can only be successful when the conditions where it exists are regarded equally important. These conditions include, among other things, the corporate strategy. Understanding the co-existence of IT and its surroundings is the one way to find the value hidden in Information Technology.

THE BUSINESS VALUE OF INFORMATION TECHNOLOGY

There is no wealth but life. Life including all this power of love, of joy and of admiration. The country is richest which nourishes the greatest number of noble and happy human beings.

Ruskin J. (1862)

We believe that managers of tradition have focused on tangible assets, such as financial reports. Nevertheless is it of most importance that they, if they have not already, learn to focus and more efficiently benefit from the hidden values of the organisation. To do this we believe that the intellectual value, including the structural value, must be made visible.

The business value of information technology has during the recent years been frequently debated. While some authors tend to attribute large improvements of productivity to investments in IT, others argue that the investments not have had the large impacts searched for.

We believe that business administration today to a high degree is affected by the rules of the market economy and its associated demand

for long- as well as short-term profit. This implies that investments are valued based on their directly associated future cash flows. Other elements of importance might be market shares, growth and customer satisfaction, but these are often simply intended as indicators of the long-term future cash flows. The demand for profitability is therefore often a restriction to the management of most organisations. This is as valid in large corporations as it is in the public administration.

Productivity is a simple concept straightforwardly defined as the amount of output units produced per unit of input. While easy to define, productivity is however more difficult to measure in modern organisations. The measure needs to focus not so much on quantities of units as on value created. This business value is today increasingly depending on product quality, timeliness, customisation, convenience and a variety of other intangible factors.

Growth in productivity does by the definition not come from working harder, whereas increasing output in this case also requires increasing input. Growth has historically instead often arisen from the use of *general-purpose technologies*, such as the steam engine and electricity, and information technology can be considered the general-purpose technology of the 1990's.

When searching for new managerial ideas, measurements of business value associated with information technology are vital. Much like the public community has distinguished between production resources such as labour, land and capital, the executive management has therefore tried to distinguish its own measurable units. This has in the case of information management often created a false security when elements not measurable have been forced into measurable units (Hansson 1998). It is therefore our opinion that managers of today must learn to lead by subjective variables. This implies that a distinction between management information and financial information has to be made.

For the research of value contributed by IT, this is in line with the discussion earlier in this chapter. We argue that it is not possible to address the value of IT without regarding its context, but the specific value contributed can be easier found if the total value is broken down to separately identifiable elements.

A simplified definition of business value consists of both *the financial assets* of the organisation and *the intellectual capital*, see Figure 6. Material assets are well defined in managerial as well as financial accounting, but the intellectual capital has been subject to the attention of several recent authors.

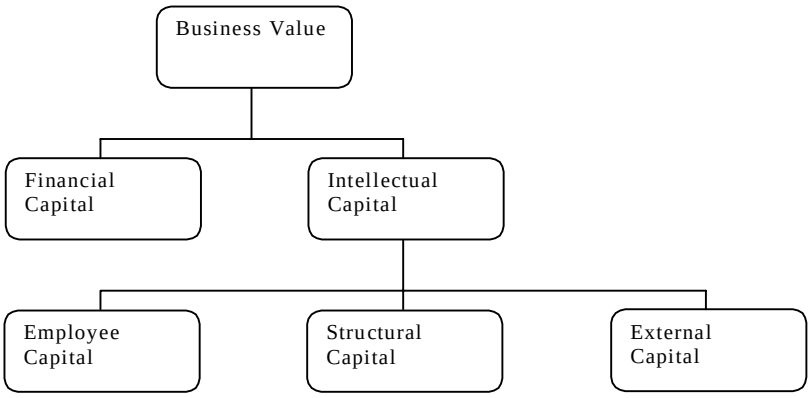


Figure 6 *Business value*
Source *Modification of Skandia 1995*

The intellectual capital of an organisation is the sum of *the structural capital* and *the human capital*. The human capital represents the skills and experiences of the employees viewed as individuals. The structural capital refers to procedures, competencies and know-how which from routines, IT-solutions or likewise is given a permanent form. Leif Edvinsson (1998) therefore argues that the structural capital has a higher degree of efficiency. The loss in intellectual capital an organisation suffers when a specific employee leaves is the human capital represented by the employee, whereas the structural capital of the organisation remains intact. Value can therefore be created by turning human capital into structural capital through, for example, the use of knowledgerecipe, a package of previously individual based knowledge (Edvinsson 1998). (Skandia 1995)

The reader should note the distinction between capital and value. We choose in this thesis to discuss the *value* created, not the *capital*. The difference, according to us, is that capital has been measured, thus given a unit. We argue that discussing the value is more significant when creating only an understanding of the hidden assets. A further discussion about the possibility of measuring value is presented in the chapter Measuring Value.

As presented in Figure 6 the external capital is separated from the structural capital. External relations can much like the employee capital be given permanent form, thus transforming it to structural capital. Consequently value concerning external relations must be addressed when researching structural value.

In this thesis we argue that a focus on the structural capital of an organisation is vital when searching for the business value directly associated with business tools. We will therefore in this thesis further explore how structural value is created from the use of these applications and the associated information technology architecture.

CREATING BUSINESS VALUE

With information technology being a part of the structure, thus creating structural value, it is important not to forget the context and the way it reflects the strategy of the organisation. It is not enough to base the value discussion only on the context of today, but also on future strategies. Although it is important to evaluate and build strategies on the current situation, the theory presented below will show that the strategy must nevertheless be adjusted to the environment and the visions of the future adopted.

Since the above discussion has highlighted the importance of researching structure in relation to the strategy when finding value, these two must be the keystones when creating business value. In literature on strategy a debate has been taking place, arguing whether strategy determines structure (Chandler 1968) or if strategy follows structure (Hall & Saias 1980). Chandler ends a classic article with the conclusion ”Unless structure follows strategy, inefficiency results”. Hall & Saias prefer to reinterpret the sentence to ”Unless structure matches strategy, inefficiency results”. The key to understanding the different views are to closely study the perspectives the authors use in their arguments. This shows that Chandler focuses the analysis on the internal structure of the organisation, while Hall & Saias has a wider focus. Chandler's narrow focus affects the validity of the argument, and it is our opinion that in accordance with the theory of cumulative validity, see the chapter Methodology, external validity has not been achieved. The theory therefore can only be considered true for a shorter period of time. A conclusion of this argument is that Chandler's theory of strategy and structure is valid for a shorter period of time, when the argument made by Hall & Saias is to be considered valid for a longer time-period. Thus must the strategy in the short run match the structure, but for an organisation to survive over time the strategy must be adjusted to the preconditions set be the surrounding environment and the structure follow this strategy.

In accordance with this, strategy should be influenced both by the organisation’s vision of the future and its current situation. Different aspects of strategy are to be combined in order to reach the best total solution. For the organisation to survive over time it is not enough to

consider only its own environment, but also the external environment. In the case of information, Davenport (1997) relates to this as information ecology, consisting of *information environment*, *organisation environment* and *external environment*, where all three must be considered in order to create a working strategy. With this approach he argues that a comprehensive strategy is becoming increasingly important for the organisation, as information and the use of information is adding structural value to the organisation.

CHAPTER SUMMARY

Traditionally managers have focused on tangible assets. This was sufficient when productivity improvements came from sources more easily understandable. The improvements associated with investments in information technology has however shown to be more difficult to understand, and their value hidden. Visualising these hidden assets of the organisations becomes even more important than before, due to growing demands on management functions as well as the increasing cost of IT investments.

When searching for the business value created by information technology we believe that a focus on the intellectual capital is useful. The *intellectual capital* makes together with the *financial capital* the *business value* of an organisation, and can be divided into *employee capital*, s*tructural capital* and e*xternal capital*.

In this thesis we have chosen to focus on the value of business tools and the structural capital has therefore shown to be a useful concept. This capital can be described as procedures, competencies and know-how, which from IT-solutions is given a permanent form.

When creating business value, structure (i.e. information technology) and strategy must work together. On a short focus of time strategy must match the structure, but if the organisation is to be successful over time the strategy must be created regarding the surroundings and the structure follow this strategy.

The Strategy

This chapter introduces the reader to information strategies. Together with the chapter *The Structure* this will give an understanding on the foundation stones for how business value is created and thereby form the base for the model presented later.

The chapter is intended to further demonstrate the necessity of combining information systems research with the organisational context, here in form of the information strategy of the organisation. To better explain the influence on our method, different perspectives of strategy are also described.

"Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where--" said Alice.

"Then it doesn't matter which way you go," said the Cat.

(Lewis Carroll, 1865)

As previously stated, evaluating application portfolios is important for the purpose of visualising hidden value and justifying IT investments. This chapter argues that an evaluation is also important when building new strategies. We believe that this gives the reader a more solid understanding of information strategies

Since focus in this thesis is the management of information, and how to visualise hidden value in the use of information technology, we will here discuss strategy most relevant to these issues. For readers wanting a more specific knowledge of other strategic issues we recommend for instance Exploring Corporate Strategy by Johnson, G. & Scholes, K. (1999).

INFORMATION STRATEGIES

When it comes to decisions about information systems, a difference can be seen between *information technology* (IT), *information systems* (IS) and *information management* (IM). The relationship between these is

somewhat complex, but information systems can be considered an instantiation of information technology (Lee 1997). Admitting to the difference between these different definitions of information-related issues does, according to us, also mean accepting the need of applying the organisational strategy in different ways. The relation between IT strategy, IS strategy and IM strategy can be better described regarding their different focus, as shown below in Figure 7.

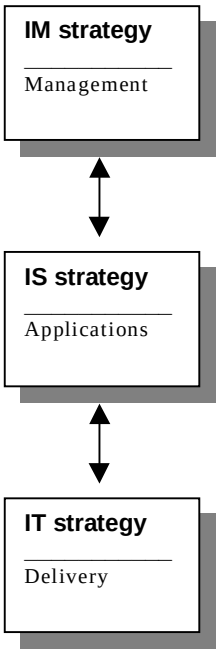


Figure 7 Three levels of strategy in IT
Source: Visualisation of Earl 1994, p. 21

On a corporate level, information management (IM) strategy focuses on the global business and the managerial issues of information. Information systems (IS) strategy is associated with a business level and focuses on the product market. This level of strategy is primarily concerned aligning business needs with proper information system supply. In a large organisation several IS strategies may be needed, responding to the demands of each of the individual business units. Information technology (IT) strategy, finally, focuses on delivery and is primarily concerned with technology issues. It can therefore be considered being an activity based strategic level. (Earl 1994)

Decisions regarding the structure in an organisation do not regard only the IS strategy, but also the other levels. In many cases the largest

improvements can be made on the overarching IM strategy level, thus affecting the other levels as well.

In order to formulate a valid IS strategy, or application strategy, the other levels of strategy must be taken into consideration.

FORMULATING THE APPLICATION STRATEGY

When implementing IT-solutions several or all parts of the organisation need to be concerned and many issues must be addressed if an investment in technology is to be economically efficient. IT is an enabler for smoother workflow in organisations, but extensive IT-solutions may imply that changes in the organisational structure or the adopted strategy must be carried out. Keen (1991, p. 19) argues for the importance of aligning business and technology: "It makes no sense to [...] build a comprehensive technical platform without the business plans to exploit it".

Also Earl (1989) agrees on that IT can not be considered an isolated matter for the company, adding that "[…] no single IS strategy formulation will work" (Earl 1989, p. 69). He argues for a multiple strategic approach, see Figure 8, shown below.

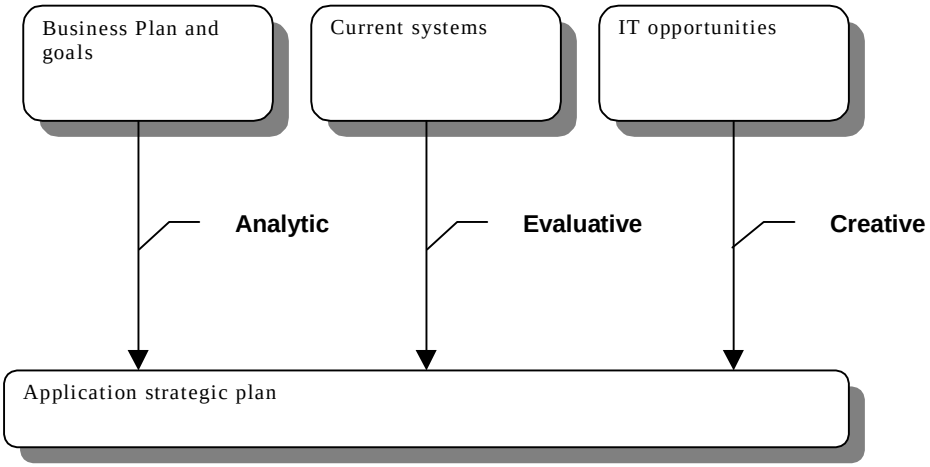


Figure 8 *A multiple strategic approach*
Source *Earl 1989, p. 71*

Figure 8 describes the connection between the different issues a company has to tackle in order to create and formulate a working application strategy. There are three important tasks:

- Clarification of the business needs and strategy in information systems terms.
- Evaluation of current information systems provision and use.
- Innovation of new strategic opportunities afforded by IT.

The analytic approach of the model derives from the need of organisations to translate goals and the associated business plan into information systems needs. This is an approach where the goals needed to meet the business vision are first clarified. These are then broken down into critical processes or activities important in order to meet these goals. Thereafter the needs of information systems that are required to support the processes are determined.

The evaluative approach is based on that in order to make a successful change, knowing what is about to be changed is necessary. This might not seem like a very strategic task but serves several important purposes. The top management is often not informed about the current IS-position of the firm and needs to be updated on the situation in order to understand the organisation's IT capability. It is also important to demonstrate the quality of the IS in order to keep up the credibility of the business. IS-strategies are rarely developed from a clean sheet, without regards taken to the strengths and weaknesses of the current application portfolio (Davenport & Stoddard 1994). Also, examining the current systems might suggest that some might add a significant value to the organisation by being better exploited.

The creative approach has a creative character where the objective is to establish a plan for how to ensure efficient management of new opportunities. New ideas and opportunities may rise from many different parts of the company. IT enabled opportunities that can create structural value, competitive advantage and new strategic options as well as a plan for how to manage these is therefore vital.

