



UNIVERSITY OF GOTHENBURG

Valuation of IT-investment

A valuation method for ICC-investment

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Abstract

Organisational spending on IS/IT is continuously expanding. Investments in IS/IT are usually seen as necessary without leading to direct organisational benefits. Only direct and easy measured benefits are valued when using traditional IT-valuation methods. This leaves out benefits that could be vital for organisations only because they are seen as difficult to measure. Organisations often fail in valuating IT-infrastructure components since they view this as strictly technical and separated from business. One such IT-infrastructure component is an ICC (Integration Competence Center). An ICC can be described in light terms as a central hub that handles communication between information systems in an organisation. This thesis is a continuation of a previously conducted research on the same subject. The previous research was conducted in collaboration with the IT-consultant company Zystems. Zystems delivers ICCs to their customers but were using an unfulfilling valuation method for ICC-investments. One result of the previous research was six demands that were claimed as important to consider in an improved valuation method for ICC-investments.

The purpose of this thesis was to construct a new valuation method for ICC-investments, based on these expressed demands. These six demands had to be investigated in relation to the intended environment where it would be applied. The valuation method should be applied by Zystems when valuating benefits of an ICC on current and potential customers in the government sector.

One of the results in this thesis was that the complexity of the studied environment had to be investigated. This was performed during empirical studies with Zystems and their current and potential customers in the government sector. The result from the empirical studies were areas of interest that defined the complexity of the investigated environment. Complexity of the environment affected how the six expressed demands could be fulfilled in the new valuation method for ICC-investments. Final result of this thesis was a constructed valuation method for ICC-investments that include the expressed demands. Except for fulfilling the six expressed demands, the new ICC-valuation method also enables two other factors that was not mention in the six demands. These factors are however important to consider and was therefore included in the new valuation method for ICC-investments.

Keywords: IT-Management, IT-Infrastructure, Valuation of IT-investment, Integration Competence Centre (ICC)

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1 Introduction to thesis

The introduction to this thesis consists of problem description, purpose, research question and delimitation. The problem description handles experienced problems that affect formulation of the purpose of this thesis. This leads down to formulation of the research question.

This master thesis on how to value an organisation's potential benefits from IT-investment is positioned in the academic field of IT-management. The thesis is written by two students at the IT-University of Gothenburg in the course master thesis 30 hec.

The choice of topic of our thesis originates from a previous course in valuation of IT-investments that was included in our master programme in IT-management. The course covered different means to value costs and benefits from IS/IT¹-investment. One of the assignments in the course was to study how different organisations value IT-investments. While working with the assignment we got in contact with an IT-consultant organisation that deals with valuation of IT-investment on a daily basis. The IT-consultant company, *Systems*, assists medium and large sized organisations with system-integration solutions to enable structured, stable and scalable handling of information. One of their main solutions is an integration platform called ICC (Integration Competence Center). An ICC can be described in light terms as a central hub that handles communication between information systems in an organisation. The ICC handles both technical and organisational components. The technical component enables exchange of data between systems while the organisational component handles competencies, rules and processes. Our assignment became to identify potential improvements of the current valuation method for ICC-investments that *Systems* was using. The result of the study identified six demands that should be considered when constructing a new improved ICC-valuation method.

This thesis is a continuation of the previously conducted study. In this thesis, we will construct a method for valuation of ICC-investments by using the findings from our previous study. The six expressed demands have a central role in this thesis. The intention with this thesis is to help *Systems* improve their current valuation method. The academic contribution is to enrich the academic field with knowledge about valuation of IT-investments. This research area has an important role in improving the use of IS/IT. This is important when organisational spending on IS/IT is continuously expanding. Investments in IS/IT are usually seen as necessary without leading to direct organisational benefits (Brynjolfsson, 1993). Only direct and easy measured benefits are valued when using traditional IT-valuation methods. This leaves out benefits that could be vital for organisations only because they are seen

¹ Information systems/information technology

as difficult to measure. Gartner predicts that by 2010, *"more than 85 percent of very large enterprises and more than 60 percent of large enterprises will have one or more ICC's"* (Gartner, 2005).

1.1 Problem description

As mentioned previously, research in the subject of valuation of IT-investment was carried out by the authors of this thesis. In our previous research, the current valuation method for ICC-investment of the case study company Zystems was investigated. Their current valuation method was claimed as inadequate since it did not describe the full potential of benefits that can be obtained by applying an ICC.

One of the results from this previous study was the valuation methods inability to measure other benefits than those strictly technical (tangible benefits). In other words, their valuation method was only able to measure an organisation's technical benefits from an IT-investment and not its organisational (intangible) benefits. The study also revealed that the current valuation method had a too general orientation and was not easy to adapt to specific situations. The valuation method was also claimed as slightly too complicated to use for someone with low methodology knowledge. The study revealed that Zystems was aware of most of its method's shortcomings. In order to strengthen their current method, Zystems specified variables they wanted to include in a new improved valuation method for ICC-investments. Based on the specified variables, a discussion took place between representatives from Zystems and the authors of this thesis. This discussion resulted in six demands that were claimed as important to consider in an improved valuation method. These six demands are the following. The method shall:

- include both tangible and intangible benefits
- enable break-down of tangible and intangible benefits into activities²
- handle unique customer situations
- be able to quantify intangible benefits
- handle revenue growth and cost-saving
- consider different levels of methodology knowledge

These six demands cannot be included directly when constructing an improved valuation method for ICC-investment. If included directly, the constructed ICC-valuation method might be unfulfilling for its purposes. An unfulfilling method either risk valuating benefits badly or in a wrong way. To avoid this situation, the six demands needs to be investigated in relation to the environment where they will be used. The constructed ICC-valuation method shall be used by Zystems when valuating benefits of an ICC on current and potential customers in the government sector.

² Objectives broken down to clearly defined activities are further explained in the theoretical chapter.

IT-management

IT management is the overlying academic field of knowledge in this thesis. In this thesis, IT-management is seen as the art of using design principles and IS/IT to improve the information environment in a long-term perspective. IT-management handles problems regarding adaption of new technology, development of systems and maintenance of previously made IT-investments. This field of knowledge also handles issues regarding the IT-organisation, responsibilities, authorities and avoidance of risks that might jeopardize successful IS/IT usage (Magoulas & Pessi, 1998). IT-infrastructure and valuation of IT-investments are two underlying research areas within the IT-management field that relate directly to our field of investigation.

An IT-infrastructure enables communication between information systems, applications and humans inside & between organisations. IT-infrastructure therefore incorporates technical as well as organisational resources such as people, skills etc (Ciborra, et al., 2001). An IT-infrastructure consists of several components, for example server-structure, networks and integration platforms. A more detailed description of IT-infrastructure is presented in the theoretical framework.

Integration platforms can be a part of an organisation's IT-infrastructure. A platform can likewise IT-infrastructure be divided into technical and organisational components. Several solutions exist that enable handling of both technical and organisational components by the use of an integration platform. One such solution is ICC (Integration Competence Center).

ICC functions as a shared and centrally coordinated resource within the organisation. The ICC aims to fulfil organisations' integration needs in a controlled and effective manner. An ICC handles both technical and organisational components. The technical component enables exchange of data between information systems while the organisational component handles competencies, rules and processes. A governance function may be included in an ICC to enable co-existence between technical and organisational components. The governance function possesses holistic responsibility to make sure that organisational integration needs are fulfilled. One example of the holistic responsibility is to orchestrate the process to convert an expressed business need into a final integration solution (Contivo, 2002) (Gartner, 2005).

Valuate benefits

Valuation of IT-investments is likewise IT-infrastructure a research area within the IT-management field. Valuation of IT-investment includes means to value tangible and intangible benefits from IS/IT-investment. Tangible benefits are usually expressed in direct economical terms. Intangible contributions are on the other hand usually expressed as rich descriptions of benefits. The intangible benefits are regarded as difficult to define in economical terms. Tangible and intangible benefits have traditionally been handled separately in the valuation process. Of these two,

valuation of tangible benefits has traditionally been dominating in practical use (McKeen & Smith, 2003). Few attempts have been made to include these benefits in a combined method for valuation of IT-investments.

1.2 Purpose and research question

The purpose of this thesis is to construct a method for valuation of ICC-investments. The method shall consider the six expressed demands identified in a previous study conducted by the authors of this thesis. The six demands are the following. The method shall:

- Include both tangible and intangible benefits
- enable break-down of tangible and intangible benefits into activities
- handle unique customer situations
- be able to quantify intangible benefits
- handle revenue growth and cost-saving
- consider different levels of methodology knowledge

These six demands need to be investigated in relation to the environment where it will be applied. The valuation method shall be applied by Systems when valuating benefits of an ICC on current and potential customers in the government sector. This investigation will be carried out in this thesis and aim to enrich the understanding of how the six demands will affect construction of the improved valuation method. Based on expressed purpose the research question is:

How can a valuation method for ICC-investments be constructed considering the six expressed demands?

1.3 Delimitations

The environment in this report is delimited to Systems and their current and potential customers in the government sector. Systems have customers in several industries and government sector is one of them. This sector is selected as object of study since organisations in this sector experience increased integration needs.

Focus on construction of a valuation method is the second delimitation in this thesis. The implementation and the follow-up stages are not handled. This delimitation is selected to both fulfil Systems experienced problems with current method for valuation of ICC-investments, and to give a contribution to the research on valuation of integration platforms.

In this chapter, an introduction to this thesis has been presented. This served the purpose to introduce the reader to topics that will be handled throughout this thesis. The purpose and the research question was presented last in this chapter together with the delimitations. Next chapter will handle the report method. This chapter describes the taken course of actions in this thesis. It also explains the validity and reliability of the thesis and handles sources.

2 Report method

A method is a means when solving problems and gathering of knowledge and understanding (Holme & Solvang, 1997). The method chapter expresses applied course of action and methods included when gathering data. Selection of research method principles are motivated by expressing how they are applied in this chapter. In order to handle credibility of primary and secondary sources, validity and reliability are handled.

2.1 Research method

Numerous different methods exist when performing research. Methods have their strengths and weaknesses in different situations. By understanding how these methods can be applied together, handling of the whole research area is enabled (Holme & Solvang, 1997). In this chapter, applied research methods and their focus areas will be explained in below section.

2.1.1 Qualitative and quantitative study

Qualitative and quantitative research methodology is two approaches to gather and handle empirical information. Qualitative methods gather and handle unstructured information. Intention when applying a qualitative approach is to gain understanding of context, problems, complexity and studied characteristics. This is reached by performing a detailed study close to investigated context (Holme & Solvang, 1997). In qualitative research, expressions and pictures are applied rather than numbers (Merriam, 1994).

Quantitative studies are more structured and formalised than qualitative studies. Quantitative method is characterised by strong control of respondents, especially when performing a question survey with predefined option fields. Intention is often to describe identified problems from a general view. Context is evaluated on distance and no close investigation on specific local characteristics is performed (Holme & Solvang, 1997).

This thesis has a qualitative approach with focus on identifying and understanding a certain context. The context is studied in detail in order to depict complexity and knowledge levels. Both rich description in words and picture will be applied when explaining characteristics of the context. In some specific areas of the report numbers were applied. These numbers were not unique for evaluated context, since they are handled in more general terms regarding economical weighing of parameters.

2.1.2 Case study

Case studies are useful in many forms of academic studies and may be more or less expressed in relation to other approaches. Detail level of case study may differ dependent on the researchers' intention with performed study. Case studies are applied to understand and investigate a certain context in order to depict complexity and characteristics (Merriam, 1994).

This report is performed partly as a case study at Zystems. Environment of the case study was set to Zystems internal organisation and their present and potential customers in the government sector. The case study enabled a detailed study of a real case problem regarding valuation of IT-investment. Complexity and knowledge of defined scope in the case study made up the fundamental empirical structure of the report. Knowledge and experience possessed by Zystems and the government sector would be difficult to acquire if solely performing a study based on secondary information.

2.2 Data collection

Data collection can be either primary or secondary. Primary information is gathered through discussions, interviews and observations. Secondary data represents already gathered and analysed information. Secondary information can be found in research papers, dictionaries, information databases, open publications and literature (Eriksson & Wiedersheim, 1991).

2.2.1 Interviews

Interviews is a method to collect primary information regarding; opinions, statements, experience and knowledge. Gathered empirical material from interviews express the respondents view of reality and is qualitative in its nature (Merriam, 1994). Level of formalisation depends on how gathered material is intended to be used. When a formalised interview is preferred, fixed answers in form of option fields can be applied. If intention is to gain more explorative material, unstructured interviews concerning a specific topic may be carried out (Merriam, 1994).