UTILISING THE STRATEGY CONCEPT

The creative approach is based on the existing organisational structure. In the short run this structure can be allowed to influence strategic decisions, but as argued earlier it is necessary to let strategy lead structure when searching for the long-term profits.

We will therefore further concentrate on the analytic and the evaluative approaches, and their interplay, when discussing the business value of applications in an organisational context. The two remaining "legs" focus the same combination of strategy and structure as we have discussed earlier. In order to create an effective application strategic

plan both approaches must be used for their respective purpose, combining the vision with the current preconditions.

This further implies that all research in the area of information technology must be done with consideration to what vision the organisation want to reach, and what actions it takes to get there.

CHAPTER SUMMARY

Creating strategic plans matching preconditions set by the surroundings is of vital importance when searching to create business value. This is why the strategy of the researched organisation is of vital importance in our presented method. Strategy has however several levels and we have therefore chosen to adapt the division information management strategies, information systems strategies and information technology strategies, where IM-strategies can be seen as the highest level of strategies while IT-strategies is the lowest. In order to be successful all three levels must be thoroughly considered.

We have presented three different approaches to strategy within the information system area; the analytic, the evaluative and the creative. We will concentrate our further research on the combination of the analytic and evaluative approaches, since we, in line with earlier chapters, believe that information systems research hold no value without regards taken to the organisational context.

The Structure

This chapter introduces the reader to information technology architecture. Together with the chapter *The Strategy* this will give an understanding on the foundation stones for how business value is created and the later presented model.

As described in earlier chapters we see a necessity of researching any IT-structure being firmly rooted in the knowledge of the organisation's strategy and vision. This is why both strategy and structure have such an impact on our method.

As argued in the chapter The Strategy, the structure must be determined by the strategy, and IT strategy can be seen as the strategic level shaping the information technology structure, in this thesis referred to as the IT architecture.

It is important to remember that the IT architecture is a tangible, existing, structure that distinguishes itself clearly from the strategic elements. For evaluating purposes it can be used in combination with other aspects of the organisation, but it is of no use to evaluate it separately.

THE IT ARCHITECTURE

The architecture is the IT infrastructure and we argue that when looked upon from a structural value perspective, five contributory elements can be distinguished, see Figure 9. These elements have been derived from discussions between the authors. When using the architecture in the later research no need for additional elements has arisen, and we therefore argue that the architecture at least includes all relevant elements. When creating the model, see chapter The Model of Evaluation, we have felt each of these could be focused and used separately. We therefore argue that the architecture can be seen as valid.

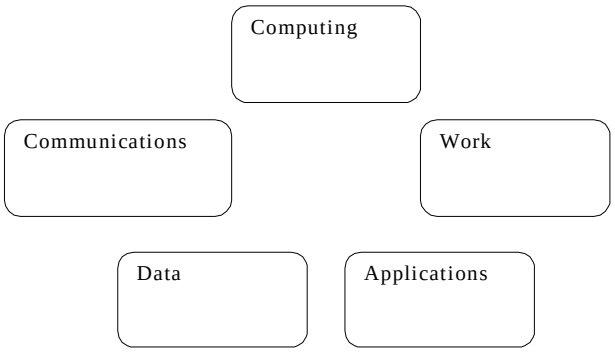


Figure 9 IT architecture

The element *Computing* represents the information processing hardware and operative systems. *Communications* are based on networks and the possibilities to establish electronic connections. This includes both protocols for exchanging data electronically and the bandwidth on available physical connections. The use, access, control and storage of data are included in *data* and the main application systems used in the organisation, their functions and relationships and the development methods are comprehended in *applications*. In this thesis we have distinguished between two different categories of applications, corporate systems and best of breed systems. These two categories are further discussed under the heading Applications.

To complete the architecture we have added the element *work*. This element represents processes and work routines. The element distinguishes itself from the others by technically not being a part of the IT architecture. It is nevertheless the basis for technological decisions and is also a vital source from which structural value is to be found.

The five elements of IT infrastructure can be focused separately, but the possibilities of IT becomes clearer when their interrelations are highlighted. A corporate system for instance effects the communication between system, the way data is stored and possibly also the operating system (computing) required running the applications. The model used in the field study, see the chapter The Model of Evaluation, is based on these relations.

Data

Data is the building materials of information. Data will become information when packaged for a particular purpose, for example when economical data is compiled to an economical report. Information is not knowledge but an important brick for the evolution of knowledge.

(Free translation of Hedberg et al 1998, p. 9)

Business value can be extracted from data by the use of proper applications in combination with communications. An example of this is *data mining*, the process of intelligently extracting hidden trends and information from corporate databases. This is often referred to as Knowledge Discovery in databases, and involves the repeated application of specific data mining methods or algorithms and the interpretation of the patterns generated by these algorithms (Dell'Orto 1997). Two related tools for this purpose are *On-line Analytic Processing* (OLAP) and *Data Warehousing* where the objective is to turn data into effective business decisions, thus transferring vast amounts of data with little business value into high valuable manageable knowledge. The transformation is shown in Figure 10.

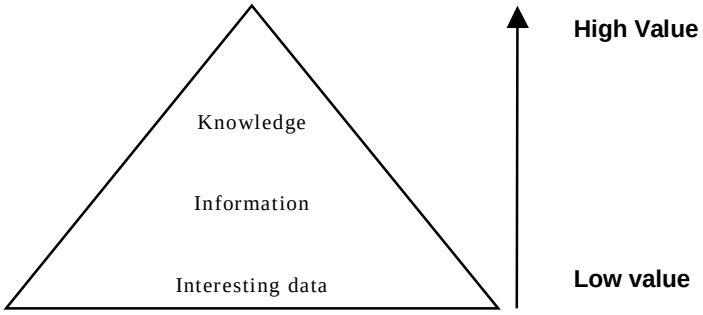


Figure 10 Information value
Source McLauren 1998

The extraction of data can be performed in three steps:

– Data selection
– Data preparation
– Modelling

The *data selection* step extracts the data to be mined from a pre-user-defined query selection or a random selection creating a representative sample of the database.

The *data preparation* step transforms the raw data into an appropriate for model generation.

The most important part of the process is the *modelling* step where various techniques are used to produce knowledge in form of classifications, clusters, associations, sequences or forecasts.

Communications

Electronic communication is a powerful tool for creation of business value from the use of business tools. Communications enables swift and accurate transaction of information between applications and therefore enhances the capabilities of process oriented work. From choosing an enterprise integration system application integration usually comes built in. The downside of this is a vendor dependency, which might make electronic communication with other applications difficult to achieve.

An alternative to communications established by enterprise integration systems is the modularization solution where all applications exchange information though common and predefined interfaces. The alternative foremost requires standardisation. This must take effect on several levels:

- Standardisation of concept.
- Standardisation of interfaces.
- Standardisation of routines and tools.

A model of this concept is *the Publish & Subscribe model*, based on one common interface. Applications creating data publishes to the interface and all applications demanding information subscribe. In an extend version of this model the borders between each application becomes less obvious and their geographic location insignificant. Instead high bandwidth communication is essential.

An important aspect of communication is security and the possibility of encrypted transactions. This becomes even more important when transferring data in a global corporation using the publicly accessible Internet as the medium of communication.

Computing

"At VeriFone we believe in Ford Fairlanes and Chevy Impalas. If you're just using e-mail, there's no reason to have a Pentium. You don't need a Ferrari to drive to the supermarket. You don't need the latest wireless device to enter the information age; you can do it with today's technology."

(Pape, Chief Information Officer at VeriFone, 1997)

When formulating the hardware policy for a corporation it is important to stress that business value is not created from the use of excessive computing power. Costs can therefore be reduced when only using adequate power.

The information processing hardware associated with computing is for obvious reasons a material asset to the organisation. The real value however derives from the appropriate use and selection of hardware. Value is created through a uniform machine park. This is addressed in the ESOE program, described in Appendix iv, specifying the hardware as well as operative systems of choice available. This will for instance allow applications to more easily be transferred from one unit to another minimising the local adaptations needed.

Work

Davenport & Short (1990, p. 12) defines a process as "a set of logically related tasks performed to achieve a defined business outcome". An other definition is presented by Hammer & Champy (Goldkuhl 1995, p. 6, referring to Hammer & Champy 1993) defining the business process as "A collection of activities that takes one or more input and creates an output that is of value to the customer".

The important characteristics of a process are *customers* and *the crossing of organisational boundaries* (Davenport & Short 1990). Processes have a defined outcome received by a customer. This customer can be either internal or external. By following the flow of a process it is possible to co-ordinate the work of different organisational sub-units. Without this focus each sub-unit might optimise its own part of the work, thereby creating sub-optimisation counteracting the process in whole.

Central in Hammer & Champys definition is the *transformation* of input into output, the result of the process. Noteworthy is that the definition does not mention the actors achieving the transformation, but instead focuses on the customer receiving the output. The later definition also

refer to the tasks as *a collection of activities*, in contrast to Davenport & Shorts definition arguing for *logically related tasks*.

Business process redesign (BPR), sometimes also referred to *as business process reengineering*, is one of the most influential managerial tools for transforming organisations during the 1990's. It can be described as the analysis and design of work flows and processes within and between organisations and one of the most useful enablers of process redesign is the information technology capabilities.

During the years IT-related strategy issues have often been the responsibility of IT-departments, but are today more commonly attracting managerial attention (Keen 1991). The assignment of responsibilities concerning IT-related matters is closely connected to how processes within a company are supported, as well as to the company's organisation in total. Falk & Olve (1996) argues that the top management has the responsibility for the company's information strategy and therefore also for its IT-strategy.

The premise an organisation exists within is continuously evolving, and in order to operate efficiently the organisation has to adjust accordingly. Flexibility is therefore of crucial importance to process management and the possibility to alter processes can not be restrain by information systems. There is otherwise a risk that the corporation is kept out of important business opportunities, when they are not able to change existing solutions.

During the later years many authors, among them Keen (1997), are arguing for more insight when it comes to process management. The main focus should be to create business value and it is therefore important to carefully choose the processes worth the effort put in. A vital part of process management is therefore to find the processes that make a difference in the company and concentrate the work on these.

Applications

In this theses we will be making a clear distinction between *corporate systems* and *best of breed systems*. Corporate systems, *Enterprise Resource Planning* (ERP), or *enterprise integration systems* as they are also known are large systems integrating across organisational functions. Dewan, Seidmann & Sundaresan (1995) defines a best of breed system as when each department in an organisation independently picks a system that fits its needs best. To improve the validity of the theories we have decided on a more general definition of best of breed systems. This defines the best of breed system as the application giving a specific sub-process the best possible support. The application can be an existing tool currently used somewhere within the global

organisation, an existing tool to be purchased from an outside vendor, a tool being developed or a specification of a possible application to be developed. A best of breed system may consequently lead to sup-optimisation of the global process.

Numerous articles are providing IS managers with contradictory recommendations about whether or not to deploy an integrated solution, including corporate systems. The benefits of this solution are obvious. When implemented the system will allow the firm to co-ordinate its activities across multiple functional, geographical and product based units (Davenport 1996). The integrated solution however has drawbacks. The routines supporting the processes may not be the most appropriate to the needs of the corporation, the corporation also becomes highly dependent of the software provider and costs for customising solutions may be high (Findahl et al 1998).

An economic analysis of systems used in a corporation can be derived from Figure 11, shown below. This model considers two departments that may be using different applications.

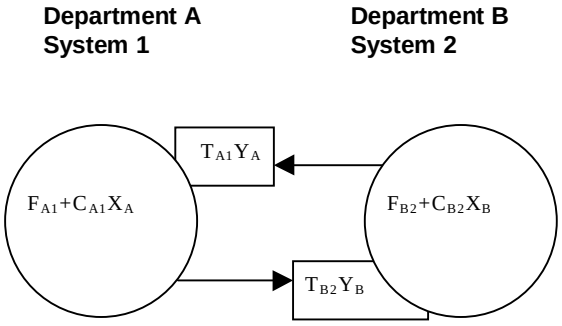


Figure 11 *Cost structure for two departments*
Source *Dewan, Seidmann & Sundaresan 1995, p. 99*

The tasks performed by the departments are simplified to include document processing and exchange. The cost components to be considered are:

F	Acquisition cost.
C	Unit document processing cost.
X	Volume of documents processed.
T	Unit translation cost.
Y	Volume of documents transferred.

S Switching cost.

The acquisition cost represents the cost of purchasing, installing and training associated with a particular system. F_{A1} is the cost of department A acquiring the system 1. Though not argued by Dewan, Seidmann and Sundaresan, this cost can also be considered include a maintenance cost. Effects from two or more departments purchasing the same systems are *joint purchase* and *delayed purchase*. These will effect the cost paid by one or more of the departments and reduce the cost for one or more of these.

The document processing cost (C_{A1}) represents the cost of processing a document using the designated application 1 at department A, also including the cost of the time consumed performing the processing. X_A represents the volume of documents by department A. Y_A represents the volume of documents received by department A. In a generalised model, we argue, this cost can represent the general cost of performing the assigned task using the designated application.

The translation cost (T_{A1}) represents the cost, including the labour cost, of translation and reformatting a document from a foreign application to one accessible by the designated system 1 used at the department A. In a generalised model, we argue, this can represent the cost of any interchange between two systems, manually or electronically.

The switching cost (S_{A1}) represents the cost to switch to the system 1 at department A.

This model can theoretically be used to build a decision model for determining corporate preferences of when to deploy or not to deploy a uniform standard. However the value of such a model is theoretical. We argue that the significance of the model is low due to difficulties estimating accurate costs and that it has to be rejected due to concern to the criteria of truth. Nevertheless is it our opinion that it can be useful in explaining the corporate standard versus best of breed dilemma.

USING THE IT ARCHITECTURE

It is our intention that the architecture presented is a general representation of IT resources in an organisation. It is therefore our opinion that it can be of use in any information systems research.

In this thesis it will be used as the structure interplaying with strategy in the creation of understanding of the business value contributed by the applications.

CHAPTER SUMMARY

As argued, the structure, in form of the IT architecture, is together with strategy the keystone to creating or understanding structural value. The IT architecture presented in this chapter can however be used describing any general IT infrastructure.