This chapter serves the purpose of building guidelines for interview data collection. Interviews were conducted with Zystems and respondents with experience from government sector. Gathered empirical material should be handled as interpretations of reality from a certain environment. This discussion is further discussed in validity and reliability of primary information.

2.2.1.1 Selection of respondents

Respondents were selected based on their knowledge regarding the defined report scope. Interviews with respondents from the case company made up the fundamental material in the study. Except for respondents from Zystems, interviews were also conducted with respondents from the government sector. In below section a more detailed description of selected respondents is expressed.

Performed interviews are expressed in the empirical result as case 1 and case 2. Case 1 is material gathered from respondents from the consultant organisation Zystems. Case 2 is material gathered from respondents from the government sector.

Zystems (Case 1)

Selected respondents from the case study organisation Zystems consist of two main respondents and a number of respondents consulted regarding specific problem areas. The main respondents have played an active role in all empirical stages. Their contributions of knowledge and experience have been gathered when generating ideas during construction of the report. Main respondent one possesses the title of IT-management consultant and has a long history in Zystems. The respondent is active in Zystems executive board and work close with customers in several integration projects. Main respondents number two works as a project manager and senior consultant. This person works with fewer but in more intensive collaboration with customers.

Other respondents consulted regarding specific problem areas seize both technical and management knowledge and possesses deep knowledge and experience of studied problem context. Respondents have a well-defined picture of the internal organisation and are at same time active in projects that require close collaboration with customers. Empirical materials from these respondents have been applied to either confirm or strengthen by the main respondents expressed statements.

Government sector (Case 2)

Selected respondent to represent the government sector are selected from three government organisations. Their involvement gave valuable input when describing a rich-picture of organisations in the government sector. Included organisations and respondents were selected due to their knowledge and experience regarding IT in the government sector.

The first government organisation consisted of respondents from the council of Karlstad's IT department. The respondents' possessed different professions on both operational and strategic level. This department is also a main actor in the evolvement of IT in the county of Värmland.

The second government organisation included as respondents is a representative from IT-department of a city district council in Gothenburg. The respondent is head of IT and has experience in practical IT-investment.

The last and third included government organisation, was represented by one consultant active in the county of Västra Götaland's strategic IT group.

2.2.1.2 Creation of interview questions

A quantitative approach is superior when handling vast number of respondents and measuring their answers, such as statistics etc. (Ejlertsson, 2005). High standardisation is most common in laboratory experiments since the need to compare answers is high. One downside is that this may limit findings from other areas in the study.

Low standardisation represents an open discussion where respondents will not answer the same questions. However, the questions should handle the same topic. This leads to lack of structure and formalisation that makes organising of respondent's answers difficult (Trost, 2007).

Jan Trost (2007) emphasises the importance to design questions in the language of contemplated respondents. It is of great importance not to ask leading questions that could influence respondents' answers. So instead of asking 'is X working good?' the question could be rephrased 'how is X working based on your preferences?' to get a more neutral question and achieve reliability in the study.

A study also needs validity. Validity is achieved by assuring that asked questions really reflect what is to be measured. A study with high reliability and no validity risk measuring wrong subject in a correct way (Trost, 2007). This aspect is further handled in the validity section.

A qualitative approach with medium level of standardisation was selected in this study. This since objective was to attain deeper understanding of studied object. A semi-structured format was chosen. A semi-structured format means that all respondents answered questions with no pre-defined options (answers). Medium level of standardisation in this matter reflects to what extent respondents will answer same questions. By conducting a study with medium level of standardisation, questions were asked to gain a clear view of their situation, this also allows for follow-up questions if needed.

2.2.1.3 Observations

Observation of respondents can be included as complementing information to interviews when performing case studies. Observations enable holistic findings in investigated context. The observations can be more or less structured. An observation can also be performed more impulsive than interviews, made findings may thereafter be studied in more detail (Merriam, 1994).

Observations were carried out on several occasions, both with Systems and the IT-department of council of Karlstad. Observations lead to both direct and indirect knowledge vital for empirical result of this report. In those situations observations were indirect, acquired topics were further investigated.

2.2.1.4 Literature

Literature studies include searching and gathering of secondary information of a defined research area from; research reports, presentation material, information from databases, dictionaries and published books (Merriam, 1994).

Gathering of secondary information was performed by searching keyword regarding a range of subjects included in IT and IT-management area. Printed and electronically published theories were gathered from available library resources, course material and databases by Zystems accessed sources. Original sources have been applied when possible, if not, references to sources discussing and using original sources are stated.

2.3 Creditability of report

In qualitative as well in quantitative studies, researchers must consider credibility of sources, regardless if data are gathered from a primary or secondary source. Critical investigation of sources includes establishing of; when, why, where and how applied sources were constructed and by whom it was created (Davidson & Patel, 2003).

2.3.1 Validity

Validity defines if chosen methods and techniques function as intended. There are two types of validity; internal and external. Internal validity describes how made findings in a certain context corresponds with reality in the context. External validity focuses instead on how made findings can be applied on situations outside the internal context (Eriksson & Wiedersheim, 1991).

Internal validity

Regarding internal validity of this report, purpose was to construct a valuation method for ICC-investments based expressed demands identified in a previous research. Systems knowledge and experience was a central theme while constructing the valuation method. Respondents from the government sector were also included to describe their experience and knowledge. Included content are depicted from a general discussion and should be seen as estimation of reality and

not a perfect match. Methods and techniques were selected and used were applicable. The purpose was always to express investigated environment as correct as possible. However all empirical findings are interpretations of reality and can never be claimed as hard facts.

External validity

The final valuation method is not intended to be applied outside its specified environment. This since the valuation method is constructed based on the specific demands and the investigated environment. Nevertheless as described in the discussion chapter, the constructed valuation method may be applicable on other environments if required conditions are fulfilled.

2.3.2 Reliability

Reliability consider if applied methods and techniques enable credible and stable results (Eriksson & Wiedersheim, 1991). Reliability of a report is affected dependent on how the study and collection of primary and secondary data is handled. Objective is to select methods, techniques and sources that are unaffected of coincidences and solely enable high reliability (Holme & Solvang, 1997). If performed study is carried out by another researcher using same methods, techniques and sources, findings should be the same, if not reliability is low (Eriksson & Wiedersheim, 1991).

2.3.2.1 Reliability of secondary data

Fundamental theories regarding IT-management, IT-infrastructure and valuation of IT-investment are described holistically and material is gathered from research in these areas. Original sources of information are applied when possible. If original sources cannot be included for some reason then theories constructed based on original statements are applied. Secondary data regarding subjects concerning valuation of ICC was gathered from less academic sources. Applied secondary sources were selected critically and applied data are regarded as reliable and high quality material.

2.3.2.2 Reliability of previous research

A previous research was performed by the authors of this thesis regarding the same topic. One of the results from this report applied in this thesis was six expressed demands of what a new valuation method shall consider. Previous research was performed on reliable methods and techniques and how sources are applied is clearly expressed. Primary sources were collect from respondents with good understanding of investigated environment

2.3.2.3 Reliability of primary data

In reliability of primary data, empirical findings in form of interviews and observations are included. Information collected from observations was divided into direct and indirect findings. If made statements was considered as vague and/or expressed in relation to another context, further investigations was performed.

Material collected when performing interviews were edited directly after performed sessions and was included in the report (or sections of the report) at an early stage. During interviews, statements were written down in digital or analogue form, no voice recording equipments were used since objective was to attain honest and correct answers. Collecting interview material by the help from voice recording might inhibit respondents to give honest answers regarding their situation. If any collected statements were seen as vague, further investigation and following up questions with respondents were performed.

In this chapter, a description of the report method was presented. The report method explained the different steps and choice of paths that were taken in this thesis. In the next chapter, the ICC concept is explained. The reason why the ICC concept is presented here is to increase the understanding of the whole ICC-concept and its included parts. This is central in this thesis since the purpose is to construct a valuation method for ICC-investment. Connection between the ICC-concept and other applied theories therefore needs to be clarified.

3 ICC (Integration Competence Center)

In this chapter, a theoretical description of the ICC-concept is presented. The purpose of this is to increase the understanding of this concept. The ICC-concept is central in this thesis since the new valuation method will be focused on ICC-investments. The ICC-concept and its included components will therefore be described in this chapter.

An ICC is an integration platform and is a part of an organisation's IT-infrastructure. An ICC serves the purpose of linking systems and applications together to enable exchange of information. Nevertheless, focused and intense work is necessary to establish safe and stable integrations. Both organisational and technical efforts must work in coalition with each other to attain this objective.

An ICC handles both technical and organisational aspects connected to system-integration. The technical aspect of an ICC relates to this as an enabler for communication through integration. The organisational aspect of an ICC operates firstly as a link between business and IT. Secondly, to provide standards and processes of how communication should be handled through integration. If only technical aspects were considered, just a few positive effects would be realised. Benefits from technical aspects are enabled when standards and processes are put in place. ICCs deliver real benefits, however they are difficult to establish (Gartner, 2005).

The ICC aims to gather competences regarding system integration, system development & architecture, business needs, governance etc. from all over the organisation. This is collected into one resource and aspires to make well-founded decisions based on the organisation's needs (Contivo, 2002).

The need for an ICC within organisations is firstly grounded on an increasing number of information-systems with needs to communicate. This results in numerous integrations and increased complexity in the system environment. Integrations are often implemented sporadically without an ICC. This situation may however be good enough as long as the number of integrations is kept to a minimum. Some sort of organising of integrations is needed when the numbers of integrations increase. An ICC can in these situations save large amounts of money by doing right integrations and by doing them correctly. Gartner predicts that by 2010, *"more than 85 percent of very large enterprises and more than 60 percent of large enterprises will have one or more ICC's"* (Gartner, 2005).

A few required resources required for an ICC is as follows;

- *Architects*, they possess a governance function within the ICC. Architects possess a holistic responsibility for the whole integration process from business need to finished integration.
- *Developers*, implementing integrations based on expressed business needs.
- *Quality assurance*, assures that developed integrations follow standards and policies.

- *Operations and system administration*, take over the finished integration from the developers. They are thereafter responsible for maintenance and support for the integration.
- *Business analyst*, work as a link between the business and the architects. They are responsible for identifying business needs and transmitting these to the architects (Gartner, 2005).

Architects are often included in a governance function in an ICC. The governance function is responsible for processes, policies and standards that need to be controlled and managed in order to reach unity. Another responsibility is to enable co-existence between technical and organisational components. The governance function possesses holistic responsibility to make sure that organisational integration needs are fulfilled. One example of the holistic responsibility is to orchestrate the process to convert an expressed business need into a final integration solution. Many organisations contain redundant applications, complex architecture and integration processes partly because of poor governance and lack of enforced standards. Redundancy can be minimized by consolidating data management and data integration throughout the organisation (Gartner, 2008-1).

Much of the governance efforts include long-term strategies and ability to foresee upcoming challenges. Many organisations fail because of reluctance to see further than one year at the time. Long-term decisions regarding system environment and integration needs can be made only when this holistic perspective is attained (Gartner, 2008-2). An ICC provides reusable processes, competence and services that can save both time and resources. An ICC can in other words make previous efforts reusable in an organisation. Reuse can become available by introducing repositories of reference data. Reusable components can be saved and reused next time they are seen as applicable. By forcing project teams to ensure that solutions are not already designed before creating new ones, the organisations do not spend resources on “reinvent the wheel”. A well-governed ICC has the possibility to drastically lower these cost by previously mentioned efforts (Gartner, 2008-1).

Informatica describes an ICC as a shared IT function that provides project teams with robust architecture, best practise and appropriate skills. These are necessary to fulfil integration initiatives rapidly and cost-effectively. Their view of an ICC is described in figure 1. People, processes and technology must work in coalition with each other in order to achieve satisfactory integrations. This results in developed assets that can be reused if seen as applicable (Informatica, 2009).

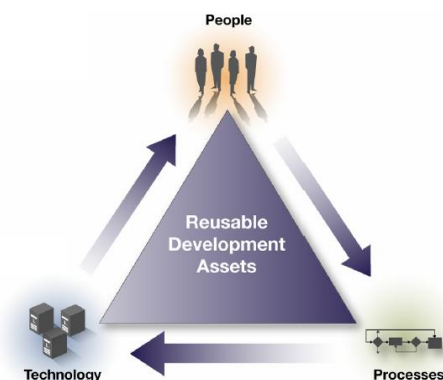


Figure 1 ICC structure according to (Informatica, 2009)

Theories from other academic fields need to be explained in order to understand the connection to an ICC. This will be presented in the following chapters in the theoretical framework. IT-management is the overlying academic field, which incorporates IT-infrastructure and valuation of IT-investments. IT-infrastructure is a part of the academic field of IT-management. IT-infrastructure consists of many different components and ICC is one of them. It is therefore important to describe this connection to gain a good understanding of what an ICC is. Valuation of IT-investments is another academic field within the academic field of IT-management. Understanding of this field is vital in understanding how the new valuation method for ICC-investments will be constructed and used. Theories from IT-management, IT-infrastructure and valuation of IT-investments will in its own way affect construction of the new valuation method for ICC-investments.

In this chapter, an explanation of the ICC-concept and its included components were presented. Understanding of the ICC-concept and the included components are important because of its central role in this thesis. In the next chapter, a theoretical framework will be presented. To be able to construct a valuation method for ICC-investments, understanding of related theories are necessary. The next chapter therefore aims to increase the understanding of how the ICC-concept relates to general theories within three academic fields. The academic fields that will be described in the theoretical framework are IT-management, IT-infrastructure and valuation of IT-investments.

4 Theoretical framework

In the previous chapter, a detailed explanation of the ICC-concept and its included components were presented. In the theoretical framework, the connection between ICC and general theories from three academic fields will be described. The connection between ICC and the academic fields will be explained at the end of the theoretical chapter. These academic fields are IT-management, IT-infrastructure and valuation of IT-investment. The academic fields include overlying theories that must be taken under consideration when constructing the new valuation method for ICC-investments. Understanding of these related theories are therefore seen as a necessity.

Furthermore, the theoretical framework will also handle the six demands that were identified in a previous research. These demands should be considered in the new valuation method for ICC-investments. The theoretical framework aims to explain the connection between the six demands and available literature on the subjects. This connection will be described at the end of the theoretical chapter. The six demands identified in previous research are presented below. They are:

The method shall:

- Include both tangible and intangible benefits
- enable break-down of tangible and intangible benefits into activities
- handle unique customer situations
- be able to quantify intangible benefits
- handle revenue growth and cost-saving
- consider different levels of methodology knowledge

These demands shall be considered in the new valuation method for ICC-investments.

The theories in the theoretical framework are selected to reflect the ICC-concept and the six demands. In the following chapter IT-management is introduced. IT-management is the overlaying theory of the three academic fields.

4.1 IT-management

A holistic view of IT-management is presented in this chapter. This thesis is positioned in the academic field of IT-management as mentioned in the introduction chapter. The IT-management perspective possessed by the authors of this thesis is influenced by courses taught at the IT-management master programme. These courses have a business-oriented perspective in relation to the traditional technical-oriented IT-management presented in traditional management literature. The IT-management chapter aims to increase understanding of this academic field and its connection to the ICC-concept and the six expressed demands. This broad IT-management scope incorporates IT-infrastructure and valuation of IT-investment that will be described later in the theoretical framework. Issues in the IT-management field therefore become important to consider when developing a valuation method for ICC-investments.

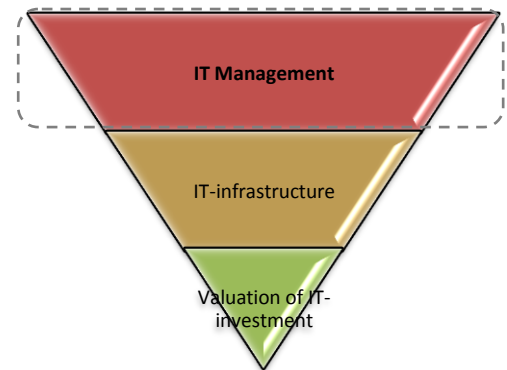


Figure 2: Funnel describing fundamental theories (own construction)

IT-management is seen as the art of using design principles and IS/IT to improve the information environment in a long-term perspective (Magoulas & Pessi, 1998). This design process can be understood as the formulation and introduction of artefacts in a social environment. Artefacts here are the technical components that are used by the organisation. The social environment on the other hand is the employees in an organisation that use and are affected by the artefacts. The process of making the technical components fit in a given social environment requires great understanding of different artefacts and their design. An artefact implemented in an organisation without considering the affected environment is therefore considered wrong (Dahlbom & Mathiassen, 1993). IT-management has traditionally focused on strict management of IS/IT-systems without paying much attention to the environment where it is to be used. This traditional view has a strong focus on control of technology and creation of system portfolios and databases for information. This view of IT-management is strongly influenced by the hard system-thinking presented in traditional management literature (Magoulas & Pessi, 1998).

A holistic view of the environment is a necessity to succeed in the process of introducing artefacts in a given environment. However, a holistic view is difficult to attain when focus is on specific IS/IT-systems instead of the whole system environment. Difficulties arise when trying to define connections between information systems, in the way they affect each other and the organisation itself. This has led to a situation where many organisations possess system environments containing separate systems unable to exchange information. This situation is often referred to as system islands (Magoulas & Pessi, 1998).

One way of solving the situation with connectivity between systems is the use of appropriate IT-infrastructure components. This process can be pictured as the

planning of a city. Infrastructure such as roads, electric wiring, and sewage discharge must be put in place before houses can be built. A house relies on the city's infrastructure and cannot function well without it. The adopting of certain rules is therefore essential to make the house fit in the provided infrastructure. Following the same reasoning, a city can become malfunctioning if houses do not follow these provided standards, especially if the evolvement of the city is hindered. Some sort of governance function, responsible for building permits and enforcement of standards is therefore desirable. IT-management in this sense relates to attaining a holistic view of the city (system environment) and not just focusing on one house (system). Infrastructure should be enabling but at the same time present desirable and enforcing standards. Both short- and long-term decision must be taken based on the whole information environment and not on what is best for a specific system (Magoulas & Pessi, 1998).

IT-management has historically been reactive and focused on upcoming problems. A new nature of IT-management revealed over recent years is in contrast to this more proactive and possess a higher level of business orientation (McKeen & Smith, 2003). IT ought to assist organisations in achieving business objectives. IT-management in this sense should be business driven and focused on both short- and long-term perspectives (Ward, Griffiths, et al. , 1990). To consider the system environment and the heritage of existing components is vital when adding new components to the environment. Hard system-thinking is therefore no longer adequate when reflecting over business, social and infrastructural factors affected by the system environment. The vast evolvement of IS/IT in organisations over recent time has added complexity to the difficult task of overlooking the system environment. There is also an evolving need to consider the organisational environment and the people affected by IT. This broader perspective considering IS/IT and organisations calls for improved role of IT-management (Magoulas & Pessi, 1998).

The previous section gave a general description of IT-management. In the following sub-chapters, three approaches in the IT-management field will be described. These approaches are hard & soft system-thinking, adaptability to general & specific situations and high & low methodology knowledge. These approaches will be described in each sub-chapter.

4.1.1 Hard & soft system-thinking

This chapter handles the complexity within the IT-management field where both hard and soft system thinking has advantages and disadvantages.

Focus in IT-management has traditionally been on hard system-thinking, as mentioned in introduction. This narrow focus is no longer adequate in a complex and changing environment (Magoulas & Pessi, 1998). Discussion regarding a systems/methods hardness and softness is a relatively new dimension. Hard system-thinking, also called "machine-age", is seen as closed constructed parts, which strive

to reach a final objective. Focus is on optimising current processes in order to reduce spending rather than increasing revenue. The world is observed as static and complexity is handled by the support of methods. The hard system-thinking is often focused on tangible components in the system environment. Tangible components are for example hardware and software used by an organisation. Measuring costs and benefits for tangible components are relatively easy since they can be compared to current components (Checkland, 1985).

Soft system-thinking on the other hand do not attempt to depict reality as static. Methods based on soft system-thinking interpret and discusses reality as constantly changing. Results do not have to be a final solution since discussions and debates about a problem could be good enough. Objective of soft methods is often to obtain continuous learning and find balance between complexity of the environment, and organisational & human adaptability. Even if complexity and problems are being view and discussed, soft methods seldom leads to clear and final answers. The soft system-thinking relates to intangible components in an organisation like for example recommendations, policies and usage of tangible components. Measuring costs and benefits for these components are in general more difficult than the tangible components. This is because intangible components are based on interpretations rather than on hard facts (Checkland, 1985).

Hard system-thinking is founded on theories regarding how an information system: is structured, how it functions and how it changes. These observations are done without including opinions and experience from the organisation. Soft system-thinking is seen as open and comprehensive. Soft-system thinking also includes subjective feelings, values and experience from the organisation. These subjective opinions consist of interrelated parts that cannot be handled separately (Magoulas & Pessi, 1998).

The debate regarding hard and soft system-thinking are in many ways restricted, when either hard or soft view are advocated (Jackson & Keys, 1984) (Checkland, 1985). The method that best fit a situation should be applied, regardless if the method is hard or soft (Jackson & Keys, 1984).

4.1.2 Adaptability to general & specific situations

Adaptability to general and specific situations in the IT-management field is discussed in this chapter. Purpose of this chapter is to describe differences between the two approaches.

Adapting a general structure is the traditional approach, this conforms to theories of hard system-thinking. Methods created on the general approach often strive for high formalising, standardising, globalising and centralising. One reason to use the general approach is to enable common work-processes with distinct rules and responsibilities (Magoulas & Pessi, 1998). General methods are often focused on a few areas of interest that are seen as static over time. There are some general issues that affects almost all organisations during a certain period of time. The general

approach will therefore enable, to a certain level, a structure regarding common issues for many organisations. Such method can therefore be applied on many organisations without considerable adaption (Røvik, 2000).

Adapting a specific structure on the other hand conforms to theories of soft system-thinking. Methods created on the specific approach depend on characteristics of the organisation. These methods do not specify a limited number of interest areas like the general methods do. Instead, they take on a wider perspective and interest areas often change over time. Content of specific methods must therefore evolve and be adaptable to changes in the organisation. Specific methods are therefore more difficult to adapt to other organisations that do not possess the same characteristics (Checkland, 1995).

One problem with general methods might be that users do not understand the whole picture and therefore have problems relating their contribution to the final result (Rentzhog, Processorientering - En grund för morgondagens organisationer, 1998). Magoulas & Pessi (1998) explain this approach as *humans as artefacts*. This is where people are seen as machines, whose purpose is to follow a fixed set of rules without questioning their relevance. The more formalised work-processes, the less flexible organisations become in adapting to changes in environment (Magoulas & Pessi, 1998). A number of authors criticise this approach and instead propagate a decoupling from: *formalised, standardised, globalised* and *centralised structures*. It is claimed that instead of treating humans as artefacts, people should be seen as *architects* whose experience and knowledge are critical for organisational success. An architect can adapt to complex and changing environments (Magoulas & Pessi, 1998).

Because hard methods are often constructed to mirror general situations, selected scope becomes limited and methods cannot be applied on problems outside its context. Context in this sense could be for example integration. As mentioned previously, this context may be apparent in many other organisations and therefore reusable. When each method has limited scope, one single method will not work for all situations. Therefore, users must be aware of when a certain method could be applied (Checkland, 1985).

Bergenstjerna et al. (1999) claim a correlation between level of uncertainty, quality and efficiency of a method. A well-functioned method could help reduce uncertainty. Selection of methods depends on the specific situation and this could not be answered on a general basis. Selecting methods that are sufficient for a specific problem requires a certain level of methodology knowledge. Treating humans as architects rather than artefacts might therefore require higher level of methodology level (Bergenstjerna, Johansson, & Wojtasik, 1999).

4.1.3 High & low level of methodology knowledge

This chapter handles high and low methodology knowledge in the IT-management field, understanding of this is essential since it affects how methods can be designed.

Methodology is more than understanding and knowledge about methods. Methodology can be seen as a worldview based on paradigm and norms. Dependent on the worldview that the methodology is founded on, it will affect all underlying methods (Bergentjerna, Johansson, & Wojtasik, 1999).

High & low level of methodology knowledge relates to the ability of using methods. It is difficult to construct a method that complies with varying knowledge. Methods are therefore often constructed for a general or a specific situation (Rentzhog, Processorientering - En grund för morgondagens organisationer, 1998). Methods for general situations generally require a lower level of methodology knowledge since the focus is on areas of interest that are static over time. Methods for specific situations on the other hand require a higher level of methodology knowledge. This since areas of interest change over time and interpretations are required to identify characteristics for the organisation (Goldkuhl, 1993).

Bergentjerna et al. (1999) claim an apparent correlation between uncertainty and the level of methodology knowledge. Not everybody possesses high level of methodology knowledge. A balanced method may contribute to reduced uncertainty, not elimination of uncertainty (Bergentjerna, Johansson, & Wojtasik, 1999). Methods should be selected based on how they comply with the problematic situation. If tools, techniques and process steps are static, they might become obsolete and bureaucratic (Goldkuhl, 1993). In order to gain a more detailed description of levels of methodology knowledge, methodology knowledge will be broken down into six levels, see figure 3 below.