The IT architecture can be viewed as five contributing elements. *Data* represents use, access, control and storage of data. *Communications* represents opportunities created by networks and electronic communications. *Computing* represents the information processing hardware and the operating systems. *Applications* represent the applications used in the organisation, the functions of these tools and the methods of application development. *Work*, finally, represents processes and work routines.

With the structure and strategy as base for our method, we can move on to the more specific parts; the model and the method-inspired use of the model.

Ulf Nordström
Anette Westling

Measuring Value

This chapter introduces the reader to the difficulties of measuring business value. An early attempt to measure business value in combination with the technical quality of applications is presented, before our views on why it may be of greater importance to create an understanding of hidden assets of business value then to actually measure the value finally are presented

The concept of measuring is tempting, since it would make it possible to relate the value contributed by an application directly to the market value of the organisation. This would make it easy to create strategies and make decisions concerning the IT infrastructure.

However, we believe that the concept of measuring is not explicitly applicable in our method, and we believe that our model and field-study must be adjusted to this. We will in this chapter explain why the aim of creating an understanding of how value is created is more important than trying to measure the value itself.

DIFFICULTIES IN MEASURING VALUE

"Studies that attempt to relate IT expenditures directly to firm level output variables ignore the web of intermediate processes, where first order effects exists."

(Mooney, Gurbaxani & Kraemer 1995, p. 18, referring to Barua, Kriebel & Mukhopadhyay 1995)

Among information system researchers there is little consensus about the nature of IT business value. Attempts have often been made to measure the output or end product value of IT but these have mostly failed. Mooney, Gurbaxani & Kraemer (1995) summarise the impact of IT business value and productivity in four lessons:

– Studies based on output measures of IT impact have been of limited value in developing an understanding of IT impacts.

- There is an emerging view that adopting a process perspective holds the key to additional insights into the IT business value issue.
- Measures of productivity need to be expanded to capture the impact of contemporary IT use.
- There is a need for a greater recognition of the importance of organisational context and competitive position in studies of business value.

Research presented by Brynjolfsson & Hitt (1998) suggests that the greatest benefits of computers appears to be realised when computer investments are combined with complementary investments, new strategies, new business processes and new organisations. The reasons for the productivity paradox, as presented in the quote opening the chapter The Business Value, are therefore, we argue, not as much inefficiency of information technology as a lack of adequate alignment of responsibility structures and limitations caused by managerial and financial accounting.

THE SYSTEM AUDIT GRID OF EARL

An early attempt to evaluate applications was made by Earl (1989). It is not an attempt to explicitly understand the structural value and instead aimed at suggesting future actions concerning the applications.

It is our opinion that the evaluations fails, since the scope of the audit is to narrow. Many contributing elements have been left out, the most vital of these being the strategic aspect of the applications. The audit has nevertheless inspired us in our search for a more complete model, and is therefore of importance.

The Grid

Earl (1989) suggests that a system audit should focus on business value and technical quality. He argues that the business value can be estimated by asking the system users the following questions:

- What is the impact of the system on the business/what would happen if we took it away?
- How easy is it to use the system?
- How often is the system used?

The technical value can be estimated by asking concerned technicians the following questions:

– How reliable is the system?
– How easy is it to maintain the system?
– How cost-efficient is the system?

Analysing the answers to these questions makes it possible to place each system in the system audit grid, see Figure 12 shown below.

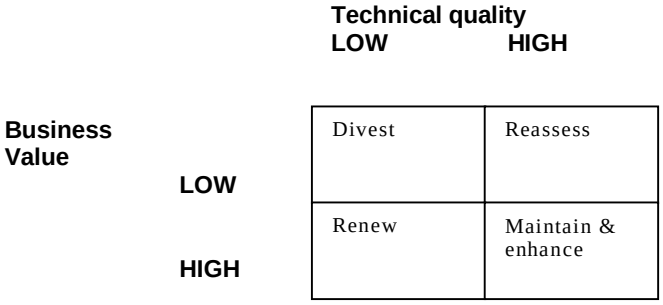


Figure 12 Systems audit grid
Source Earl 1989, p. 74

As shown above the grid classifies the examined systems into four distinguishable conditions suggesting different actions.

An application rated low on both dimensions should be *divested*. These applications may never have been rated higher due to improper development procedures or has simply been outdated due to changes in business or technological conditions.

Applications rated high on business value but low on technical quality are potential business exposures and are not uncommonly applications running beyond their expected lifetime. In these cases proper system maintenance management might have been neglected. A more appropriate management, with assignment of responsibilities and established routines, would have detected these weaknesses and already called for appropriate actions (Bergwall & Welander 1997). Applications identified in this condition are in most cases in need of *renewal*.

Applications rated low on business value but high on technical value may have been developed without adequate support and commitment from the users. Before eliminating the application a *reassessment* is needed to decide if it can be enhanced to add business value.

Finally, applications rated high on both business value and technical quality should be given priority for any *maintenance or enhancement*

needed. Unless they are properly maintained they may easily turn into business exposures. (Earl 1989)

In our opinion, what Earl wants to focus as business value can be interpreted as the structural value, earlier defined in the chapter The Business Value.

Criticising the Audit Grid

It is our opinion that the audit grid presented by Earl (1989) fails in measuring the business value, but instead measures the functional value of the system. We believe this can be explained by the research perspective influencing Michael Earl. Earl seems to have adopted a too strict positivist perspective, paying little or no attention to the organisational context the application exists in. With this context in mind we argue that the business value of an application better can be focused.

CREATING AN UNDERSTANDING

"When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science."

(Lord Kelvin, British physicist, 1890's)

The attempts to measure structural value, thus giving it a unit, will in our opinion most likely be unsuccessful. The reason for this becomes clear when examining the overall reasons for the measuring, the search for data comparable to financial keyvalues suitable for financial reports. As previously argued we have made a distinction between financial information and management information, but the reason for measuring value must in the case of applications nevertheless be to justify IT investments. IS researchers has to our knowledge yet to find methods for transforming technological data to reliable, and more important valuable, management information.

One of the keystones in this thesis is that while unable to measure, it is important to create an understanding of the business value contributed by the structural value of applications. The viewpoint once submitted by lord Kelvin is therefore in our research to be considered outdated.

CHAPTER SUMMARY

Finding productivity improvements directly associated with investments in information technology has shown to be very difficult, a paradox known as the Solow-paradox. It has even been argued that there is no improvements to be found, but we argue that the paradox instead has its reason in problems aligning investments and improvements in IT with information strategies, as well as responsibility structures and limitations caused by managerial and financial accounting.

An early attempt to measure business value in combination with the technical quality of applications was made by Michael Earl in 1989. In his audit grid the business value was captured by asking the questions:

- What is the impact of the system on the business/what would happen if it was taken away?
- How easy is it to use the system?
- How often is the system used?

The technical value was also captured asking the following questions:

- How reliable is the system?
- How easy is it to maintain the system?
- How cost-efficient is the system?

Analysis of the answers made it possible to later suggest necessary future actions regarding the system. Remembering the different research perspectives presented in the earlier chapter Methodology, it becomes obvious that Earl had adopted a strict positivist perspective. This perspective will however force any researcher to simplify the impacts in information technology beyond reasonable limits, and we therefore suggests that instead of measuring and classifying systems, creating an understanding of the structural value of a system is enough.

The aim of our method will therefore be to create an understanding for both the complexity of information system research and for where the value of applications is created.

Ulf Nordström
Anette Westling

The Model of Evaluation

This chapter presents a model for how the structural value of application can be visualised and is based on the previously presented elements strategy and structure. As a part of the model a query is presented and we ask the reader to note that this particular query is highly influenced by the preconditions at Ericsson Radio Systems AB.

This chapter, and the previous, forms the more practical part of the method, and they are intended for use in the field study.

In earlier chapters we have discussed the need of combining strategy and structure in order to understand the business value created by the applications. Regards must be taken both to how the application is interacting with other parts of the structure and to the influence of the organisational context, i.e. the strategic purpose of the application.

THE MODEL

The model we present in this chapter is designed influenced by the organisational context, and is meant to reveal the business value of the business tools. We argue that possible business value can be revealed using the IT architecture as a solid foundation for the structure. This value is however only realised when, as previously argued, the structure is combined with the strategy. This model is visualised in Figure 13, see below.

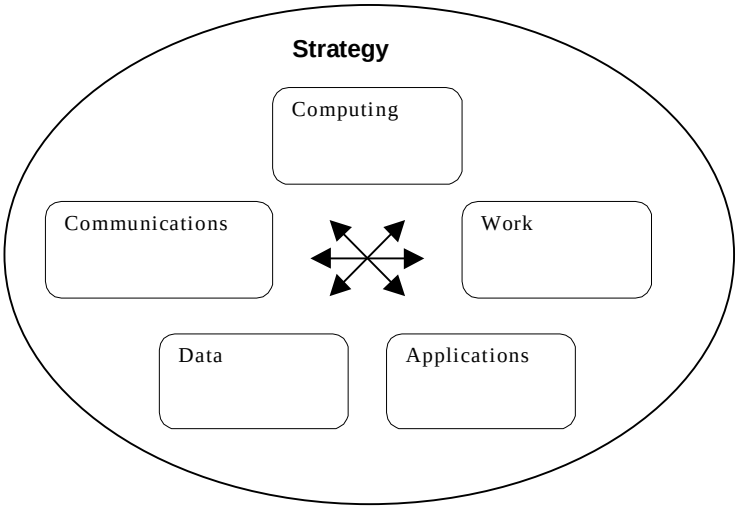


Figure 13 The model of evaluation

We argue that the relations between the elements of the IT architecture can be used for deriving possible structural value. In this thesis we have chosen to focus on the applications, and therefore the relations between applications and the remaining elements are of particular interest.

Finding Possible Business Value

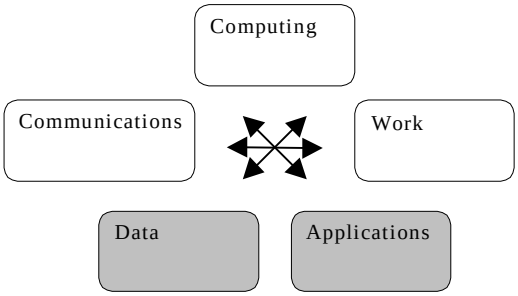
In order to understand the value created by an application we claim that the first step is to scrutinise the structure. By examining the relations between the application and the other elements of the IT architecture a set of possibilities can be collected. This enables the researcher to use a structured approach to the data collection, which can be performed through queries and/or interviews, combined with information retrieval through other sources.

The scrutiny of the structure can be divided into two parts. The researcher first needs to define a query that extract the information needed from the structure. The query, we argue, must be designed with consideration to the particular preconditions set by the field study. Thereafter the query is used to collect the needed information, describing the possibilities provided by the unique structure of the research object.

The second step is to analyse the collected information from a strategic perspective. This will be discussed further under the headline Utilising the Possible Business Value later in this chapter.

The query presented below is influenced by the unique preconditions set by the field study at Ericsson Radio Systems. As an example the questions are all designed to be easily communicated through a media limited in information richness.

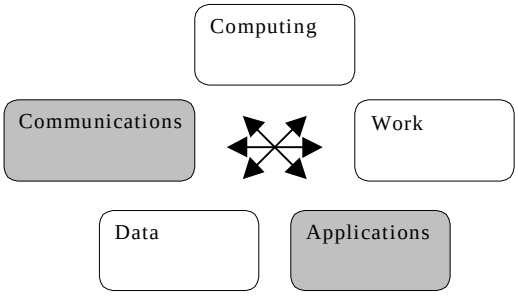
Data - Applications



– Electronic interconnections with other business tools

Considering the IT architecture shown above, see Figure 9, structural value can be created by appropriate electronic transactions and communication of data between systems. This value is measured by focusing on each system's built in capability to electronically interconnect with other systems. If the connecting system is, for example, a database that is updated by the system or itself updates the system, the importance of this relation becomes high. This since the exchange of data, or use of data from the same source, helps keep the total IT-architecture free from inconsistent data.

Communications - Applications



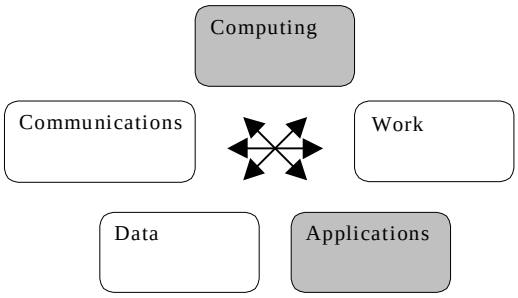
– Electronic interconnections with other business tools
– Assigned bandwidth

Structural value is not only derived from efficient use of data but also demands communication capabilities. This aspect is captured by the same question as above. In an attempt to simplify the query, the security aspect of electronic interconnectivity has been disregarded.

Applications demanding communication capabilities are far from their potential value if the assigned bandwidth is inadequate. This demand applies both to the internal communication as well as the communication between the local companies and RMOA in Sweden.

By asking for the interconnections with other tools, it can be understood if the applications are supporting the workflow, including the switch between different parts of the process, and if results from earlier work are reused further on in the process.

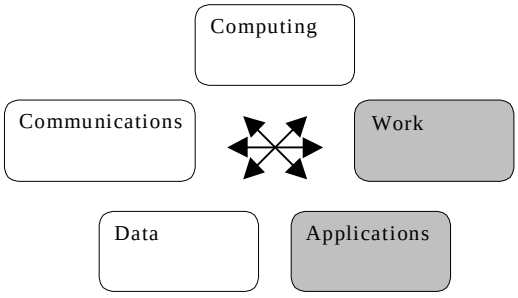
Computing - Applications



- Technical platform
- Technical platform supported in the future

The platform the system is running on is vital due to possible corporate directives concerning the hardware used in the global organisation. No such directive has come to our attention, but it is not unlikely that such directives will emerge in the future.

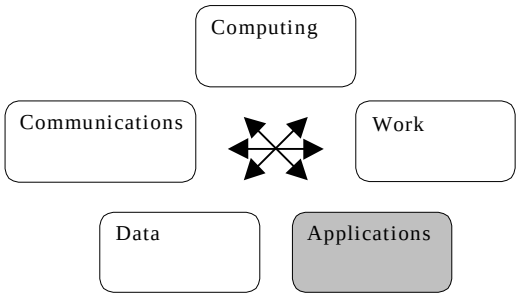
Work – Applications



- Support to the sub-process
- Use frequency

How well the application is supporting the sub-process is together with how often the system is used an attempt to estimate the importance of the systems in the daily routine work. Opposed to the questions concerning only the application element, evaluating how well the application does what it is designed for, these questions aim to capture if the application does the right thing.

Applications



- User friendliness
- Reliability
- Known Y2K problems

As mentioned above, these questions aim at evaluating how well the application does what it is designed for.

Examining how user friendly a system is might be interesting but is in our opinion a measure of functional value. Nevertheless we consider this relevant and have therefore included this part of the functional value in the technical value, see below.

The reliability of the system describes how well the system is functioning, not concerning its environment but instead standalone or possibly also concerning technical aspects of the system when communicating electronically with other systems. For instance the reliability can be estimated by measuring how often system crashes occur.

Year 2000 problems can be of major importance when deciding on the future of an application. The weakness in the question is that it fails to describe planned future maintenance regarding these problems, but in an attempt to simplify the questioning we have decided to focus on the present state of the applications. Nevertheless will planned maintenance in other ways be regarded in the evaluation.

Utilising the Possible Business Value

The second step to understand the value created by an application is to analyse the collected information from a strategic perspective. This analysis can however not be done in the same structured way as the data collection. It should therefore be noted that what we have presented so far is not an easy to follow guide to how the results from the evaluation should be interpreted.

We argue that a strict positivist perspective on the interpretation, as suggested by Earl (1989), is bound to fail. Instead of creating an explanation we believe that the model should be used for the creation of

understanding. With an awareness of how information technology is evolving and increasing its potential as a business enabler, as well as of the organisation unique context the applications exists within, we believe that it is possible to efficiently interpret evaluations based on the systems approach used in the thesis.

When analysing the data all levels of strategy must be considered, not only the IT strategy closest to the application. The IT strategy focuses, as described in the chapter The Strategy, on delivery and is primarily concerned with technology issues. The perspective therefore is too narrow to represent the total organisational context, and all three levels of information strategy should instead influence the analysis. We therefore suggest that the final analysis is done in consultation with persons together having a thorough knowledge of all three levels.

Key Issues

In order to fully utilise the possible business value we see a need of understanding the interaction between the different elements in the IT architecture, but also the interaction with the underlying strategy. Without understanding the connections between structure and future and current strategy, there is no use in evaluating a certain tool, or set of tools. This understanding is influencing the interpretation of the questions asked in a company specific query, but it is necessary to have it in mind also when designing the questions asked.

In the case of Ericsson, we have to a certain extent designed the query to be company specific. Two of the criteria asked for can be derived directly from strategic decisions. These were also determined to be of such direct vital importance that they could not easily be categorised as business value or technical value. We argue that these are of such importance that they are determining whether an application needs to be evaluated at all and are therefore classified as *key issues*. This further contributes to the idea that it is important to combine both structure and strategy.

The identified criteria are:

- Will be replaced
- Is/Will be ESOE-certified

The first criteria, *Will be replaced,* concerns decisions made regarding the future of the application. RMOA TTC Business Tools are currently developing several new applications and the Ericsson Global Business Model (EGBM) (further described in Appendix iii) includes a worldwide SAP R/3 implementation. Business tools known to be replaced by any of these systems are therefore not to be evaluated. Asking what system the

application will be replaced by serves no direct purpose for the evaluation, but is intended as background information.

Also the second criteria, *Is/Will be ESOE-certified*, is of major importance to whether an application should be object for further evaluation. The Ericsson Standard Office Environment (ESOE) certification is an ongoing project within LM Ericsson, aiming to standardise the PC-environment at all users around the world. Any future use of not ESOE certified applications is limited to isolated, non-integrated local installations and they can therefore not be candidates as best of breed systems. In accordance with this, they are not likely to provide the best process support in the global perspective. ESOE is further described in Appendix iv.

CHAPTER SUMMARY

As previously argued, strategy and structure must be sufficiently aligned if all possibilities of creating business value is to be utilised, and regards must therefore be taken to how an application interacts with other elements of the IT architecture, i.e. the structure, as well as all levels of strategic decisions.

The purpose of the model is to understand the value created by an application and the first step is to find the possible value contributed by the application. The following step is to examine how these possibilities created is utilised.

In order to find possible value the interrelations between the five elements of the IT architecture is to be analysed. From this analysis a query, later used to collect needed information, is extracted. For instance the relation between the elements Data and Application reveals the possibilities created by electronic communications between applications, providing the means for the use of common data. As another example the interrelation between Communications and Applications reveals the necessity of adequate bandwidth providing the means for electronic communication. As the final part of the first step this query extracted is used gathering information from throughout the organisation. This will give the researcher a picture of the existing IT architecture.

The second step is as mentioned to analyse how the possibilities created is aligned with the strategic decisions made. When analysing the previously collected data all levels of strategies must be considered. We therefore suggest that the classification presented in the chapter The Strategy is used. We also believe that in most organisations the involvement of several organisational members with knowledge of the

different strategic levels may be necessary. Analysing the collected data from this strategic point of view will reveal how the possibilities created by the IT architecture is utilised and indicate the strategic value of the applications.

The Field Study

This chapter presents the field study executed. First the object of the field study, the Ericsson organisation in general and RMOA in specific, is presented. After this the method used collecting the data during the field study is explained, and the results are summarised and discussed. Finally the limitations in communications are discussed.

This chapter contains a description of the practical use of the method and the model. Some conclusions will be drawn in this chapter, but the analysis of the method and the model will be discussed in detail later in the thesis.

The purpose of the field study is to enable a validation of the model presented earlier. The validity discussion is presented in the chapter Evaluating the Method. The communication process and how it has affected the field study is discussed in the chapter Communication in Theory and Practice.

The presented organisational chart is at least valid during October 1998, but Ericsson is undergoing a major reorganisation. We believe that presenting the former organisation is more relevant, since these were the circumstances under which the field study was executed.

TELEFONAKTIEBOLAGET LM ERICSSON

In April 1876 the company LM Ericsson & Co. was founded in Stockholm. The base was thereby laid for the company that a century later is one of the world-leading suppliers in telecommunications. Today Ericsson's 100,000 employees are active in more than 130 countries. Net sales in 1997 amounted to SEK 167,740 millions (+35% from the previous year), and order bookings to SEK 179,770 millions (+30%).

The area of expertise spans, among other things, fixed and mobile networks, mobile phones and infocom systems. In reality, Ericsson is active in almost all sectors of the telecommunications field. An organisational chart of the corporation as presented October 1, 1998 is shown below, see Appendix i, Ericsson Organisational chart.

The company is, since January 1, 1997 divided into three business areas:

Business Area Mobile Systems (BR)	Mobile telephone systems, mobile voice and data communications systems and paging systems.
Business Area Infocom Systems (BN)	Network solutions, products and services for licensed operators of dedicated networks and operators and users of business communications networks.
Business Area Mobile Phones and Terminals (BT)	Consumer products such as cellular mobile phones and modems, as well as stationary phones.

Table 1 *Business Areas*
Source *Inside Ericsson 1998*

Business Area Mobile Systems (BR)

The Business Area Mobile Systems (BR) had in January 1998 about 37 800 employees around the world. Of these 18 800 were situated in Sweden and 5000 in USA & Canada.

The Business Area is divided in different business units according to the product set they represent. These are:

Mobile Telephone Systems GSM, NMT, TACS (RMOG)	The largest Business Unit, working with the standards for the mobile telephone systems most commonly used in the world, GSM, NMT and TACS.
Cellular Systems American Standards (RMOA)	American standards, AMPS and D-AMPS.
Mobile Telephone Systems PDC (RMOJ)	Japanese standard, PDC.

Private Radio Systems (RPRS)	Provides voice and data transmission in limited, private radio networks, such as police and emergency service radio
Microwave Communications (RCIV),	Core company for microwave communications and defence electronics. R&D centre for microwave technology and high-speed electronics.
Fixed Radio Access (RWLL)	Provides solutions for extending old fixed copper nets with digital functions.

Table 2 Business units
Source Inside Ericsson 1998

Of the three business units working with systems for mobile systems RMOG is the largest. The GSM-system is today adapted in 59 countries in the world, the NMT-system in 29 and TACS in 12 countries. This can be compared with the AMPS-system in 29 countries and D-AMPS in 25. The PDC-system is used only in Japan, but is nevertheless an important system for Ericsson.

Cellular Systems American Standards, RMOA

Cellular Systems American Standards (RMOA) has the total business responsibility including marketing, sales, product management, product development and operation activities for mobile telephone systems based on D-AMPS/AMPS. The AMPS/D-AMPS standards are used mainly in North- and Latin America, but also in Oceania, the Far East, Eastern Europe and Southeast Asia. Regarding the PDC standard, RMOA has the development and maintenance responsibility, whereas RMOJ has the product management and market responsibility.

One of RMOA's activities is to perform efficient sales and marketing support to the local companies, as well as to perform direct sales to certain markets. The support includes securing a competitive product portfolio based on product planning, product management and systems design, but also providing means, methods and tools to the local companies for timely implementation of customer projects and support of the installed base.

The RMOA TTC Business Tools is one part of this support organisation. Its mission is to secure "Information Systems as business enablers for

the TTC process in order to achieve maximum efficiency for RMOA". In accordance with this there are three major areas to focus; TTC IS Co-ordination, IS Projects and IS Maintenance.

TTC IS Co-ordination

The co-ordination of the portfolio of existing and needed IS in the global TTC process is done through investigations of the current IS situation at the different global RMOA units. The best tool for each area of functionality and information is searched for, in order to promote the tool globally.

The co-ordination also includes how the different tools can interface with each other trying to connect the different islands of information and taking away multiple storage of the same information.

The aim is to establish an IS Strategy for the RMOA TTC that is co-ordinated with the Ericsson overall IS Strategies. The gaps between the current situation and the strategy give a number of tactics that are prioritised against each other to find the highest pay-off of IS investments.

IS Projects

Some of the tactics resulting from the gap analysis will be approved as IS projects. The TTC Business Tools then work as project managers in order to develop the solutions needed by the business for a certain area.

IS Maintenance

TTC Business Tools manage existing IS in order to provide systems to anybody in the RMOA organisation that wants them, in order to receive the pay-off from the investment that has been made in the development of the tools.

The Ten Local Companies

In most of the countries where Ericsson is active there are local companies responsible for the contacts with customers within their geographical market. The local companies differ in size and in what business areas they are active. Some of them are subsidiary companies that have business operations in all three business areas, while the smaller ones might have business operations in only one or two.

During the work with the World Class TTC-program (further described in Appendix vi) ten local companies have been defined as the first target group. Three of these companies, the companies in USA, Brazil and Mexico, are active in all three business areas, while the companies in Russia, Canada, New Zealand, Argentina, Chile, Hong Kong and Malaysia are active in one or two. These ten companies will in this

thesis be referred to as the ten local companies, and are the object of the case study used for the evaluation of the enhanced model of evaluation. As mentioned earlier, our interest is only for the parts of these companies that are selling the American standard, although many of them also sell other products.

Argentina

Compania Ericsson S.A.C.I. (CEA) was established in Argentina in 1921. In 1997 they had 390 employees. The head office is located in Buenos Aires and there are four other branch offices in the country. The company's major activities include Marketing and Sales, Operations (Installation & Support) and Training

Brazil

Ericsson Telecomunicacoes S.A. (EDB) in Brazil is one of Ericsson's larger M(LC)'s. The head office is located in Sao Paolo and there are eight branch offices and one factory in other parts of the country. EDB has around 2500 employees (1997). The major activities include Marketing and Sales, Manufacturing, R&D, Operations (Installation & Support) and Training.

Canada

Ericsson Communications Inc. (EMC) in Canada had about 1000 employees (1995) working at the head office in Mississauga, Ontario and the five branchoffices. The major activities include Sales & Marketing, Operations (Installation & Support), Service and Repair and Software Development. Ericsson has been active on the Canadian Market since 1953.

Chile

Compania Ericsson de Chile S.A. (CEC) is located in Santiago and had 475 employees in 1997 The company's major activities include Marketing and Sales, Operations (Installation & Support) and Training. The company was established in 1946.

Hong Kong

Ericsson Limited in Hong Kong (EHK) has about 180 employees and opened in 1980. The major activities includes Marketing and Sales, Operations (Installation and Support) and Training

Malaysia

Perwira Ericsson Sdn Bhd (PEM) is one of four Ericsson companies located in Malaysia, with about 1150 employees in total. The company was established in 1965, and the major activities are Marketing and Sales, Product and Project Management, Manufacturing, Operations (Installation and Support) and Training.

Mexico

Ericsson in Mexico, and Central America, contains of four different companies, of whom Teleindustria Ericsson S.A. de C.V. (TIM) is included in this thesis. The head office is located in Tlalnepantla outside Mexico City, and there are three branch offices within Mexico and six in other countries in Central America. In total the companies has more than 2000 employees. Ericsson has been active on the Mexican market since 1904.

New Zealand

Ericsson's representation in New Zealand consists of the local company Ericsson New Zealand (ENZ) with about 400 employees in Wellington, Napier and Auckland. The main activities includes Marketing and Sales, R&D, Operations (Installation and Support) and Training.

Russia

Ericsson Corporatia AO (ECR) has its head office in Moscow, with branch offices also in St Petersburg. In 1996 there were about 250 employees, today it has increased significantly. The major activities include Marketing and Sales, Field Support and Training. Ericsson signed its first contract in Russia 1881

USA

Ericsson Inc. (EUS) is one of one of Ericsson's largest local companies. The head office is located in Richardson, Dallas, but the more than 8 200 employees are also working at about 100 branch offices across the country. The major activities include Marketing and Sales, R&D, Manufacturing, Operations (Installation and Support) and Training.

THE STUDY

The field study has covered ten companies in five continents. During the study some 130 Ericsson employees were contacted, either helping us locate respondents or providing us with application information. A structured approach to information collection was therefore necessary in order to obtain comparable data.

We are here presenting in what way the data has been retrieved, what results that were obtained from the field study and how these results will be used by Ericsson in the future. The chapter is concluded with a short discussion of how the limitations in the way of communicating with the local companies have affected the study.