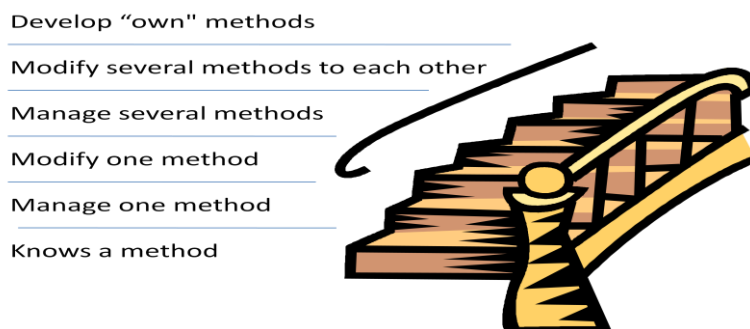


Figure 3 Methodological stair (Pessi, 2006)

The first step on the methodological stair is to know at least one method. Users do not have to understand how a method is constructed or how to manage it. Knowledge about a methods bare existence is satisfactorily on this step. From knowing at least one method, next step is to learn how to use a method. Users are not required to know how to construct or in which context a method will be applied. Solely understanding of how to manage a method in its simplest form is good

enough. Methods must sometimes be adapted to fit a specific context which is handled in the third step. Even if one can modify a method, no method can fit all purposes and contexts. Ability to handle one single method is therefore not enough. The fourth step of the methodological stair is thus to manage several methods. (Pessi, 2006).

Users have to understand how each method works and in which situations it can be applied. Methods do not always comply with each other when managing several methods. These methods must therefore be modified to function together. To do so, users are required to know how each method is constructed and how they can be adapted to one another in order to solve a problematic situation. The last and sixth stage is to develop an "own" method. The reason why own is quoted is because several existing methods can be combined in order to develop a new method. If no available method can handle a certain situation, an entirely new method could also be constructed. This new method should be based on existing theories with support from gathered empirics (Pessi, 2006).

In the IT-management chapter, theories from the IT-management field have been presented. These theories are important to consider when constructing the new valuation method for ICC-investments. Next chapter will handle IT-infrastructure, which is part of the IT-management field. ICC is included as a part of an organisation's IT-infrastructure. Understanding of IT-infrastructure is therefore important to explain since it works as the link between IT-management and the ICC-concept.

4.2 IT-infrastructure

IT-infrastructure is explained in this chapter and aims to increase understanding of this academic field. IT-infrastructure is included since the case study company in this thesis delivers IT-infrastructure solutions to their customers. The focus in this thesis is on the IT-infrastructure component ICC. IT-infrastructure issues therefore become important when developing a valuation method for ICC-investments. A general view of IT-infrastructure and

its components will be presented in this chapter. IT-infrastructure acts as connection between IT-management and the ICC-concept. Clarification of this connection must therefore be explained.

IT-infrastructure incorporates technical components as well as social components such as people, skills etc. (Ciborra, et al., 2001). IT-infrastructure is often regarded as technology separated from the business and its objectives. Sirkemaa (2002) emphasise a problem where organisations too often focus on business processes and information systems and disregard the important foundation they all rely and depend on. The infrastructure should not be regarded as different systems and services. The infrastructure should instead be seen as a foundation or a platform that enables and supports business needs. The infrastructure should be observed as a long-term investment. Long-term investment means to fulfil current business needs and be flexible for future evolvement (Sirkemaa, 2002).

Ciborra et al (2001) state that no organisation starts from a blank page when building their infrastructure, there is always a heritage that needs to be taken into account. Organisation's infrastructure is therefore constantly evolving and components may be implemented for new functionality or replacement of other components. Building an infrastructure is therefore a constant development, this since new components need careful adjustment to fit in a given environment. Ciborra et al. exemplifies this as roads that are an integral part of a society. Roads are seldom erased, they are instead continuously improved (Ciborra, et al., 2001). Alongside this, organisations are constantly evolving and new functionality from the infrastructure is requested. A better alignment between the business and the IT-infrastructure is therefore desirable. Organisations have and will always have evolving needs that the IT-infrastructure must enable and support. The IT-infrastructure must therefore evolve in tune with the business. This must however be done in a controlled manner based on needs and heritage (Ciborra, et al., 2001).

Sirkemaa (2002) emphasise the human as one aspect that is often left out when discussing IT-infrastructure. The human aspect is represented by competence, knowledge and experience possessed by employees in an organisation. One view of

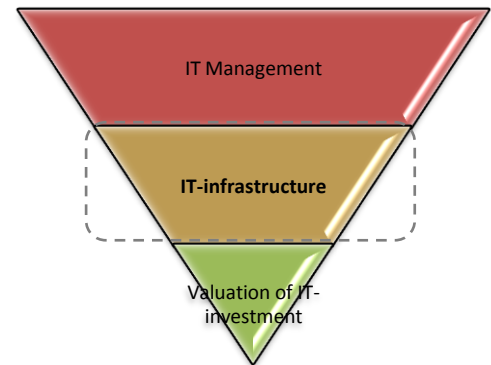


Figure 4 Funnel describing fundamental theories (own construction)

this human aspect is as the glue that connects technology with the business. The IT-infrastructure in an organisation must therefore reflect business needs and at the same time be usable by the employees (Sirkemaa, 2002). Sirkemaa emphasise a stable and at the same time flexible infrastructure as integral for all organisations. Stability and flexibility could be provided by standardisation of IS/IT. Standardisation aims for a unified infrastructure throughout the whole organisation. Standardised infrastructures are easier to maintain and modify than a diversified infrastructure (Sirkemaa, 2002).

Ciborra et al. (2001) agree with previous statement and regard an infrastructure without standards as just a gathering of autonomous components. Costs can be heavily reduced in an organisation by introducing standards. One example of this is that bilateral alternatives do not need to be maintained and integrated. Another example is that non-compatible components can be discarded at an early stage in an investment process (Ciborra, et al., 2001).

Integration platforms could be one component in an organisation's IT-infrastructure. The ICC-concept is a one of several integration platforms. In order to understand the ICC-concepts role in an organisation's infrastructure, theories about integration platforms ought to be included in the theoretical framework. Theories regarding integration platforms are therefore introduced in the following section.

4.2.1 Integration platforms

Integrations could be one component is an organisation's IT-infrastructure. In this section integration platforms will be introduced.

An ICC is an integration platform and is a part of an organisation's IT-infrastructure. It serves the purpose of linking systems and applications together to enable exchange of information. Nevertheless, focused and intense work is necessary to establish safe and stable integrations. Both organisational and technical efforts must work in coalition with each other to attain this objective.

Historical system integration and integration platforms have been focused solely on the technical side. The technical side was in this aspect solely how to create integration between two applications with minimum effort. Virtually no standards were available when performing integrations. This resulted in numerous of integration solutions that were unable to communicate with each other (Chappell, 2004). Integrations were in the mid 1990's something that was performed to link already existing information systems and applications together. These systems and applications were not designed to be connected to each other from the start (Gartner, 2008). Nowadays organisations have higher demands for the way integrations are implemented and linked to the organisation. Factors like scalability, availability and performance are important organisational demands. It is no longer adequate to have information systems that are disconnected from the remaining system environment. Neither is it desirable to attain a system environment where every system is connected to each other with disparate connections. An integration

platform might therefore possess an important role in upholding this connectivity (Chappell, 2004).

To establish standards and processes for how this connectivity will be performed relies on the organisational side of an integration platform. Organisations may perform integrations more efficient by enforcing standards and best practise for how integrations should be performed (Gartner, 2008). This becomes more important when the number of information systems in organisations is constantly growing. The amount of information handled in organisations is, likewise information systems, growing. An integration platform could also help ease the increased information flow. Integration solutions will always be needed in organisations and appropriate ways to handle integration is requested by many organisations (Chappell, 2004).

In this chapter, an explanation of IT-infrastructure and its included components were presented. IT-infrastructure issues are important when constructing a valuation method for ICC-investments. The link between IT-management and ICC has now been clarified. This link is expressed through IT-infrastructure and integrations platforms. Now when this connection has been clarified, next step is to valuate the ICC-concept. A general view of valuation of IT-investments is presented in the next chapter. No adequate valuation method for ICC-investment was identified during the theoretical study. Next chapter therefore serves the purpose to increase understanding of valuation of IT-investments in general.

4.3 Valuation of IT-investment

A general view of valuation of IT-investment is presented in this chapter. This chapter aims to increase understanding of this academic field and present different factors to take into consideration when constructing an ICC-valuation method.

A general view of valuation of IT-investments is described first in this chapter. Secondly, methods that could be applied in new valuation method are presented. No adequate valuation method for ICC-investment was identified during the theoretical study. Material gathered in

the theoretical study therefore presents a general view of valuation of IT-investments.

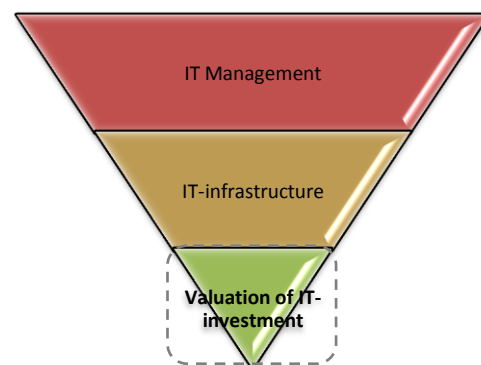


Figure 5 Funnel describing fundamental theories (own construction)

Valuation of IT-investment include means to evaluate potential investments in IS/IT components. Valuing IT-investment relates to both the costs and the benefits of an investment. Benefits that relates to what the investment will deliver when implemented is rarely investigated (Lundberg, 2004). Good insight in business needs combined with knowledge about current infrastructure is therefore desirable. IT-management has an immense role in this process by providing competence regarding current system environment, strategies and stakeholders view (Magoulas & Pessi, 1998).

Valuation of IT-investment has historically, likewise general IT, been focused on tangible benefits. IT departments have often been viewed as a separate part from the business itself required to deliver IT at lowest possible cost. Because of poor alignment between business and IT, there has been a lack of understanding between them. Lack of understanding has led to problems interacting. A part of this is explained in the productivity paradox. The productivity paradox is the state where IT-investments are made without resulting in increased productivity (Brynjolfsson, 1993). This paradox is seen as unacceptable when economical resources are limited. Brynjolfsson states that if this paradox is correct, further IT-investments appear doubtful (Brynjolfsson, 1993). Better alignment and understanding between business and IT is important. Better alignment might result in focus on intangible benefits and enabling capabilities of IT. McKeen & Smith (2003) express following statement: *“Until the business gains full understanding of the technology’s potential and until IT acquires an appreciation of the business strategy, the full potential of an IT-investment cannot be estimated with any degree of confidence”* (McKeen & Smith, 2003). Furthermore, Lundberg (2004) states that the IT-investment processes must be accompanied by appropriate changes and adjustments in the organisation (Lundberg, 2004).

The historical statement that IT spends resources without adding value is according to McKeen et.al (2003) dubious when value for the business can be found in both tangible and intangible factors. Even though IT does not always increase

productivity, IT-investments could still lead to other positive effects, McKeen & Smith (2003) discusses three different types of potential benefits from IT investments:

- Extended services/products delivered internally and/or externally – for example improved ability to deliver, access to information, flexibility and compatibility.
- Cost savings/avoidance for example reduced duplication and manual operations, improved reliability and efficiency.
- Enhanced work environment for example improved usability, physical environment and responsiveness towards customers.

These potential benefits represent both tangible and intangible benefits, which contain opportunities for both cost reduction and revenue growth (McKeen & Smith, 2003).

In this section, a general view of valuation of IT-investment was presented. In the following sections, methods applicable when valuating IT-investments will be described. The included methods are; Balanced Score Card, PENG-method, portfolio management, and some of the more common economic assessment methods.

4.3.1 Break-down by using BSC (Balanced Score Card)

Balanced Score Card is described in this chapter. BSC is one example of a valuation method that is often used when valuating IT-investments. Parts of this method could be used when constructing the new valuation method for ICC-investments. The BSC is described below.

BSC (Balanced Score Card) is a method that aims to connect an organisations' vision, business plan and strategies to operative performances (Bruzelius & Skärvad, 2000). The vision is the overlying aspect in BSC. The business objectives are however the starting point when constructing a BSC structure.