The Data Collection

The information collected during the field study consists of data from both primary and secondary information sources. Primary sources are, among other, people at RMOA, the TTC project managers and system owners / super users. Secondary sources are in particular the local Intranet, the Ericsson Radio Systems application database and internal documents.

The TTC-process flow is chosen as the common frame of reference between us and the ten local companies. This structured approach is chosen with the positivist perspective in mind and will allow us to with a higher validity compare the results from the different countries.

In order to obtain the needed information from the local companies, we are using the query defined in the chapter The Model of Evaluation. The outline of the query is presented in Appendix v. To suit the circumstances during this field study, the query is divided into priority 1 and priority 2 criteria. These two serve different purposes. The priority 1 criteria are of importance mostly for locating the systems, while the priority 2 criteria are more strictly based on the model of evaluation.

In a first phase, only four of the ten concerned companies are addressed. This gives us an opportunity to improve the methods for collecting data. Any alterations are only to be made in the practical aspects of the work and with great care. This will ensure the consistency in the data, not obstructing future analysis and the search for patterns. Starting with only a few companies also enable us to better focus on these in time.

The countries selected for the first phase of the data collection are Russia, Canada, Brazil and Argentina. Later USA and Chile and finally Mexico, Hong Kong, Malaysia and New Zealand follows.

We have established two alternative approaches to the information sources. The first of these is focused on the major business tools, such as administrative systems. The sources of information, their relations and expected information output are shown below in Figure 14, Information sources: Major systems.

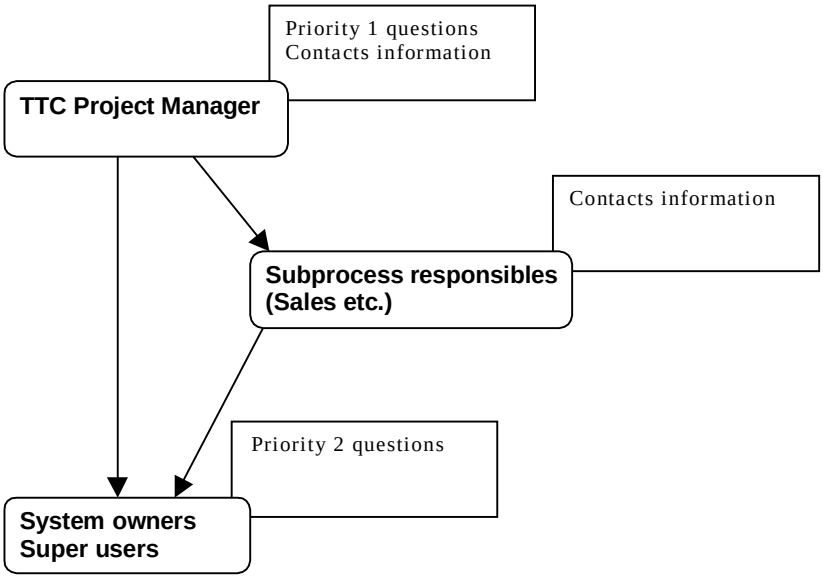


Figure 14 Information sources: Major systems

As shown, we expect the TTC project managers to be able to answer our priority 1 questions. Priority 2 questions will primarily be answered by the system owners or super users, and we believe that it in some cases will be necessary to locate the sub-process responsible. For a complete list of priority 1 and priority 2 questions the reader is, as mentioned earlier, directed to Appendix v.

In the process of finding key persons to interview, employees working with or being responsible for the different functions (sub processes) included in the TTC process at the local companies will also be addressed.

Minor systems we define as not so commonly used systems, local systems etc. These systems are in most cases more difficult to obtain information about. The information sources are shown below in Figure 15, Information resources: Minor systems.

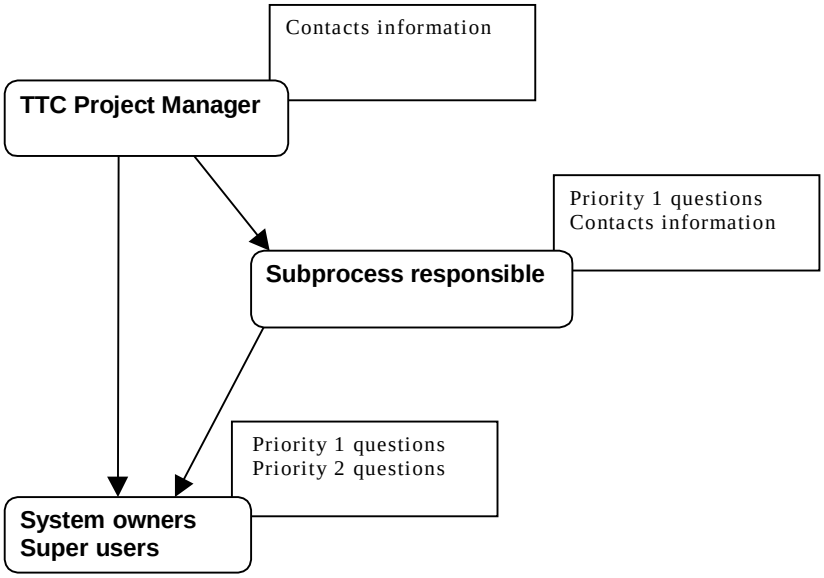


Figure 15 Information sources: Minor systems

The reader of this thesis should notice that the classification major and minor systems are not used in the evaluation of the applications.

During the contacts with the companies selected for the first phase we made one major reconstruction of the query. This since we realised that some of the priority 2 questions were irrelevant for a certain category of systems (SAP R/3 modules), and they were therefore left out during the further contacts.

We believe that these two approaches to receive information have been useful. Not only have they helped us during the information collection, by giving us the chance of structuring our work, but they have also ensured the possibility of a correct further evaluation and comparison of the retrieved data.

The Results

During the study about 100 applications were found. For about 50 of these applications the respondents provided priority 1 information and for the remaining systems also priority 2 information was provided.

The results are presented to Ericsson Radio Systems AB in two different ways:

- The documentation of the field study has been added to the RMOA application database. Systems earlier not known of have resulted in new entries in the database, while supplementary details have been added to the "old" systems. Since some of the information obtained through the query is not relevant for the intended technical use of the database, part of the information has been placed in files connected to their entries.
- To give an overview of the total situation, all the traced systems have been listed in a large matrix, divided in columns for each subprocess in the total TTC process, and rows for each local company. This gives the spectator an impression of how the tools used are supporting the TTC process, for example by indicating empty fields. Also a further discussion of the use of the tools can be initiated with the matrix as starting point.

Through the field study the RMOA TTC Business Tools organisation has also been provided with an extended contact list, enabling a further follow-up of the process support at the local companies.

At Ericsson Radio Systems AB the results from the field study is being used when globalising process ownership as well as when defining information strategies. For this purpose the results were highly sufficient and very well received by the RMOA management organisation. Especially the matrix, with its overview of what systems are used, and where they are used, to support the process will be of high importance in the further work for the RMOA TTC Business Tools department.

Some examples of more concrete use of the matrix are:

- As a base for discussions with the local companies (i.e. we believe that you would be better supported if you were using these tools instead of these)
- For development of new support tools (i.e. we see that we are probably not supporting this part of the process enough)
- To standardise the use of tools around the world

Due to confidentiality reasons the results will not be explicitly reported in this thesis. We also argue that the result in its details is of little relevance to the reader. These restrictions, of course, make it difficult for the reader to verify our conclusions. We believe, although, that it anyway is possible to understand the evaluation of the model as we have described it in the chapters Evaluating the Method and Conclusions.

Limitations in Communication with the Local Companies

Our position during the field study, as observers in a large, multinational corporation such as Ericsson Radio System AB, entails limitation in the communication process. An effective communication transaction process is, as stated above, depending on a common frame of references or the ability to overcome any differences in these frames. To be able to effectively communicate with the local companies we need to spend a great deal of time researching the corporate culture including the specific characteristics of the ten foreign countries. The impossibility in this task in combination with limitations in the choice of media, long distance telephone and e-mail (personal letters), force us to adjust the information transmitted accordingly. The impact of the communication difficulties is better analysed in the chapter Communication in Theory and Practice.

CHAPTER SUMMARY

The RMOA TTC Business Tools department is a part of the IT support organisation within the part of Ericsson that delivers mobile telephone systems within the American standards. The department supports the local companies around the world with IS tools, works to co-ordinate existing and future IS portfolios and aims at establishing an IS Strategy for RMOA that is coherent with the Ericsson overall IS Strategies.

The field study was executed from the RMOA TTC Business Tools department, and concentrated on ten local companies around the world. These were contacted in a structured approach to enable a high validity comparison of the results from the different countries.

The results are presented to Ericsson in the form of an extended database, containing information about the different tools, and in the form of a large matrix where the tools are listed by country and sub process. The results will be used in the work with globalising process ownership and defining information strategies, as well as in the direct contacts with the local companies.

Due to confidentiality reasons decided by Ericsson, the specific results are not presented in this report.

Ulf Nordström
Anette Westling

Communication in Theory and Practice

This chapter presents communication and the richness of different communication media. The purpose of the chapter is to help the reader understand how our possibilities of communicating with the local companies during the field study has affected and limited the results.

The theory presented in this chapter is not in particular affecting the method presented in this thesis, we believe that the base of the method is intact regardless of the media used. What we on the other hand want to stress in this chapter is that the use of the method must be adjusted to the particular conditions supplied by the research situation.

Main Entry: **com·mu·ni·ca·tion**
Pronunciation: k&-"myü-n&-'kA-sh&n
Function: noun
Date: 14th century

1 : an act or instance of transmitting
2 a : information communicated **b** : a verbal or written message
3 a : a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior <the function of pheromones in insect communication>; also : exchange of information **b** : personal rapport <a lack of communication between old and young persons>
4 plural **a** : a system (as of telephones) for communicating **b** : a system of routes for moving troops, supplies, and vehicles **c** : personnel engaged in communicating
5 plural but singular or plural in construction **a** : a technique for expressing ideas effectively (as in speech) **b** : the technology of the transmission of information (as by print or telecommunication)

(WWWebster Dictionary 1998)

COMMUNICATION

Communication can be seen as a tool for maintaining organisational structures by the actions of informing of, regulating and integrating decisions, but it can also be viewed as the components, tasks and relations, as innovation, change and management or as a tool for controlling the social as well as physical environment (More & Laird 1985). As a fourth approach communication can also be seen as a tool for the members of an organisation where three distinct functions can be found (Moberg 1993).

- To give, receive, interpret and act on orders and instructions
- To create and maintain business or private contact and relations
- To reduce uncertainty in decision-making

The communication process is dynamic and is primarily effected by the participants characteristics and actions (More & Laird 1985).

Interpersonal Communication

Interpersonal communication is the purest form of communication, and we therefore argue that the theories presented below help illustrate the most vital elements affecting all communication.

The most strict definition of interpersonal communication includes only communication from one individual to another where the communication is face-to-face and both the form and content of the communication reflect the personal characteristics of the individuals as well as their social roles and relationships (Hartley 1993). Any communication mediated with information technology, i.e. email, telephone, etc, is therefore not to be included in the definition. The definition is however still relevant as an abstraction of the communication process. A model of the keystones of interpersonal communication is shown below, see Figure 16.

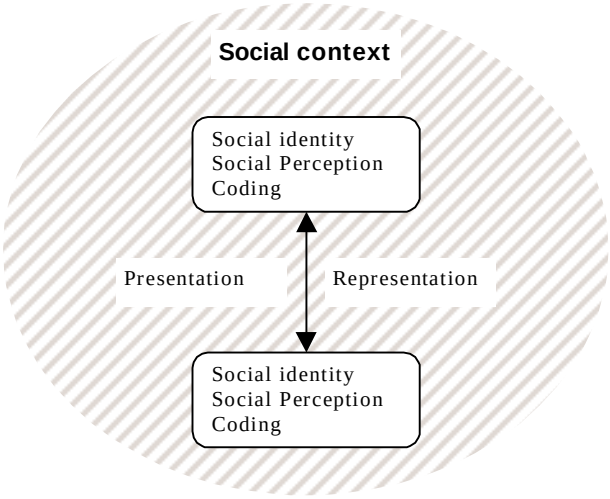


Figure 16 A model of interpersonal communication
Source Hartley 1993

Many authors have simplified this model and represented social identity and perception as well as coding by the social context. Later in this thesis we will also use this simplification, but to better understand interpersonal communication the included components have to be addressed specifically (Hartley 1993):

Social context

The time and place influence both actions and reactions in a conversation.

Social identity

The participants in the communication process are affected by how they see themselves.

Social perception

The participants in the communication process are affected by how they see each other.

Coding

A code is the particular way a participant is expressing a message which has a special meaning to a certain audience.

Presentation and Representation

When communicating a participant is simultaneously representing and presenting information. The representation of information is the

statements actually said, while the presentation of information is the particular way it is said.

All interpersonal communication is in other words effected by whom we think we are, who we think we are communicating with and the circumstances under which the conversation is taking place.

Mediated Communication

> The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the message has a *meaning*; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant aspect is that the actual message is one *selected from a set* of possible messages.
>
> (Shannon 1948)

When communication as described above needs to be transmitted using a media it always becomes defected. The theory presented below illustrates why.

When information during the communication process is transferred using a channel, the model of interpersonal communication has to be modified. The elements added are a transmitter, a channel, a receiver and a noise source in the media, see Figure 17.

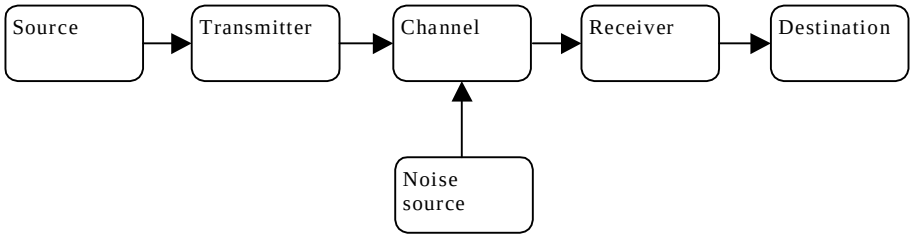


Figure 17 A model of the communication process
Source Shannon 1948

The model is most commonly referred to as the communication model of Shannon and Weaver from 1949, but was already presented in 1948 by Shannon alone. The model was originally intended to be a mathematical

theory of communication where the semantic aspects of communication were irrelevant.

The noise source is a dysfunctional element interfering with the message sent trough the channel, which may result in a received signal different from the signal sent.

If the model is generalized the noise source could be interpreted as any interference disturbing the message when its is transferred over a designated media. The elements would in this case include the social presentation and representation of the participants (the source and destination), their ability to code the message, how these elements are influenced by the social context and the distortion to the message caused by the media. The distortion is caused by the communication media richness, see The Information Richness Theory.

The Information Richness Theory

Mediating communication using different media affects the information in different ways. We believe that the theory of information richness will help the reader understand how.

Daft and Lengel (1986) define information richness as the ability of information to change understanding within a time interval. Communication transactions that can overcome differences in frames of reference in a timely manner is considered rich. Transactions consuming more time or that can not overcome different perspective are lower in richness.

The richness of different media is shown below.

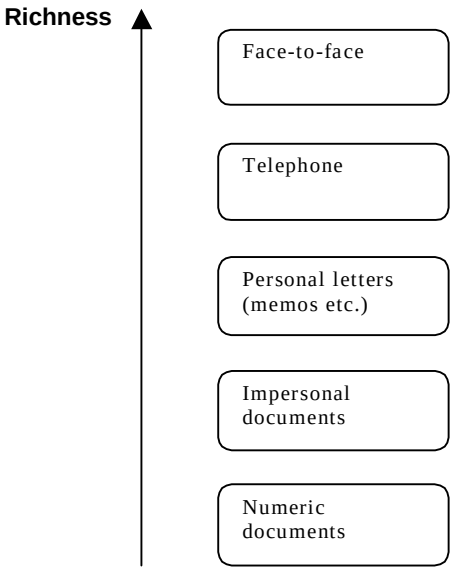


Figure 18 Communication media richness
Source Daft & Lengel 1986

The information richness theory (IRT) has previously earned great acceptance in the works of information theory and information systems researchers, but is now more commonly being criticised. Results from empirical test show that the actual media use behaviour many times are inconsistent to the theory (Ngwenyama & Lee 1997 referring to Marcus 1994). Marcus states: "In particular, managers, especially senior managers, used the [electronic mail] medium more intensively than the [information richness] theory predicts and in a manner that the theory regards as ineffective and hence unlikely".

Several researchers have offered alternative perspectives explaining the obvious richness in traditionally lean media. The social definition theories presented by Marcus herself emphasise the emergent properties or social dominants of behaviour as a contrast to the individual level rational choice explanation of IRT. Among other theories *the social influence model* of Fulk, Schmidtz and Steinfield (1994), *the emergent network perspective* of Contractor and Eisenberg (1990) and *the genre theory* of Yates and Orlikowski (1992) can be mentioned. These alternative explanations all have in common that they regard communication richness as emerging from the interaction between the actors placed in their organisational context, and not primarily limited by the communication medium.

ANALYSING THE COMMUNICATION PROCESS

In the chapter The Field Study we describe how the data has been collected. The communication process used has of course affected the validity of the study and influenced the method. We therefore believe it to be important to better analyse the process. The evaluation is primarily made from a critical social theory perspective, examining how our influence has affected the obtained results.

Finding the Information Providers

During the field study we were in contact with about 130 information providers located in eleven different countries including Sweden. Our first contacts at the ten local companies were the TTC project managers and it has been noticed that motivating these and encouraging them to locally sponsor and promote the project has been of great importance.

The TTC project managers has initially, themselves or with local assistance, started the inventory by collecting primary information from local TTC sub-process responsible. After this we approached the local TTC sub-process responsible and collected additional information.

Finding the right respondents has however not always been easy. Within Ericsson Radio Systems AB many change projects are ongoing, sometimes with different focus. Several of the respondents has in their work positions been closely involved in these projects and this has in some cases caused unwillingness to provide information negative about the projects.

Obtaining the Necessary Information

As discussed in the chapter Methodology respondents may for several reasons be unwilling to share and provide the necessary information. We believe this in part can be explained by how successfully our communication action has been, viewed from a social action perspective.

The basic types of social actions can be classified as (Lee & Ngwenyama 1997):

Instrumental action

This behaviour is oriented to attaining rational objectives. The respondent is viewed as an organisational resource and the actor will attempt to manipulate him to act in accordance with the actor's wishes. The respondent is motivated by organisational authority or by other means.

Communicative action

An actor using a communicative behaviour strives at achieving mutual understanding. In an organisational context the actor and the respondent must share a common language and a common understanding of the social context.

Discursive action

This action is commonly initiated when an actor needs to achieve agreement for a joint action or to restore agreement in situations of breakdown. The action may imply that the actor and the respondent will have to momentarily suspend his immediate objectives in order to achieve some common agreement to build on.

Strategic action

Much like the instrumental action strategic actions are oriented to attaining rational objectives. The major difference however is that the actor engaged in strategic actions treats the respondent as another actor capable of counteractions.

Our primary intention has been to use strategic actions when motivating the primary contacts in the ten countries. It is however our assumption that the distinctions between what is to be interpreted as strategic actions or instrumental actions become dangerously narrow when limiting the communication process through communication media low in richness. Actions carrying influences of instrumental actions were in some cases nevertheless efficient when the World Class TTC program manager in Sweden sponsored the inventory project, giving us the informal authority to present and claim our request.

As we were directed through the local organisations the prerequisite for strategic actions declined. We noticed that in the cases where the respondent had a more close working relation with our primary contact we received information quite easily. When this was not the case we often found ourselves using instrumental actions. Lee and Ngwenyama argue that when the more structured actions fail, discursive actions can be used to restore the communication. This type of action is however, we argue, not possible when communicating using a media as low in richness as electronic mail, see heading Mediated Communication. In the cases when we were able to reach the respondents using the telephone discursive action was more appropriate, using a common frame of reference as the foundation for recreating communication.

Enforcing a Common Frame of Reference

As argued earlier, the social context influences both actions and reactions in a conversation. The two different aspects of social context

affecting our empirical studies are first the social structure, influencing how motivated the respondent will become. This aspect has been discussed under the heading Obtaining the Necessary Information, see above. The second aspect of the social context is the importance of a common frame of reference when communicating. This frame will serve as the foundation when explaining the objectives of the requests for data.

The defined TTC process is however not yet implemented at all the local companies and this has affected the empirical study. When trying to create a common frame of reference we have been facing two major risks. First, misunderstandings in the definition of the TTC process may have lead to failures in finding all areas intended in the scope of the study, or caused that areas not actually covered in the scope have been included. Second, from a social action perspective the enforcement may lead to a rise of tensions in the relations between the local companies and the head office.

CHAPTER SUMMARY

The art of communication is defined different by different authors. When it comes to interpersonal communication, it is however clear that the social context, consisting of social identity, social perception and coding, is affecting the messages that are exchanged. It is also clear that the media chosen for the communication affects the messages.

During the inventory process we were in contact with about 130 information providers in eleven different countries. For most of them we were forced to use a communication media low in richness, such as telephone or e-mail. This has made it difficult both to find the right information providers and to obtain the necessary information, which of course have affected the results of the field study.

Ulf Nordström
Anette Westling

Evaluating the Method

This chapter uses the results and experiences from the field study to discuss how the method, and the model, behaved in practical use. Some conclusions are drawn, although the next chapter in more detail outlines our experiences and suggests improvements.

A certain focus is put on the model, although we believe that the whole method in this case can be regarded as input to the model. This is discussed further in the last part of the chapter, where the theory of cumulative validity is used to argue whether the model does capture the structural value or not.

'Hush!' said Christopher Robin...

'Hush!' said Pooh to Piglet.

'Hush!' said Piglet to Kanga.

'Hush!' said Kanga to Owl.

'Hush!' said Owl to Eeyore.

'Hush!' said Eeyore in a terrible voice to all Rabbit's friends-and-relations, and 'Hush!' they said hastily to each other all down the line, until it got to the last one of them all.

And the last and smallest friend-and-relation was so upset to find that the whole Expotition was saying 'Hush!' to him, that he buried himself head downwards in a crack in the ground and stayed there for two days until the danger was over, and then went home in a great hurry, and lived quietly with is Aunt ever-afterwards. His name was Alexander Beetle.

(Milne. A.A 1926)

THE METHOD

Starting the work with this thesis, our first aim was to construct a model for finding/evaluating the structural value for an organisation contributed by a single application. In order to do this we needed to clear out what kind of knowledge and input that necessary to carry out this task. While making interviews and preparing ourselves for the mission, we realised that a model, without connections to a base of

knowledge, is of no use. Our aim then shifted focus, and we believe that the method we present in this thesis, explaining the needed input to the model and giving instructions on how to adjust and execute a research in the area, is of much higher usability then a clean, theoretical model.

We also believe that the method we have been using, in its every detail focusing the importance of understanding the whole picture, has proved to be a good basis for distributing the model. This will be discussed further down, in the analysis of the field study. It is although important to remember that the method does not only focus the actual collecting of the data, but also the importance of knowing what data to collect, and how to make interpretations of it.

During the field study carried out, covering ten companies in five continents, some 130 Ericsson employees have been contacted. This extensive group of contacts has allowed us to closely study not only how a model can be communicated, see chapter Communication in Theory and Practice, but also how the query based on the model has been received and interpreted.

From the field study including the evaluation of the applications used at the local companies an analysis is consequently made and some initial conclusions are drawn.

ANALYSING THE FIELD STUDY

For reasons of perspicuousness the model will be analysed following the relations between the elements in the IT-architecture.

Data – Applications

The answers to the question “Electronic interconnections with other business tools” give us information about to what degree the applications are using common data, reducing the risk of manual transfer errors but also the use of inconsistent data. To be able to make a correct analysis of the value created in this relation it is necessary to have a detailed knowledge of the tool.

Since the approach used during the inventory has been to first contact the users, this has affected the validity of this connection. Normal users are sometimes not aware of what interaction the tools they are using have with other tools. It can therefore be argued that this connection has not been thoroughly examined.

A more advanced query would contain more detailed questions about what kind of interconnections that exist, but since the limitations in communication also have influenced this analysis, we consider the query

sufficient as information provider. Although, we believe that the validity of the results would have been higher if we had directed our questions to persons with higher technical awareness.

Structural value is not only created from the transaction of data but also from the use of consistent data. It has come to our attention that we have failed in finding the common databases used supporting the global organisation with updated, accurate information. This could also have been avoided by a different approach.

Communication – Applications

Using the questions "Electronic interconnections with other business tools" and "Assigned bandwidth" to evaluate the value created by the connection between Communication and Application has caused the same problems as described above under the heading Data – Application.

When determining the assigned bandwidth technical personal must be addressed. Requests for information must therefore be sent to several different instances. This problem must therefore be solved not with adjustments to the model, but with a structured approach to communication enabling localisation of the key respondents, see under the heading A Structured Approach to Interactions. This topic will also be discussed under the heading Cumulative Validity.

Computing – Applications

The platforms set as options in the query was PC, UNIX, World Wide Web (WWW) and Mainframe. These options have however shown not to be enough detailed. To better capture the possibilities of transferring applications without reprogramming work also the operating systems must be addressed. The field study has shown a common use of locally developed Microsoft Excel based tools. In these cases also the Excel version needs to be identified, since these may not always support full compatibility between the different versions.

Besides the platforms mentioned there are new operating systems, such as Linux, a free Unix-type operating system originally created by Linus Torvalds with the assistance of developers around the world. In the case of Ericsson Radio Systems AB Linux is not in use. The model however needs to be adjusted to the conditions set by the examined company.

It should also be noted that it is from the use of common platforms and operating systems that structural value can be created. The platforms of the application portfolio must therefore be compared.

Web technology is used with *Internet*, *Intranet* and *Extranet* networks. These networks offer some obvious advantages compared to traditional client-server technologies. The networks can provide a seamless access independent of the platform used by the user. The networks can also provide access to applications and common data over wide area networks to a global organisation. The technology however raises some new issues, including security and choice of development platforms and guidelines.

Internet is used for sharing different types of open information with external parties, e.g. customers. The Internet is often used for publishing rather general information accessible to anybody.

Intranets are used for sharing internal information within a closed group belonging to the same organisation. Intranets are just like Internets usually used for publishing information, but on Intranets the information is usually more internal.

Extranets are used to create closed groups involving external parties like customers or suppliers. Extranets are used for publishing information, but also to provide functionality for sharing information between the parties that are part of the Extranet. Business applications can also be built using Extranets where e.g. customers could be given access to ordering modules.

Web technology applications therefore differ from applications built for other platforms. Common platforms are no longer needed since the web can be accessed from practically any computer connected to the right network, but the bandwidth is instead becoming increasingly important.

Work – Applications

“Support to the sub-process” and “Use frequency” are two highly subjective questions aiming at capturing if the application is designed to perform to right tasks. They must consequently only be evaluated with great care.

In some cases the respondents have let us know that they have failed in comprehending the first of the two questions. One of the reasons for this is the poor understanding of the TTC process. We also argue that it is possible to better prepare the respondents for the subjectiveness in the questions, a concept many of them most likely are unfamiliar with in their daily work.

On the other hand, when we have been able to receive many answers from different countries concerning the same application, they have in most cases been surprisingly concordant.

An aspect of work not captured in the model is the globalisation of organisations. In the case of Ericsson Radio Systems AB the organisation is global in the aspect that it has sales companies and even production and construction units in a large number of countries. Structural value, however, is created when the business processes are uniformed and linked throughout the global organisation.

Applications

"User friendliness" and "Reliability" is like the two previous questions also highly subjective. It is however obvious from the field study that they are easier to grasp. User friendliness and reliability are to a higher degree concerned with technical aspect of the applications and are consequently more easily comprehended.

Mapping and comparing companies performing the same work at different locations has without recognition to economical aspects illuminated some best of breed systems, see the chapter The Structure. These best of breed systems must however be viewed in wider spectrum with the complete model. This stresses the importance of the complete IT architecture as a foundation. Some of these tools, ranking high on some of the questions, are internally developed MS Excel applications, more or less advanced. They have however not been incorporated in the strategic plans and will fail in providing the best possible support in a long-term global perspective.