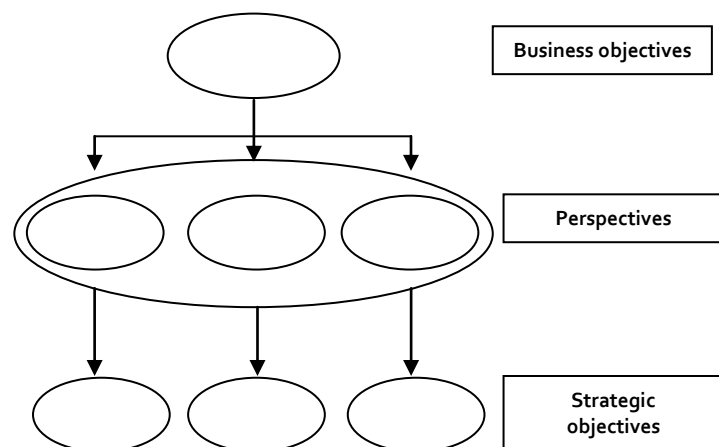


Figure 6 the BSC structure (Own construction)

A number of underlying perspectives are selected and broken down from the business objective. A perspective is an interest area that is observed in detail. A perspective is then examined in relation to the overlaying business need and the other selected perspectives. Selected perspectives are in the next step broken down into underlying strategic objectives. The strategic objectives shall give a rich-description of the business objective in relation to the selected perspectives. The strategic objectives are in the next step broken down into critical success areas. Critical

success areas express what is critical to the specific organisation in order to reach their strategic objectives. The critical success factors are rich-descriptions of strategic objectives. First at the following stage, the critical success factors are broken down into weighing. The weighing express how the success factors will affect organisational performance. The last stage of the BSC is to express a plan for how the specified weighing will be fulfilled. This stage is connected to the planning and implementation phase of an investment (Olve, Roy, & Wetter, 1999).

In this thesis, only the first three stages will be used from the BSC-method. These are construction of: business objectives, perspectives and strategic objectives. The following three stages are not handled by using BSC in this thesis. Other methods will be applied to handle these stages.

Handling of organisational business objectives

The first stage when using BSC is to express how the organisational business objectives will be handled. These business objectives are broken down from the overlying vision. A vision is defined as: "an expression of the overall purpose where an organisation is striving" (Hallegård & Johansson, 1999). Most organisations already have a vision before applying a BSC. It is important that the vision really express what the organisation is aiming for. The vision could otherwise lead the organisation in a wrong direction. Acting in a wrong direction could have a great negative effect on organisational performance and in some situation be disastrous. The business objectives then aim to help the organisations fulfil its vision.

Selection of perspectives

Perspectives express certain areas that are interesting to investigate in order to fulfil the stated business objectives. The perspectives can be selected as preferred. Important when selecting perspectives is to mirror the needs of the organisation, these objectives shall therefore be based upon the vision. The perspectives can be described from which view the world is observed (Hallegård & Johansson, 1999).

Break-down of perspectives into strategic objectives

The strategic objectives are the connection between the business objectives and the selected perspectives. These objectives therefore express rules, actions and decisions of how to fulfil the business objective. How the business needs will be reached depends on the view of selected perspectives (Olve, Roy, & Wetter, 1999).

4.3.2 Valuation by using the PENG-method

The PENG-method is described in this chapter. The PENG-method is another valuations method that can be used when valuating IT-investments. The PENG-method is described below.

The PENG-method is a framework for valuation of investments, mainly focused on IT-investments. The method aim to brake-down strategic objectives into activities, next step is then to investigate how each activity can be valuated. Valuated activities shall give a clear picture of its potential benefits of the proposed investment. The brake-down process begins from an overlying strategic objective and down to preferred detail level. Each activity will thereafter be valuated and expressed in percentage or direct figures. The valuation relates to the state before the investment was made. The valuation will therefore express potential improvements compared to current state. (Dahlgren, Lundgren, & Stigberg, 2000).

The PENG-method consists of three phases:

- Preparation-phase
 - The preparation-phase handles the first stages in the PENG-method. This phase consist of four sub-stages: *select purpose of the study, gain understanding of purposed change, select and delimitate.*
- Analysis-phase
 - The analyse-phase also consists of four sub-stages, these are: *identify potential benefits, structure benefits, valuate benefits and calculate investment cost.*
- Quality assurance phase
 - The third and last phase is the quality assurance phase. This phase consists of two sub-steps: *validate risks with suggested & calculate benefits in financial form and schedule how investment process shall be carried out.*

Only the analysis-phase of the PENG-method will be discussed in this thesis. The reason for this decision is that the PENG-method has its strengths in the valuation phase. The analysis stage will be introduced below.

Analysis stage

As mentioned above, the analysis-phase consists of four sub-steps. These sub-steps are:

- *Identify potential benefits*
- *Structure benefits*
- *Valuate benefits*
- *Calculate investment cost*

The first sub-stage is to *identify potential benefits* the investment might lead to. Benefits are expressed as rich description without including percentages or figures. The identifying process shall be carried out by people with knowledge of objectives

and cause & effects relations for the investigated organisation. When this step is performed, suggested benefits must be structured in a logical flow. By construction a tree structure with the overlaying strategic objective on the top, suggested benefits can be connected on different levels, see example in appendix 2.

When the cause and effect relation of benefits is logically structured, the following step is to value suggested benefits. Suggested benefits can either be expressed in percentage or as direct figures. Direct figures will give a clearly expressed picture of how benefits affect a certain situation. However, benefits expressed in percentage are more general and enable adaption to more than one specific situation. The valuation relates to the state before the investment was made. Converting benefits into financial percentages or figures is a complicated process. The valuation process is usually based on combined experience from people included in the session. However, the valuation process can also be based on empirical studies or on applied theories. Of this reason, knowledge and experience of included people are critical in order to perform a successful valuation process. The fourth and last step in the analysis stage is to calculate valuation costs. Calculating the investment costs is seen as easy compared to the valuation of benefits. By comparing saved cost-spending and increased revenue growth with the cost of planned investment the customer can decide if proposed investment is favourable or not (Dahlgren, Lundgren, & Stigberg, 2000).

4.3.3 Gathering experience by using portfolio management

Portfolio management is described in this chapter. This method can be used when gathering and maintaining experience from previous efforts. The portfolio management is described below.

Portfolio management is a problem solving means that originates from scientific management. The norm in scientific management is to adapt tools in order to handle organisational complexity. The most effective means is to adapt a systematic organisation. A systematic organisation is aware of how to solve upcoming problems by selecting appropriate solutions. Being aware of solutions imply the possessed grade of methodology knowledge. When certain methods are applied on how they comply with practical problems. Methods included in a portfolio are usually well known methods that can be applied on a wide number of problems and/or organisations. However, the most important is not to include well-known methods in a portfolio. The most important is instead to include methods that comply with: organisational needs, context and competences (Røvik, 2000).

Portfolio management is a concept of handling vital information and experience. Even if portfolio content can be static, the content should evolve in tune with needs, context and competencies (Røvik, 2000). Constructed portfolio ought to deliver problem-solving tools in following three areas:

- general problem-finding & local problem solving

- rational and holistic problem solving regarding organisational design
- problem solving for continuous progressing knowledge base for organisation & management (Røvik, 2000).

Not everybody can be chefs but almost everyone can follow a recipe. A recipe is the same as a method in the area of methodology knowledge. If a number of problem solving tools is included in a portfolio, the users can select those techniques, methods and information that best comply with experienced problem (Røvik, 2000). Therefore, user do not have to modify or develop own methods to solve upcoming problems, this reduces the need of high methodology knowledge in the organisation. New content can be created if no tool, method or information that corresponds to a certain problem is found in applied portfolio. New content can be constructed by people with high methodology and thereafter be included in the portfolio (Bergfeldt & Börjesson, 2009).

4.3.4 Economical assessment methods

This chapter describes some of the more common economical assessment methods. These methods could be used in the new valuation method for ICC-investments to calculate costs and benefits for the investment. The economical assessment methods are described below.

Economical assessment methods can be explained as long term investment calculations. Economical assessment methods are traditionally based on tangible figures, but can also include intangible benefits. An assessment valuation method in traditional form is built on continuous evolving revenue and spending during life-cycle of the investment. Methods usually focus on liquidity transactions. Liquidity is defined as the flow of income and spending in an organisation. An economical method cannot solely focus on payments and income. A method must also include the time factor as well, since value of currency is not constant over time. Including time as a factor is only interesting in investment calculations concerning a longer time span. Time will therefore not be interesting in assessment calculations with shorter lifecycles. Investment assessment methods can be applied in many different ways dependent on the purpose. For example if an organisation wants to view a certain investment in a positive way. The organisation could perform the calculation on the investment's technical life-cycle. The technical life-cycle is usually longer than the economical life-cycle. The investment proposal will therefore be more lucrative. Final investment result could therefore affected by the selected purpose. Investments are based on either economical or technical life-cycle. Economical life-cycle can be the same or shorter than the technical lifecycle, but can never be longer than technical life-cycle. Therefore, a technical lifecycle can be applied when a longer life-cycle is favorable (Andersson, 2001) (Lenskold, 2003).

In this thesis three economical assessment methods are included. The included assessment methods are: ROI (Return On Investment), Pay-back method and NPV (Net Present Value). These are included because they are well-known.

ROI (Return On Investment)

The ROI assessment method divide revenue and spending connected to made investment during its economical life-cycle. Investments that give a positive result will be profitable. The investment proposal with highest return on investment (expressed in percentage) should be selected when choosing between several investments. (Andersson, 2001). The assessment method does not clarify what percentage an effective result would have. Result can only be evaluated in accordance with similar investments or a predefined policy level (Lenskold, 2003). The ROI formula is expressed below:

$$\text{ROI} = \frac{(\text{Gain from Investment} - \text{Cost of Investment})}{\text{Cost of Investment}}$$

Figure 7 Return On Investments (ROI) (Lenskold, 2003)

If spending and revenue differ excessively between years, the total sum must be balanced over its life-cycle. Important when adapting ROI is to be aware of that final result can be affected of user's intention, which can influence the result. Even if the ROI method has some weaknesses, it is well known, effective and easy to use and understand (Lenskold, 2003).

Payback method

The payback assessment method is applied when calculating payback time for investments. The method is easy to use and understand. The payback method is simpler to use than ROI since value of currency is regarded as stable over time. Changes in currency will therefore not be included. Evaluation formula can be seen in table 1 below. Calculation is performed by subtracting invested amount with yearly profit (Andersson, 2001).

Investment	Invested amount	Yearly profit					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	Year 0						
A	50'	20'	20'	10'	5'	5'	-
B	50'	10'	10'	20'	20'	20'	20'
C	50'	40'	20'	5'	-	-	-

Table 1 Payback assessment method (Andersson, Kalkyler som beslutsunderlag, 2001)

The payback method is not a comprehensive investment assessment method since it only includes economical effects of a relatively short period of time. Even if proposed investment is favorable for expressed time scale, it may not be the best investment overall. The method cannot be used when comparing investments on general basis because revenue and spending may be calculated differently. To avoid this dilemma, policy rules regarding how calculations shall be performed can be expressed (Copeland, Weston, & Shastri, 2005).

NPV (Net present value)

Net present value is likewise the payback method calculated based on income and spending during a specified period of time. However, in contrast to the payback method, the net present value considers return of capital in the calculation. Return of capital is calculated on interest rate based on internal and external factors. Profit of investment can be expressed by calculating present value of made or planned investment for a certain time. If net present value is positive, then investment is favorable from a financial point of view (Andersson, 2001) . A simplified formula of net present value can be seen below:

$$\text{Net present value} = (\text{sum of income} - \text{sum of spending})$$

All transactions from made investment to present date

Figure 8 Net present value formula (Andersson, Kalkyler som beslutsunderlag, 2001)

In the theoretical framework, theories were presented from three different academic fields. The presented academic fields were IT-management, IT-infrastructure and valuation of IT-investment. Next chapter will clarify the connections to the theoretical framework. First connection is the one between the theoretical framework and the ICC-concept. The second one is the connection between the theoretical framework and the six expressed demands. These connections will be described in the following chapter.

4.4 Connections to the theoretical framework

In this chapter, two connections within the theoretical framework are explained. These two connections were explained in the introduction of the theoretical framework. The first connection is between the theories in theoretical framework and ICC. How each academic field in the theoretical chapter connects to the ICC-concept is described in this chapter. The second connection is between the theories in the theoretical framework and the six expressed demands. In this chapter, explanations of how each demand connects to the theories from the different academic fields are explained.

4.4.1 Theoretical framework connected to ICC

In this chapter, a connection between the theories in the theoretical framework and the ICC-concept is described. This is based on finding within the three academic fields explained in the theoretical framework. How findings from each academic field are connected to the ICC-concept is explained in the sections below.

4.4.1.1 IT-management connected to ICC

In the IT-management chapter, theories were presented that can be connected to the ICC-concept. These theories were IT-management in general, hard & soft system-thinking, adaptability to general & specific situations and high & low methodology knowledge.

Hard & soft system-thinking is also apparent in an ICC. Both technical (tangible) & organisational (intangible) components needs to be handled in an ICC. Issues in hard and soft systems-thinking therefore become important to consider. This is because arguments in both hard and soft system-thinking affects how the new valuation method can be constructed.

Adaptability to general & specific situations must also be considered in an ICC. This is because an ICC should be able to handle general situations that are common for many organisations. The new ICC-valuation method should at the same time be able to handle specific customer situations. Adaptability to general & specific situations will therefore affect the construction of the new valuation method.

High & low methodology knowledge must also be considered in an ICC, especially when handling methods. This therefore becomes an important issue to consider when constructing a valuation method for ICC-investment. This is because the new valuation method should be usable for people with varying level of methodology knowledge, as expressed in one of the demands. High & low methodology knowledge will therefore affect the construction of the new valuation method.

How these theories will affect construction of the new ICC-valuation method is handled in the analysis chapter of this thesis.

4.4.1.2 IT-infrastructure connected to ICC

In the IT-infrastructure chapter, theories were presented that can be connected to the ICC-concept. Theories presented in this chapter were a general view of IT-infrastructure and integration platforms.

The IT-infrastructure chapter served the purpose to clarify the connection between IT-management and ICC. This connection is expressed through IT-infrastructure and integrations platforms. An integration platform is a part of IT-infrastructure and handles communication between information systems and applications. An ICC is an integration platform with multiple purposes.

4.4.1.3 Valuation of IT-investments connected to ICC

In the valuation of IT-investment chapter, theories were presented that can be connected to the ICC-concept. These theories were valuation of IT-investment in general and common methods within this field.

In the valuation of IT-investment chapter, general methods to value IT-investments were described. No adequate valuation method for ICC-investments was found during the theoretical study. Construction of the new valuation method for ICC-investments will therefore be partly based on general theories for valuation of IT-investments. Methods were identified that are used frequently when valuating IT-investments. If and how mentioned methods can be used when constructing the new valuation method should to be analysed.

How theories and methods expressed in the valuation of IT-investment could be used when constructing the new valuation method is handed in the analysis chapter of this thesis.

4.4.2 Theoretical framework connected to the six expressed demands

In this chapter, the connection between the theories in the theoretical framework and the six expressed demands will be explained. How each demand connects to the theories from the academic fields are explained in the sections below.

4.4.2.1 IT-management connected to the expressed demands

The theories explained in the IT-management chapter were IT-management in general, hard & soft system-thinking, adaptability to general & specific needs and high & low methodology knowledge. Only the demands that are connected to these theories are presented here.

All of the six expressed demands were handled in the IT-management chapter.

- Include both tangible and intangible benefits, relates to:
 - Handling of both tangible and intangible benefits were discussed in the *hard & soft system-thinking* section. Tangible components relates to hard system-thinking components while intangible components relates to soft system-thinking in an organisation. Both components should be included in the new valuation method for ICC-investments.
- Enable break-down of tangible and intangible benefits, relates to:
 - Appropriate methods must be selected to enable break-down of tangible and intangible benefits. How this selection of methods is carried out depends on the level of methodology knowledge. Level of methodology knowledge was discussed in the section of *high & low methodology knowledge*.
- Quantify intangible benefits, relates to:
 - Appropriate methods must be selected to quantify intangible benefits. How this selection of methods is carried out depends on the level of methodology knowledge. Different levels of methodology knowledge were discussed in the section of *high & low methodology knowledge*.
- Handle unique customer situations, relates to:
 - Handling of unique customer situations were discussed in the section *adaptability to general & specific situations*. Improved valuation method must be useful in both general & specific situations. As stated in this chapter, a general approach might comply with many different organisations while a specific approach complies with situations that are unique to a few organisations.

- Handle revenue growth and cost-saving, relates to:
 - Handling of both revenue growth and cost-saving was discussed in the section *hard & soft system-thinking*. Findings were that methods constructed based on the hard system-thinking were more focused on cost-savings. Methods constructed based on the soft system-thinking on the other hand focus more on revenue growth. Both should be included in the improved valuation method.
 - To be able to handle revenue growth and cost-saving also requires use of methods. Which methods that are selected depend on the level of methodology knowledge. Level of methodology knowledge was discussed in the section of *high & low methodology knowledge*.
- Consider different levels of methodology knowledge, relates to:
 - To consider different levels of methodology knowledge was expressed in the section *high & low methodology knowledge*. User possesses different levels of methodology knowledge and the new ICC-valuation method must therefore consider this fact.

4.4.2.2 IT-infrastructure connected to the expressed demands

The theories explained in the IT-infrastructure chapter were general description of IT-infrastructure and integration platforms. None of the expressed demands was handled explicit in the IT-infrastructure chapter.

4.4.2.3 Valuation of IT-investments connected to the expressed demands

The theories explained in the IT-infrastructure chapter were about valuation of IT-investments in general and methods to handle an IT-valuation process. Only the demands that are connected to these theories are presented here.

Five of the expressed demands were handled in the chapter *valuation of IT-investments*. The connection will be described below.

- Include both tangible and intangible benefits, relates to:
 - In the chapter *valuation of IT-investments*, both tangible and intangible components were connected to IT-investment benefits. Tangible benefits have had an immense focus historically IT-valuation. One reason for this could be that tangible benefits are easier to value than intangible benefits. However, there is an increasing need to be able to measure intangible benefits as well. The new valuation method for ICC-investments must therefore enable both tangible and intangible benefits to be expressed.

- Enable break-down of tangible and intangible benefits into activities, relates to:
 - To enable this break-down, a method must be used to enable a clear structure of the new valuation method. A method included in the valuation of IT-investment chapter might be included to handle the brake-down of tangible and intangible benefits.
- Handle unique customer situations, relates to:
 - To handle unique situations, a method that enables collection of experiences from previous efforts must be included. First time a situation appears it may be viewed as specific for a certain organisation. If the situation reappears, gathered experience can be included to handle the situation. This situation could be considered as a general situation if it reappears in many organisations. A method included in the valuation of IT-investment chapter might be included to handle unique situations in the new ICC-valuation method.
- Be able to quantify intangible benefits, relates to:
 - A method that handles the valuation stage must be included to quantify intangible benefits. A method included in the valuation of IT-investment chapter might be included to handle the valuation of tangible and intangible benefits.
- Handle revenue growth and cost-saving, relates to:
 - In the chapter *valuation of IT-investments*, both revenue growth and cost-saving were discussed in the section *economical assessment methods*. A method that can handle both revenue growth and cost-saving must be selected.

In the theoretical framework, theories from the three academic fields were introduced. These theories could be applied when constructing the new ICC-valuation method. These fields were IT-management, IT-infrastructure and valuation of IT-investment. Two connections within the theoretical framework were presented at the end of the chapter. The first one explained the connection between the theories in the academic fields and the ICC-concept. The second one explained the connection between the theories in the academic fields and the six expressed demands. In this connection, it was established that all demands were handled in the theoretical framework. All the demands were handled in the IT-management chapter while five of the demands were handled in the chapter valuation of IT-investments. These connections are important to understand for the continuation of the thesis. How the expressed demands will be handled in the new valuation method is described in the analysis chapters in this thesis. Next chapter is the empirical result. This chapter is divided in two case studies. The findings presented in this chapter will affect how the new ICC-valuation method will be constructed.

5 Empirical result

Empirical results from two different case studies are presented in this chapter. The first case study is performed with respondents from Zsystems. The Respondents answered to questions regarding their general experience of ICC and their experience from collaborations with customers. The second case study was performed with respondents from the government sector. These respondents answered questions regarding understanding of their own organisation. The empirical findings regarding the level of methodology knowledge are based on methodology knowledge levels expressed in the methodology stair – High and low level of methodology knowledge. On the methodology stair, stage one and two refers to low methodology knowledge, stage three to four are regarded as medium level and stage five to six as high methodology knowledge.

Important to notice is that findings in this chapter are based on the respondents' interpretations of discussed topics. There are no exact facts, interpretations are instead based on either experience or understanding of discussed topics.

5.1 Case 1 - Zsystems general experience of ICC

This chapter includes findings from an interview with respondents from Zsystems. The interview focused on establishing Zsystems view of an ICC and the services they offer their customers.

Zsystems general understanding of ICC was seen as fundamental when constructing a valuation method of ICC investment. Zsystems view on their ICC solution was therefore important to investigate in this empirical study. Zsystems handles a range of offerings containing technical and organisational components. The ICC is one of those offerings that include both components. Zsystems have been working with the ICC concept since the beginning of this decade and have obtained a wide experience of the concept. Regardless of this experience, they have not had a specific department handling ICC offerings until recently.



Figure 9: Zsystems ICC offering

Zsystems consider an ICC as a collection of service commitments that enables increased knowledge and competence in the system-integration area. The main purpose with an ICC is to support organisations in making well-governed integration decisions as well as making sure that integrations are implemented correctly.

Zsystems ICC offering is divided in five services.

- Business, creates integration requests based on business need.
- Governance, attains a holistic perspective of the whole integration process from integration request to implemented integration. The governance function is also responsible for processes, standards and policies regarding integration.
- Delivery, implements the integration requested by the business.
- Operations, deal with maintenance and support for the implemented integration.
- Integration board, is a collection of people from the other four services. This collected resource possesses good knowledge and experience of how business needs can be fulfilled by the use of available resources.

An ICC heeds both technical (tangible) and organisational (intangible) aspects connected to system integration. The ICC's technical contribution in form of an integration platform enables technical infrastructure when performing system integration. ICC's organisational contribution relates to importance of processes, standards and policy statements. Technical and organisational contributions have to work in co-existence to enable a fully functional ICC.

An integral part of an ICC is as explained above, the technical integration platform. The integration platform in Zsystems case is the ESB (Enterprise Service Bus). The ESB connects integrated systems and applications to each other, makes them replaceable and handles reliable connectivity between them. Zsystems claims that a clear process for how integrations are performed in organisations is essential. Integrations are often left out when considering new applications. Investments might appear cheaper than they really are because costs for integration are not included in the investment proposal. These costs are instead added on development and maintenance of integrations. A well-governed ICC addresses this topic and raises awareness of integration costs.

According to respondents from Zsystems, an ICC is not the solution to all problems experienced in a system environment. Nevertheless, it acts as an enabler to make processes more *effective* and *time and cost efficient*. Zsystems emphasises a few of many identified improvements by introducing an ICC;

- Dismissal of unsuitable integrations
- Quality assurance of accepted integrations
- Reusability of previous efforts
- View and competence regarding integration
- Cost reductions for development and maintenance

The fundamental structure of Zsystems ICC offering is rather stable. Zsystems also possess required competencies to deliver their ICC solution. Further competencies

would be needed first if Zystems radically changed their offerings to include services outside the system integration area. Their competencies are relatively stable at present. This since several people in Zystems acquires both theoretical and practical competences. Because their offering is stable it does not mean that the ICC solution has not improved since the beginning of this decade. The fundamental structure and concept has been stable while individual components have evolved. The individual components of their ICC offering have evolved in tune with their increased experience. Examples of individual ICC-components are applied techniques, standards, processes and rules.

Zystems have obtained experience from applying ICC solutions on several customer organisations. From these projects, Zystems have gained a broad experience of how an ICC can be applied. This experience shows that their customers rank both tangible and intangible benefits as important to measure. Nevertheless, an ICC cannot valuate all their customers' objectives, regardless if they are tangible or intangible. Valuating all objectives is not the purpose of an ICC. An ICC can handle objectives regarding communication between information systems and people. Zystems experience of objectives and how these can be reached with help from an ICC is therefore crucial in collaborations with their customers. Objectives that cannot be handled by using an ICC should be dismissed in an open discussion between Zystems and the customer.

This discussion is usually carried out in a workshop between Zystems and their customers. The First stage in a workshop is to identify appropriate objectives that can be handled in an ICC. Next stage is to break-down selected objectives in the components provided in by the ICC. Components available in Zystems ICC offering were described in figure above. Selected components are thereafter broken down into a more detailed description of proposed benefits. Zystems cause & effect experience of how benefits can be broken down in an ICC is valuable in this stage. Zystems customers have in most situation no previous knowledge or experience of benefits using an ICC. Zystems therefore act as a guide in the process to identify potential benefits. Zystems primary goal during these workshops is to reach a final result. A final result is to construct a rich description expressed in financial form for how an ICC will affect their customers' organisation. Nevertheless, the learning process and the gathering of experience are also important for Zystems. Experience of how objectives can be handled in an ICC could possibly be reused on other customer organisations in the future. Customers' primary goal on the other hand is usually to learn more about the own organisation and how their objectives can be handled in an ICC. Secondary goal is usually here to reach a final result. The interaction between customers and Zystems are handled later in the empirical result.