CUMULATIVE VALIDITY

To evaluate the model the theories of criteria of truth, presented in the chapter Methodology, have been used.

Conclusion Validity

As described in the chapter Methodology, conclusion validity addresses the question "is there a relationship between the variables studied?" With the model presented in the chapter The Model of Evaluation, we aim to search for the structural value derived from the applications and the interrelations between the elements of the IT-architecture. Conclusion validity should therefore in this case exist if there is a relationship between the model based on the IT-architecture and structural value.

Carefully re-examining the presented model we argue that conclusion validity has been reached. The validity exists since the model is based on an IT architecture built on theories from different sources, discussing

both the role of the IT architecture and the creation of structural value within a company, as well as relations between them. The IT architecture is, we argue, a very wide foundation to build on and no sources we have studied, nor experiences from the extensive use of the model through the field study, has suggested that it as a foundation would be incomplete. The IT architecture and the model has also been presented at several internal meetings at Ericsson Radio Systems AB and has during these seminars gained approval.

Analysing the relation between the model and structural value in any other way than theoretical has proved to be very difficult. We have for the reason of limited resources chosen not to ask uninitiated experts to verify our theories.

Internal Validity

Assuming that there is a relationship between the variables in the study, internal validity exists if the relationship is causal. Related to this case the definition can be translated into the question “Does the IT-architecture cause structural value?” Or, more accurately focusing on the research area and the use of the study: “Does an improved IT architecture lead to a higher structural value?”

Assuming that structural value and an improved IT architecture are not both caused by a third unknown element, the antithesis to a causal relation is an anti-causal relation. This would imply that a structural value would create an improved IT architecture.

It must be considered obvious that it is the IT architecture that creates structural value. The architecture is the physical manifestation of what creates a value to the business and hence is the relation between IT architecture and structural value causal. As stated throughout the chapter The Structure, structural value is derived from the proper use of consistent data. Integrated communication across the organisation and work routines can co-ordinate and increase efficiency of operations globally. Structural value within an organisation may be created from several other elements then the IT architecture, see chapter The Business Value. These elements can, we argue, however not create an improved IT architecture.

We therefore argue that the presented model holds internal validity.

Construct Validity

Construct validity exists if the research is focused on the addressed subject and the results thereby are based on this subject. In this case, we

argue this should be interpreted as regarding how the query extracted from the model actually concerns the structural value derived from the IT architecture.

Assuming internal validity structural value is derived from the presented model. The model will therefore hold construct validity if the query extracted from the model efficiently enough measures the structural value of applications.

To an extent construct validity has been discussed earlier in this chapter, in the analysis of the relations between the elements included in the IT architecture, see heading Analysing the Field Study.

Not only does the chosen way of communication influence the results from the query, and thereby the validity of the field study itself. It also makes it more difficult to validate the model from a scientific perspective. This has previously been discussed in the chapter Communication in Theory and Practice.

Limitations in the communication process has forced us to search for a to a very high degree simplified query. This has therefore limited the efficiency of the evaluation, but it has been necessary to adjust the query to the preconditions set by the nature of the field study. Was another field study to be executed, the query extracted must be designed to the new preconditions set by the new case.

We will however argue that, considering the arguments presented in the chapter The Field Study, the efficiency has been significantly enough efficient to present an evaluation of structural value in applications. It should however be noted that further evaluation of particular business tools might be needed.

It is here also important to stress that, even though we concentrate this validation on the model, certain validity can also be transferred to the method and the actual way of working. In every step of using the model, the knowledge and input as presented in the early chapters is necessary to understand and draw conclusions.

External Validity

External validity exists, assuming that the construct validity has been built up, if the research can be generalised to other persons, places, or times.

The IT architecture is, as we previously have argued, a solid foundation. We therefore argue that the model can be generalised. The query has been adapted to the specific preconditions set by the case study. Searching for structural value under more limiting preconditions then to

the conditions set by the field study is not to be recommended and we consequently argue that the IT architecture and the model including the extracted query at least can be generalised to all other conditions.

We must however stress that when extracting a query for cases with the possibility of using a richer media of communication, a query better capturing structural value can be found.

We believe that the method, with its focus on a structured approach to analysis and on the necessity of a comprehensive view based in knowledge also reaches external validity. This because this kind of input is the very core of enabling a transfer of the model to other conditions.

CHAPTER SUMMARY

The method we present in this thesis explains the needed input to a model, specified to find the value of a specific application, and gives instructions on how to adjust and execute a research in the area. We believe that the method used, in its every detail focusing the importance of understanding the whole picture, has proved to be a good basis for distributing the model.

By describing the experiences from the field study and analysing them, a base for validation of the method and model is presented. By using the theories of criteria of truth, the method, but to a higher extent the model influenced by the method, is validated, and said to reach conclusion validity and internal validity. With some regards taken to the preconditions, the model also reaches construct validity, although we believe that only the method, not the model can be said to reach external validity.

Conclusions

This chapter presents the major parts of this thesis and explains why we believe the purpose, as presented in the first chapter, has been fulfilled.

Some possible improvements to the method are suggested and some areas close to the subject of the thesis are introduced and suggested as suitable for further research. Some conclusions are also drawn regarding the performed field study and what effect the researched object has had on the method, and vice versa.

The aim of the chapter is to present, and further discuss, what this thesis is contributing to the area of information systems research.

RECAPITULATING THE METHOD

This thesis presents a method of how to research an organisation's information systems in order to find and understand the value contributed by a single application. Focus in the method is to create understanding, rather than an attempt to measure a particular value of the application in numbers or equivalent.

We believe that the only way to make a correct evaluation of an application is to have knowledge of the organisation's goals and strategy, in order to understand the contributions of the application in its organisational context. This is explained in the chapter The Business Value, which also presents the theoretical background to the concept of structural value and how it is applicable on information technology. Here is also where we first define the need of combining knowledge of both strategy and structure in order to find, but also to create, structural value.

The importance of strategy is explained further in the chapter The Strategy, just like the importance of structure is explained in chapter The Structure. We define the most useful strategy concepts to be the analytic approach and the evaluative approach. The first one analyses the vision of the organisation, and breaks it down into critical processes and activities important to reach the goals set. The second one is based on the fact that in order to change something you must know what is about to be changed. This further underlines the concept of the thesis; to combine the vision with the preconditions where it should be implemented, i.e. the strategy combined with the structure.

The concept of structure do we approach with the strategy fresh in mind. To meet the need of a structured approach of researching the value of an application, we focus both on the single application and on its surroundings. As a foundation for future information systems research we therefore create an information technology architecture, as presented in the chapter The Structure. The architecture is also presented in Figure 19, below. Being influenced by the positivist perspective we believe this is the logic approach to a structured research regarding structural value.

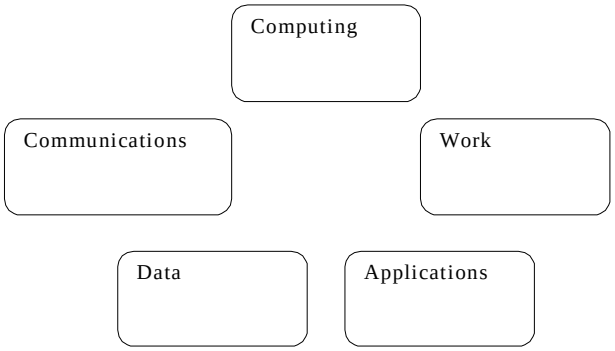


Figure 19 IT Architecture

Building on the IT architecture as well as the presented theories of business value and the need of combining structure with strategy we define a model, as presented in Figure 20.

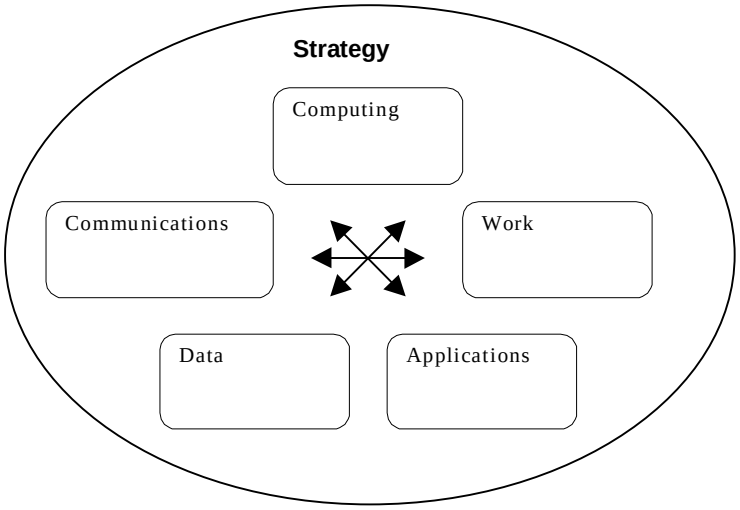


Figure 20 The Model

Using the systems approach presented by Arbnor & Bjerke (1997) the model is based on the idea of emphasising the relations between the elements in the IT architecture. From these relations the structural value of applications can be derived.

Figure 20 intends to show that the strategy is always behind, affecting every relation in the structure and also the interpretation of the relations. For our results, the strategy discussion aims at highlighting the necessity of having a wider knowledge of the company in order to interpret them and draw conclusions.

Our next step is then to extract a query from the model. The query needs to be adjusted to the preconditions set by the research object, and under what circumstances such research can be performed. Of course our research object, a part of Ericsson Radio Systems AB, has significantly influenced the query, both regarding the information searched for and the facts of how the research is carried out. To help the reader understand how the field study executed has affected the evaluation process, we also present theories of communication and make a short analysis of the communication process.

Through the field study the efficiency of the model was confirmed. However, a guide to how to interpret and use the results from the evaluation will not be presented in this thesis. This is further discussed under the heading *Suggesting Improvements to the Method*, below, where we also present a slightly different focus of information systems research.

Our conclusions regarding the efficiency of the method, based on our theoretical studies, interviews with people concerned and the results and experiences of the performed field study, is however that it is well suitable for information systems research. We also believe that it proficiently meets the purpose as presented in the first chapter, being a structured way to make visible the value of information systems.

SUGGESTING IMPROVEMENTS TO THE METHOD

Although we believe that the method meets the expectations put upon it, there are several things that it does not cover. In this chapter we would therefore like to point out some of them, that we believe could be interesting to the reader, and also highlight areas where we believe that further research is necessary to better understand the perception of the subject.

Capturing Shareholder Value

> Recent economic theory about innovation and growth in society provides a solid foundation for connecting changes in companies' intellectual capital (the IC-Index) to change in both financial performance and, interestingly, shareholder value creation and destruction.
>
> (Dragonetti et al 1997)

In the new age replacing the industrial age, commonly referred to as the information age or the knowledge age, information technology is an important, not to say vital, part of any organisation's business processes. Technology has been so highly incorporated in the organisations business operations that a separation of specific IT questions and IT investments from other topics no longer has any meaning. IT investments are today more investments in business processes and not in the actual technology. The bottom line of IT investments therefore becomes clearer – the creation of shareholder value.

It is in our conclusion that the model in combination with the communication process efficiently manages to evaluate the value of the applications. It does not, however, in any way measure the structural value of the applications.

When creating structural capital financial capital is consumed. It must therefore to the management functions of the organisation be considered

important to, in an expressional way, capture the return of the investments. Dragonetti et al (1997) argues, for instance, for a second generation of intellectual capital practise. This second generation consolidates the extracted measurements into an intellectual capital-(IC-) index and then relates this index to shareholder value, thereby creating a bottom line for intellectual capital to measure investments against. (Dragonetti et al 1997)

As a conclusion of this thesis we argue, in accordance with the above, that organisations must efficiently learn to visualise their intellectual, and thereby also the structural, assets. Of tradition managers have focused on tangible assets, but we argue that it is of most importance that they, if they have not already, learn to focus and more efficiently benefit from the hidden value of the organisation. To do this we believe that the intellectual value, including the structural value, must be made visible.

The method, as presented in this thesis, does not further discuss how to present the value, or in what way the value should be indexed or measured. We believe, although, that we have presented the first step in the process of visualising value to others, i.e. to create an understanding to how and where the value of information systems arises.

Global Organisations

Although we believe the method to be valid for different levels of the organisation, the field study makes us understand that the model might need adjustments in several ways. The IT architecture the model is based on has a distinct internal perspective. It has therefore not been a great surprise to, during the field study, discover that the model fails in emphasising topics concerned with global, or even very large domestic, organisations. These organisations contain almost always sub-organisations, which distinguish themselves by executing unique, or at least separate, strategic approaches. It is consequently our conclusion that when studying global organisations with several clearly distinguishable local organisations, a separate evaluation made for each of these internal organisations may be necessary. The model can then be used at a macro level evaluating the organisation from a global perspective, thus applying it on the highest global strategic level. This approach will better highlight topics important to these organisations.

The same arguments made for global organisation is also, we argue, valid for large, complex, domestic organisations where separate internal organisations also can be found.

External Relations

Much as the IT architecture fails in emphasising global aspects of organisations, its internal perspectives also fail to explicitly explain external relations, such as automatic data interchange with customers and suppliers. As presented in the chapter The Business Value the external capital is vital part of the intellectual capital, yet separated from the structural capital. We have also previously argued that such relations are irrelevant in the field study executed at Ericsson Radio Systems AB. When generalising the model, external relations may nevertheless become most important, but it is our conclusion that the IT architecture would have to be redrawn if external relations are to be explicitly captured. In our presented IT architecture these relations, however, are captured foremost through the elements communications, data and work; communication between the organisations, the use of consistent data among the organisations and granting each other access to common databases, and pre-established routines and procedures between the organisations.

Interpreting the Results

As previously argued the positivist perspective of interpreting results from evaluations, represented by Earl in the chapter Measuring Value, is not consistent with the systems approach adopted in this thesis. To interpret an evaluation of such a diversified research area as information technology, we argue that the ideas presented as the systems approach must be used and it is therefore necessary that the actor executing the evaluation hold knowledge and understanding of the perspective.

Any academic researcher can be expected to carry such knowledge. We however believe it to be impossible to assume that a professional actor should have such scientific methodology knowledge. Although, with an understanding of how every decision must be built on a solid business foundation, as well as an awareness of how information technology is evolving and increasing its potential as a business enabler, we believe that the successful managers of today still will be able to efficiently interpret evaluations based on the systems approach.

We will, as stated earlier, in this thesis not attempt to present a guide for how to interpret the results from the evaluation method presented. It is yet our belief that the thoughts and arguments presented will be helpful with this task. We also believe that the actor interpreting the results must have an adequate knowledge and understanding of the context the applications exist within.

A STRUCTURED APPROACH TO INTERACTIONS

Our experience from the field study has been that the way the method is distributed, and thereby how the communication flow of the organisation is structured, is of very high importance. We would therefore like to introduce the reader to some conclusions and suggestions on how to create an environment suitable for effective communication.

The interactions between the local companies and Ericsson in Sweden are today limited by the lack of structured co-ordination. Interactions are therefore today commonly channelled through personal relationships, "I've met someone who knows a person who might know this…". These relationships make Ericsson Radio Systems highly dependent on the individual employees. The alternative approach used channelling interactions used at Ericsson Radio Systems is through the organisational hierarchy. We therefore argue that a structured co-ordination could improve the efficiency in the future work.

Co-ordination can be defined as "managing dependencies between activities". Co-ordination theory can furthermore be defined as "theories about how co-ordination can occur in diverse kind of systems". Crowston (1994)

Organisational actors, in other words, face co-ordination problems arising from dependencies in how the actions are resolved. These problems force the actor to first perform additional co-ordination mechanisms.

We therefore argue that interactions better can be channelled in other ways, such as work design, information systems or new patterns of information distribution. As an example, the TTC Business Tools Department at Ericsson Radio Systems may use the locally deployed TTC-process organisations to create a permanent network for communication.

Within the new permanent network a forum for the communication needs to be formally organised. Orlikowski and Yates (1998) argue for a genre system, structuring interaction through communicative norms. This system will serve as a template for social interaction and shape, but not determine, how community members will engage in actions.

Genre systems, like individual genres, are sequences of interrelated communicative actions strategically or habitually structuring collaboration, providing expectations about the purpose, content, form, participants, time, and place, as illustrated in Figure 21 below. (Orlikowski & Yates 1998)

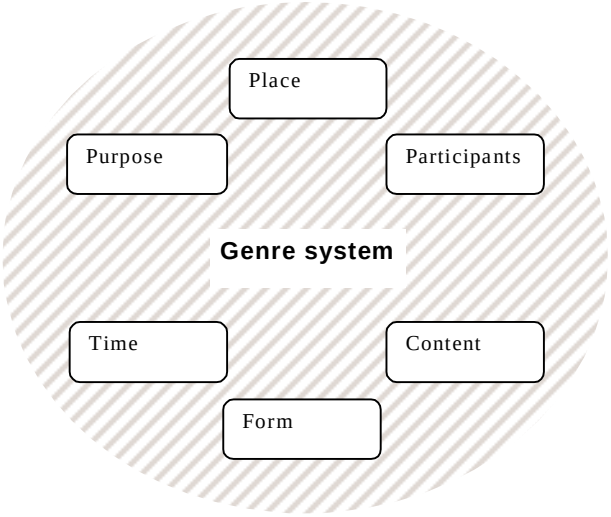


Figure 21 Genre system
Source Visualisation of Orlikowski & Yates 1998

Purpose.

The genre system provides expectations about the within the organisation recognised purpose of the interaction.

Content.

The genre system provides expectations about the content of the genre.

Form.

The form of the genre states expectations about media, structuring device and linguistic elements.

Participants.

The genre system provides expectations about the employees participating in the interaction.

Time.

A genre system may have specific temporal expectations such as deadlines.

Place.

A genre system provides expectations about the location of the interaction.

With this permanent network structure we believe that it is possible to maintain, and when required activate, responding actors in a global organisation without being limited to personal relationships or

hierarchical organisation structures. If such a system had existed within the Ericsson organisation, we believe that our task had been easier, and the validity of both the inventory and the model would have been significantly higher.

The reader should notice that the genre system needs to be a permanent solution, and it is therefore not the solution for someone executing a similar field study.

GENERALISING THE METHOD

The generalisation of the method has already been discussed, in the chapter Evaluating the Method as well as previously in this chapter. Nevertheless we feel that it is important to clarify and discuss how the method, and in particular the model, can be generalised and thus used in other field studies. We also believe it to be important to discuss the impact of such generalisations in such studies.

As argued we have come to the conclusion that the method, but not necessarily the model and the extracted query, can be used in other studies evaluating structural value. The model can, more easily, be used in studies concerning limited organisations with little interaction with other organisations. When applying the model on organisations breaking these restrictions some problems may arise.

Applying the method on internal sub-organisations within organisations will eliminate misunderstandings arisen from uncommon frame of references, since the unique context of each internal organisation better can be used. This approach, we argue, is however not possible when conducting a research using communication media limited in information richness. Better ways of communication are consequently an important demand.

With better possibilities of communication than used in the conducted field study, key respondents can more easily be located and interviewed. We believe it possible to, instead of being limited to an extracted query, freely interview key respondents with necessary knowledge of the elements presented as the IT architecture, or specific relations between desired elements. This approach will give the actor interpreting the result a greater possibility to find the true creators of structural value within the organisation.

A CHANGE IN STRATEGIC APPROACH AT ERICSSON RADIO SYSTEMS AB

We have in this thesis discussed the necessity of combining strategy and structure in order to perform useful information systems research. We would here like to focus this again, this time in closer relation to the research object, Ericsson Radio Systems AB.

Anders G. Nilsson (1990) divides the procurement of an Enterprise Integration System in three phases: Choice, Adjustment and Implementation. According to us, Ericsson in general is somewhere in the end of the adjustment phase or beginning of the implementation phase, depending on at what part of the organisation that is studied. This since the choice has been made; Ericsson has decided to implement SAP R/3 in the whole organisation, and the work is now concentrating on adjusting the system to the company needs.

The introduction of SAP R/3 can be seen as a major change of Ericsson's application strategy. The local companies have until now not had such a strict management, but have had the liberty to develop their own solutions and choose different tools, depending on what needs they see within their own organisation. From now, the focus has shifted to a global level and the local needs are no longer the major issue.

In accordance with the multiple strategic approach presented above, Ericsson is changing the direction of the first leg, clarification of business needs and strategy in information systems terms. The information flow on the global level is to be focused, thereby giving best possible solution also on the local level (Ericsson Global Business Model website 1998). In our opinion, this means a restriction in the former freedom of the local companies to develop or choose own solutions. Although, since the ten different companies in this study are performing similar tasks the need of different systems can be discussed.

With the shift of focus, and the changes that come with it, it is important to create a functional strategic plan. In doing this it is, as argued for in this thesis, important to be fully aware of the present situation. Other authors, among them Moberg, Nilsson & Tägtström (1991) who discuss the importance of the pre-study also highlight this. Also Goldkuhl & Röstlinger (1988) bring forward the need of analysing the current situation before making changes. In their opinion it is of high importance not to decide for any kind of solution before understanding the actual need of the organisation, and this can only be done by examining the present situation. The changes risk otherwise solving the symptom, but not the actual problem.

The importance of this is getting even clearer when the future purpose of the field study made in this thesis is discussed. The aim is to minimise the number of tools on a global level by finding the best tools and promote them globally, combined with the SAP R/3 system, while divesting the less good tools. Correct information, and a complete overview, is necessary to conduct this in a successful way.

FURTHER RESEARCH

In accordance with the conclusions of this chapter we have defined some topics not researched in this thesis but well suited for further research.

As described under the heading Capturing Shareholder Value, creating an IC index, or even capturing the return of the investments, is to be considered a non-trivial issue. We are therefore happy to leave this topic to other authors.

As discussed under the heading Global Organisations, co-ordinating information strategies and application portfolios between sub-organisations is a complex area, and we consider it suitable for further research.

We also believe that the question of how an evaluation of an application portfolio can be used improving the business, thus increasing the structural value of the organisations, is a topic suitable for further research. This has been described under the heading Interpreting the Results.

Researching how genre systems can improve global interaction and how to create, implement and maintain these systems is also a topic suitable for further research. We have discussed this under the heading A Structured Approach to Interactions.

CHAPTER SUMMARY

This thesis presents a method of how to research an organisation's information systems in order to find and understand the value contributed by a single application. Focus in the method is to create understanding, rather than an attempt to measure a particular value of the application in numbers or equivalent.

We believe, based on our theoretical studies, interviews with people concerned and the results and experiences of the performed field study, that the method is well suitable for information systems research. We also believe that it proficiently meets the purpose as presented in the first chapter, being a structured way to make visible the value of information systems.

Some areas close to the researched subject are of special interest, as a deeper study or as further research. Four of these are presented as especially interesting, i.e. the creation of an IC-index that more distinctly measures the return of IS-investments, the co-ordination of IS-strategies between different sub-organisations, how to use the method in order to increase the value of the organisation, and finally the topic of creating a genre system in order to improve global interaction.

Epilogue

"Where shall I begin, please your Majesty?" He asked.

"Begin at the beginning," the King said, very gravely, "and go on till you come to the end: then stop."

(Lewis Carroll, 1865)

Some thoughts have arisen during the work with this thesis.

We believe that successful managers must realise that the information technology has created a new economy and a new business logic. New organisations are therefore needed, although they may very well spring from older. These organisations will focus only and utterly on a few value-creating activities, most easily classified as information transformations. All other activities are rationalised, outsourced or even divested. Value is in this way more often created through intangible assets then ever before.

We also believe that successful managers must focus on the creation of lean processes with adequate support from information technology. A key to these topics is a change in the information handling, and the vital term is standardisation.

Finally we believe that a great evolution in application portfolios soon is about to take place. This evolution does not spring from the increasing use of enterprise integration systems today implemented by many organisations. The value derived from the relations stressed in the presented model will instead greatly benefit from increasing possibilities of information communication and interchange, providing significantly larger accessibility of information in large organisations.

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Appendix i

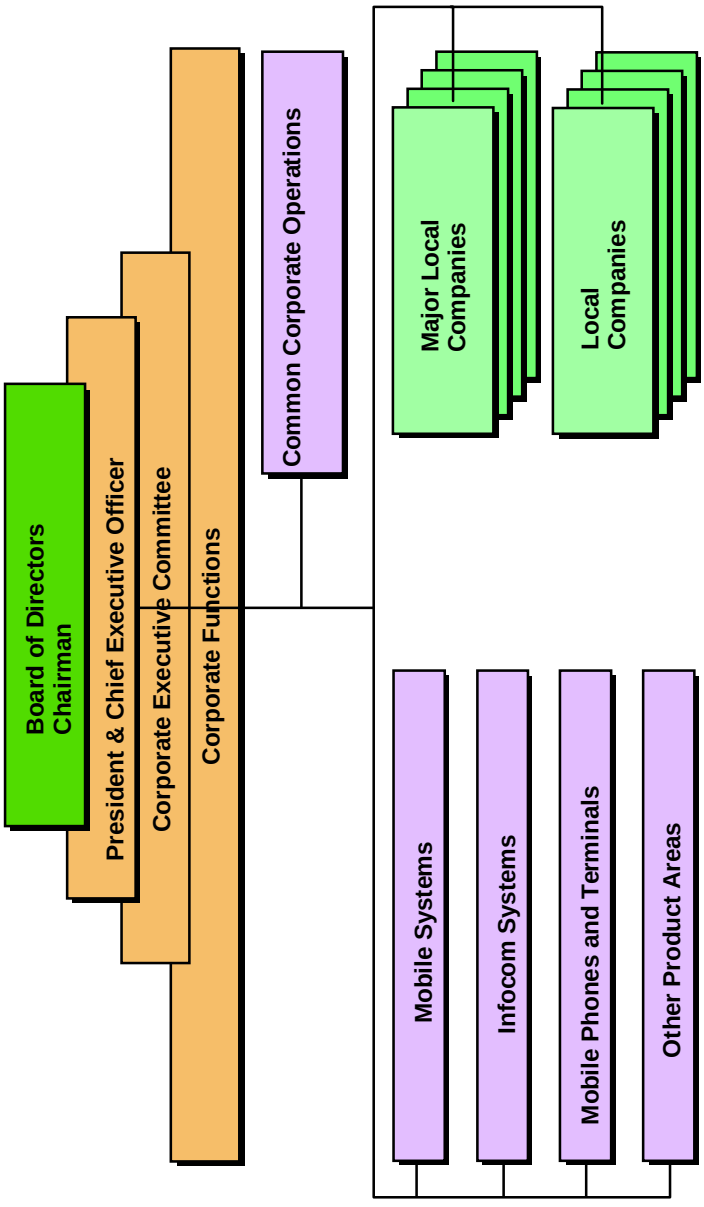

Figure 22 *Ericsson Organisational chart*
Source *Ericsson intranet (1998)*

Appendix ii

This figure has been left out in this version due to confidentiality reasons.

Figure 23 *The TTC flow*
Source *Ericsson intranet*

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Appendix iii

EGBM - ERICSSON GLOBAL BUSINESS MODEL

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Appendix iv

THE ERICSSON STANDARD OFFICE ENVIRONMENT

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Appendix v

PRIORITY 1

- Name
- Description
- System Owner
- Process Name

PRIORITY 2

Name of business tool

Description

System Owner

Process name

Age

Number of users

Yearly maintenance budget

	EDT	ERA	External
System vendor	()	()	()
Maintenance vendor	()	()	()

	PC	UNIX	WWW	Main-frame
Technical platform	()	()	()	()

	High	Medium high	Medium low	Low
Support to the sub-process	()	()	()	()
Use frequency	()	()	()	()
Reliability	()	()	()	()
User friendliness	()	()	()	()

	Yes	No	With:
Electronic interconnections with other business tools	()	()	
Will be replaced	()	()	

	Yes	No
Technical platform supported in the future	()	()
Known Y2K problems	()	()
Is/Will be ESOE-certified	()	()

Other comments

Information given by

Ulf Nordström
Anette Westling

Appendix vi

THE TIME TO CUSTOMER PROCESS

This text has been left out in this version due to confidentiality reasons.

WORLD CLASS TTC

This text has been left out in this version due to confidentiality reasons.