The ICC concept is integrated in Zystems organisation and they recently opened a new department that solely handles ICC projects. Handling of ICC's requires general understanding of the concept, although this knowledge is seldom enough.

Methodology knowledge is especially important when understanding how an ICC will affect a customer organisation. Methods are applied to analyse how the ICC will affect an organisation and how to solve experienced problems. Zsystems aspire to use methods that consider the characteristics of individual customer organisations. They also desire to be able to use methods in a way that suits the individual organisations. Zsystems are currently not able to handle this adaptation.

The consultants at Zsystems use methods in their daily work or have previous knowledge of using it. Experience of methods is also communicated inside the organisation. If an employee use or construct a new method to solve a certain situation, this method should be communicated to colleagues in Zsystems internal organisation. By spreading the use of methods, experienced problems might be solved more efficient if these situations reoccur. Increased methodology knowledge usually has a correlation with increased experiences. Methods do not always have to be complicated. Methods can instead be expressed as ways of thinking based on gathered experience. This experience can be valuable when handling upcoming problem situations.

5.2 Case 1 - Zystems experience from collaborations with customers

As mentioned in previous section, interaction between Zystems and their customers are vital when valuating benefits from an ICC. Zystems possesses general knowledge of how an ICC solution can be applied in their customers' organisation. Except for knowledge of how an ICC solution might affect a customer's organisation. Zystems need to understand how their customers' organisation functions. This knowledge is crucial for Zystems when guiding their customers in the ICC-valuation process. This section will therefore handle Zystems experience from collaboration with customers.

The ICC solution is delivered as a whole concept consisting of an integration platform, standards, processes and education. Even if an ICC is delivered as a combined solution, a tailored offering can be constructed to better suit customers' specific needs. Zystems understanding of their customers specific needs is necessary in order to construct such tailored solutions.

Most of Zystems customers are situated in the private sector. In recent time customers in the government sector has become more interesting. The government sector has an increased need of integration solutions. Zystems have no previous experience from the government sector. It is therefore vital for Zystems to gain better understanding of this sector. Increased understanding will be gained by collaborating with customers in this sector.

Zystems possess a broad experience of customers' objectives. This experience is gained from several customer projects. Nevertheless, Zystems sometimes have problems to understand each customer's specific objectives. Essential in these situations is that the customer has a clear view of their own objectives. Zystems can in these situations express how objectives might be fulfilled by applying an ICC. Zystems has to act as a guide to help crystallise the organisational objectives in situations where they are unclear. Zystems can in these situations use their experience to understand their customers' situation. This process is carried out in a discussion between Zystems and their customers. A result from these discussions is usually a declaration of customer-specific objectives. The objectives that can be reached by using an ICC are thereafter selected.

The amount of declared objectives expressed by customers could be vast. Based on Zystems experience, objectives can be divided into three groups:

- Objectives important in almost all organisations
- Objectives important in a specific industry/sector
- Objectives important for one or a few organisations

When objectives are selected, the selected objectives should be analysed regarding how they could be fulfilled with an ICC. As mentioned above, Zystems has experience of cause & effect relations from previously ICC projects. Even if Zystems

possess previous experience, they might not be able to understand how an ICC will affect a specific customer situation. Systems customers possess understanding of how their organisation functions. Systems can act as a guide in the process in those situations where customers' lack in understanding of their own cause & effect relation. An organisation's understanding of their internal cause & effects relation is carried out together with declaration of objectives. This is usually performed during a discussion between Systems and their customer.

The more heterogeneous objectives are the more difficult they become to handle. Except heterogeneity of objectives, stability of objectives also affects experienced complexity. Systems experience is that objectives are rather stable over time. Nothing is stable forever but everything is more or less stable over time.

To understand how a specific organisation function is crucial. This knowledge will however not be useful without understanding of how customers' specific situations will affect the use of an ICC. Customers seldom possess knowledge regarding how an ICC will affect their organisation. If there is a clear description of customers' objectives, stability and cause & effect relation Systems are usually able to understand how an ICC will affect the specific customer organisation.

5.3 Case 2 - Customers understanding of their own organisation

As discussed in the previous section regarding Systems experience from collaborations with customers. The collaboration between Systems and customers are vital to enable valuation of an ICC. If customers understand their own objectives, stability of objectives and cause & effects the valuation could be performed rather easy by the help from Systems. In those situations where customers do not have understanding of their objectives, stability and cause & effect, Systems will be able to guide the customers in the process. Systems have no possibility to carry out the valuation process on their own since they do not obtain understanding of specific customer organisations. Based on these expressed findings, identification of Systems customers' understanding of objectives, stability of objectives, cause & effect and methodology knowledge is vital.

The customers in the government sector possess in general a good understanding of their organisational objectives. Organisations in the government sector consist of several disparate departments/organisations with very different purposes. Schools and health-care centres have for example very different objectives. The school wants integration solutions to enable the education process that is handled on local level from teacher-to-teacher and teacher-to-student. The objectives in a health-care centre on the other hand could for example be integration need to exchange patient journals. Understanding of objectives is therefore seen as crystallized but with vast homogeneity between departments/organisations. All the respondents expressed during the interviews that they have both technical (tangible) and organisational (intangible) objectives. How these objectives could be fulfilled by the help of an ICC was unclear to most of them because of lack of ICC experience.

Objectives are seen as rather stable over time in the government sector. The fundamental purpose of a department/organisation existence is very stable even if slight changes occur. Objectives will therefore be important for a longer period of time. How long the objectives will be stable cannot be stated.

The objectives were seen as crystallized and stable. The understanding of how these objectives will affect the organisation (cause & effect relation) is also clear in general. However, the understanding of cause & effect relation in relation to an ICC is blurred. In these situations, a correlation between Systems experience of general objectives and ICC, and customers understanding of their own organisation is vital. The correlation between Systems and their customers are handled in the above section of *Systems experience from collaboration with customers*.

The customers in the government sector have a good understanding of their current situation. However, they experience problems of how to solve upcoming problems if they have not occurred earlier. The customers in the government sector claim they have a rather low level of methodology knowledge. There have been several projects aiming to increase methodology knowledge of their employees, but these

projects have in general been unsuccessful. Several respondents from the government sector experience that upcoming problem that has not occurred before takes longer time to solve. Almost no experience of how to solve upcoming problems is shared between departments/organisations. An explanation of this ineffective relation, expressed by the government sector, is lack of methodology knowledge and clear processes of how to gather experience.

5.4 Summary of empirical result

The empirical result is in itself a summation of a large amount of data collected from interviews. Only relevant data from these interviews have been presented in this chapter. The relevant data can be assorted in three sections. These sections follow the way interview were conducted in the two different case studies. Included content in these sections were identified during interviews. This content is, according to the authors of this thesis, important to consider when investigating complexity of an environment. The environment is as explained previously delimited to Zystems and their current and potential customers in the government sector.

5.4.1 Zystems general understanding of an ICC (Case 1)

This section handles Zystems experience gathered from previous ICC projects.

Experience of objectives possible to handle in an ICC

- Zystems have a broad experience from which objectives that can be handled in an ICC.
- Selected objectives must be expressed based on the customers' objectives
- Experience of how objectives can be handled in an ICC could possibly be reused on other customer organisations in the future
- Customers rank both tangible and intangible benefits as important to measure

Experience of stability of components in an ICC

- The fundamental structure of Zystems ICC is rather stable
- The individual components of Zystems ICC have evolved in tune with their increased experience and are therefore not as stable as the structure

Experience of cause & effect relation in an ICC

- Zystems have good knowledge of how cause & effect relation is handled in an ICC
- Zystems experience is important since only a few customers are familiar with the ICC-concept and how benefits can be attained

Zystems level of methodology knowledge

- High methodology knowledge and experience of using methods
- Experiences are spread among colleagues

5.4.2 Zystems experience from collaborations with customers (Case 1)

This section handles Zystems experience regarding objectives and cause & effect relation in customer organisations. This is not connected directly to an ICC, it is instead connected on a higher level. Zystems experience regarding these factors is nevertheless important when connecting them to an ICC.

Experience of objectives in customer organisations

- Zystems have good general experience of customers objectives from several customer projects
- Sometime have difficulties to understand specific customer objectives
- Essential in these situations is that the customer has a clear view of their own objectives
- Based on Zystems experience, objectives can be divided into three groups:
 - Objectives important in almost all organisations
 - Objectives important in a specific industry/sector
 - Objectives important for one or a few organisations

Experience of stability of customers objectives (over time)

- Customers' objectives are rather stable in time. Nothing is stable forever, but everything is more or less stable over time.

Experience of cause/effect relation in customer organisations

- Zystems possess general experience of cause & effect relation,
- They might not be able to understand how an ICC will affect a specific customer situation
- Zystems can act as a guide in the process in those situations where customers' lack in understanding of their own cause & effect relation.

5.4.3 Customers in the government sector's understanding of their own organisation (Case 2)

This section handles Systems current and potential customers in the government sector. Handled topic was their understanding of their own organisation. This is not connected directly to an ICC. Customers answered questions on a general basis since they do not have previous experience regarding ICC's.

Understanding of objectives

- Possesses in general a good understanding of their organisational objectives
- Homogeneity of objectives between departments/organisations
- Have both technical (tangible) and organisational (intangible) objectives.
- How objectives could be fulfilled by the help of an ICC is unclear

Understanding of stability of objectives

- Objectives are seen as rather stable over time
- The fundamental purpose of a department/organisation existence is very stable even if slight changes occur. Objectives are therefore important for a longer period of time.

Understanding of cause/effect relation

- How objectives will affect the organisation (cause & effect relation) is clear in general
- Understanding of cause & effect relation in relation to an ICC is blurred

Customers level of methodology knowledge

- They experience problems of how to solve upcoming problems if they have not occurred earlier.
- Problem that has not occurred before takes longer time to solve.
- Almost no experience of how to solve upcoming problems is shared between departments/organisations
- An explanation of this ineffective relation is lack of methodology knowledge and clear processes of how to gather experience
- The customers in the government sector claim they have a rather low level of methodology knowledge

In this chapter, the empirical result was presented. Last in the chapter, a summary of the most important findings from the empirical result was described. These findings describe the complexity of the investigated environment. These findings will be used in the analysis chapter. First, Systems ICC will be compared with general ICC descriptions from chapter 3. This will result in a rich description of the ICC-concept. Secondly, the empirical findings will be analysed in relation to the three approaches. These three approaches were introduced in the IT-management chapter.

6 Analysis

The analysis is divided into three chapters. In the first chapter a rich description of ICC is expressed. The rich description is founded on theories and Systems experiences regarding ICC. In the second chapter the conceivable balance within three approaches are handled. Conceivable balances within the three approaches are affected of made findings from the empirical result. In the last and third chapter the three conceivable balances are analysed in relation to the six expressed demands presented earlier in this thesis. The conceivable balances affect how the ICC-valuation method is constructed based on the six demands.

6.1 Rich description of ICC

A rich description of an ICC and its components is presented in this chapter. This is a result of the theoretical and the empirical studies on this concept. Empirical data are gathered from case study 1 with respondents from Zystems. Purpose of this chapter is to attain a collected view of what an ICC is. This rich description will afterwards be used in the new valuation method for ICC-investments.

Structure of an ICC

An ICC aims to gather competences regarding system-integration, system development & architecture, business needs and governance regarding integrations. The competencies are collected into one resource that aspires to make well-founded decisions based on the organisation's integration needs (Contivo, 2002). Gartner clearly emphasise the governance function in an ICC as integral for the success of an ICC. The governance function possesses a holistic responsibility to make sure that organisational integration needs are fulfilled (Gartner, 2008-1).

Informatica describes an ICC as a shared IT function that provides project teams with robust architecture, best practise and appropriate skills. Their view of an ICC is described in figure 9. People, processes and technology must work in coalition with each other in order to achieve satisfactory integrations. This process results in developed assets that can be reused if seen as applicable (Informatica, 2009).

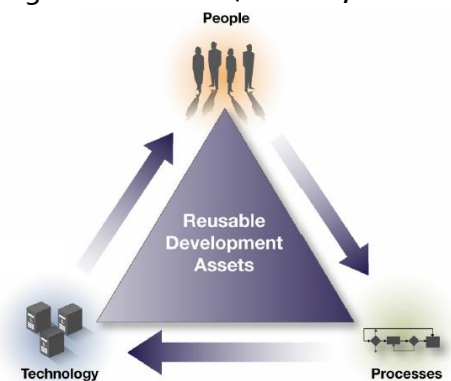


Figure 10: ICC structure according to Informatica (2009)

These two definitions are similar to Systems ICC. Systems ICC contains five services for handling of system-integration in an organisation. The services are business, governance, development, operations and integration board. The first four services contain different responsibilities while the integration board is a collection of representatives from the four services. An illustration of Zystems ICC offering is presented in figure 11. All relevant ICC-components from the theoretical studies are included in the four services in Zystems ICC offering. However, no such clear division of ICC components have been found in litterature on ICCs.



Figure 11: Zystems ICC offering

The technology function in Informaticas ICC (figure 10) is in Zystems ICC covered by the two services of operations and delivery in figure 11. The people function in Informaticas ICC is represented in all of Zystems services. The processes in Informaticas ICC is created and maintained by the governance function in Zystems ICC offering.

The content of an ICC

A result from both theoretical and empirical studies is that technical and organisational contributions have to work in co-existence to enable a fully functional ICC. Both the technical and the organisational aspect of an ICC are emphasised by Gartner and Informatica. The technical aspects function as an enabler for communication through system-integration. The organisational aspect of an ICC operates firstly as a link between business and IT. Secondly, to provide standards and processes for how communication should be handled through integration (Gartner, 2005) (Informatica, 2009). This both aspects are also apparent in Zystems ICC. Their offering heeds both technical and organisational aspects connected to system integration. ICC's technical contribution in form of a platform enables technical infrastructure when performing system-integration. The ICC's organisational contribution relates to the importance of processes, standards and policy statements.

Important roles to include in an ICC are according to Gartner (2005): architects, developers, quality assurance, operations & information system administrators and business analysts. These roles are enclosed in Zystems ICC solution. Architects and personnel for quality assurance are included in the *governance service*. Developers are included in the *development service*. Personnel for operations and system administration are included in the *operations service*. A simpler form of business analysts is included in the Zystems *business service*. A simpler form means that the business itself requests integrations. These requests are thereafter analysed by the governance function, which decide if and how the request shall be fulfilled.

An apparent focus on the governance function was found during the theoretical studies. Other functions were also identified, as described above, but the governance function was emphasised as central in all identified ICC solutions. Gartner emphasises a governance function with a holistic perspective. One example

of the holistic responsibility is to orchestrate the process to convert an expressed business need into a final integration solution. The governance function is responsible for processes, policies and standards that need to be controlled and managed in order to reach unity (Gartner, 2008-1). This is also evident in Zystems ICC offering. The governance function plays an important role in establishing processes, standards and policies for how integrations should be performed.

Summary of rich description of ICC

Zystems structure for an ICC was claimed as more detailed than those available from the theoretical study. No other ICC definition had this clear division of services and responsibilities. Zystems ICC-structure will therefore be used when constructing the new valuation method. The roles identified from theoretical studies were in this chapter analysed in relation to Zystems defined roles. It was claimed that all roles presented by Gartner was covered in Zystems ICC offering. Zystems division of roles in an ICC is therefore claimed as an adequate description of a general ICC.

In this chapter, a rich description of the ICC-concept was defined. One of the results in this rich description was that Zystems ICC can be claimed as an adequate description of a general ICC. In the next chapter, the complexity of the investigated environment from the empirical result will be analysed in relation to the three approaches. These three approaches were introduced in the IT-management chapter.

6.2 The three approaches in relation to the empirical result

In this chapter, the complexity of the environment from the empirical result will be analysed in relation to the three approaches. These three approaches were introduced in the IT-management chapter. The three approaches are;

- *hard & soft system-thinking*
- *adaptability to general & specific situations*
- *high & low methodology knowledge.*

The three approaches in this aspect relates to what is possible based on the complexity of the environment. The complexity of the environment was investigated in the empirical result. The two empirical case studies resulted in a number of factors in the environment that need to be taken into consideration when constructing an improved valuation method for ICC-investments. The three different sections handled in the empirical result were;

- *Systems general understanding of an ICC*
 - *Experience of objectives possible to handle in an ICC*
 - *Experience of stability of components in an ICC*
 - *Experience of cause/effect relation in an ICC*
 - *Systems level of methodology knowledge*
- *Systems experience from collaborations with customers*
 - *Experience of objectives in customer organisations*
 - *Experience of stability of customers objectives (over time)*
 - *Experience of cause/effect relation in customer organisations*
- *Customers understanding of their own organisation*
 - *Understanding of objectives*
 - *Understanding of stability of objectives*
 - *Understanding of cause/effect relation*
 - *Customers level of methodology knowledge*

These three empirical sections were identified as means to define the complexity of the investigated environment. The complexity of environment will affect the balance within the three approaches, this will result in a conceivable balance for each approach. A conceivable balance within each of the three approaches will be established in this chapter based on the complexity of the environment. The relation between them is explained in the figure below. Each chapter ends with a summary that explains the connection to the complexity of the environment.

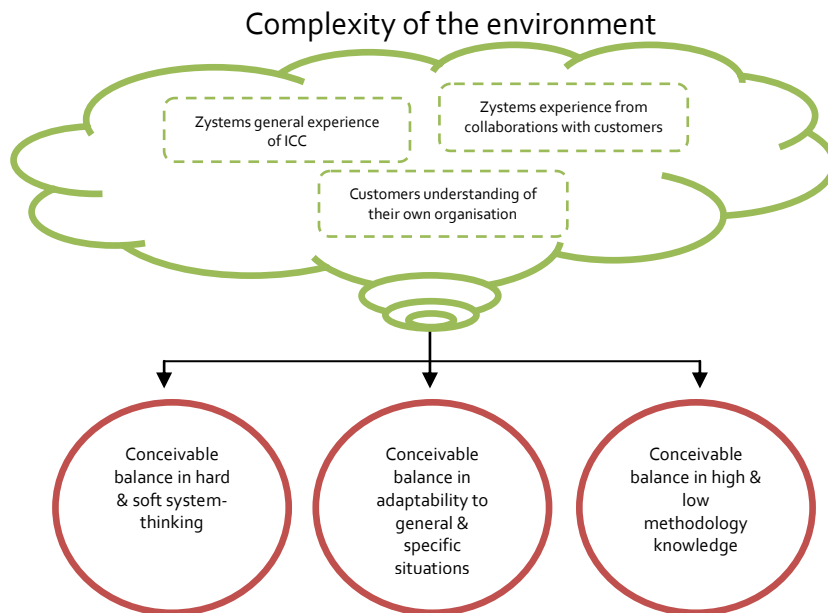


Figure 12 The three approaches in relation to the empirical result (own construction)

The first approach that will be analysed in relation to the complexity of the environment is hard & soft system-thinking. This section is handled below.

6.2.1 Hard and soft system-thinking

Conceivable balance within hard & soft system-thinking will be established in this chapter. Hard & soft system-thinking will be divided into four separate balances. This is done because of the fact that hard & soft system-thinking is too extensive and diverse to handle in one balance. The hard & soft system-thinking is therefore divided into the following four sub balances:

- ***Tangible and Intangible benefits***
- ***Static and changing environment***
- ***Final result and increased learning***
- ***Picture of the world and interpretation of the world***

These topics were identified during theoretical studies and they are central concepts in the hard & soft system-thinking. Each of these topics will result in one balance and this will be established in this chapter. Each section will end with a summary that explain the balance in relation to the complexity of the investigated environment.

6.2.1.1 Tangible and Intangible benefits

The hard system-thinking is often focused on tangible components in the information system environment. Tangible components are for example hardware and software used by an organisation. Measuring costs and benefits of tangible components are relatively easy since they can be compared to current components.

The soft system-thinking relates to intangible components in an organisation such as recommendations, policies and usage of tangible components. Measuring costs and benefits for these components are in general more difficult than the tangible components. This is because intangible components are based on interpretations rather than on hard facts (Checkland, 1985).

Zystems have obtained experience from applying ICCs on several organisations. Zystems have gained a broad experience of how an ICC can be applied from these projects. This experience shows that their customers rank both tangible and intangible benefits as important to measure. Nevertheless, an ICC cannot value all their customers' objectives, regardless if they are tangible or intangible. Only those objectives that can be handled in an ICC should be selected. This is especially important if the customer have a vast number of objectives. The selection should in these situations be carried out in collaboration between Zystems and the customer. The selection of customer objectives will be ease if Zystems have experience of the customers' objectives. If not, the wrong objectives might be selected.

The customers possess in general a good understanding of their objectives. Problems may occur when an organisation consists of several departments with different objectives. During the interviews, all the respondents expressed that they have both technical (tangible) and organisational (intangible) objectives.

The ICC must therefore be able to handle both tangible and intangible benefits in order to fulfill the customers' objectives. According to the rich description of an ICC, the concept heeds both technical (tangible) and organisational (intangible) aspects connected to system-integration. These benefits can only be realised in collaboration with the employees of an organisation. Full benefits when applying an ICC cannot be expressed if solely tangible or intangible benefits were presented. Both tangible and intangible benefits should be expressed in order to gain a rich description of benefits realised with an ICC.

This does not mean that tangible and intangible objectives shall always be included and valued in relation to an ICC. The ICC-investment valuation is based on, by the customers, expressed objectives. Selected objectives may differ dependent on the customer.

The balance between tangible and intangible benefits is therefore claimed as balanced in general. However, balance in the specific customer situation depends on selected objectives. Zystems shall not force their customers to select either tangible or intangible objectives. They can however recommend their customers to express both tangible and intangible objectives.

Summary of tangible and intangible benefits

In this section, a summary of findings from the section tangible and intangible benefits will be presented.

- **Systems experience of objectives possible to handle in an ICC**
 - customers rank both tangible and intangible benefits as important to measure
 - only those objectives that can be handled in an ICC should be selected
- **Systems experience of objectives in customer organisations**
 - Systems experience of customers' objectives are important, if not the wrong objectives might be selected
- **Customers in the government sector's understanding of objectives**
 - possess in general a good understanding of their objectives
 - have both technical (tangible) and organisational (intangible) objectives

6.2.1.2 Static and changing environment

The environment in hard system thinking is observed as static and complexity is handled by the support of methods (Checkland, 1985). Soft system-thinking on the other hand do not attempt to depict reality as static. Methods based on soft system-thinking interpret and discusses reality as constantly changing (Checkland, 1985).

The more heterogeneous objectives are the more difficult they become to handle. The stability of objectives is another factor that may affect the complexity of the environment. Systems experience is that objectives are rather stable over time. Almost no objectives are stable forever but the majority of them are more or less stable over time. Objectives are seen as rather stable over time in the government sector. The fundamental purpose of a department or an organisation's existence is very stable even though slight changes do occur. Objectives will therefore be important for a longer period of time. How long the objectives will be stable cannot be stated.

The fundamental structure of Systems ICC offering is rather stable. Systems also possess required competencies to deliver their ICC solution. Further competencies would be necessary first if Systems radically changed their offering to include services outside the system integration area. Their competencies are relatively stable at present. This since several people in Systems acquires both theoretical and practical competences. Only because their offering is stable, it does not mean that the ICC solution has not improved since the beginning of this decade. The fundamental structure and concept has been stable while individual components have evolved. The individual components of their ICC offering have evolved in tune with their increased knowledge and experience of ICC. Examples of individual ICC components are applied techniques, standards, processes and rules.

Nothing is stable forever but almost everything is stable for a certain time (Røvik, 2000). This complies with Zystems experience and their customers' understanding of objectives. The fundamental ICC structure has been relatively stable for almost a decade. Customers' objectives were in the case study claimed as rather stable over time. The constructed valuation method for ICC-investments should therefore handle objectives that are rather stable over time. The new valuation method should therefore be treated as rather stable while objectives included in the valuation phase should be treated as more changing. The balance between the environment seen as static versus changing have an even balance.

Summary of static and changing environment

In this section, a summary of findings from the section static and changing environment will be presented.

- **Zystems experience of stability of components in an ICC**
 - fundamental structure of ICC is rather stable
 - individual components evolves in tune with increased knowledge and experience
 - required competencies are stable
- **Zystems experience of objectives in customer organizations**
 - majority of objectives are more or less stable over time
- **Customers in the government sector's understanding of stability of objectives**
 - objectives are important for a long period of time
 - objectives are heterogeneous but rather stable over time

6.2.1.3 Final result and increased learning

Hard system-thinking, also called "machine-age", is seen as closed constructed parts, which strive to reach a final objective. Focus is on optimising current processes in order to reduce spending rather than increasing revenue. Results in soft system-thinking on the other hand do not have to be a final solution, this since discussions and debates about a problem could be good enough. Objective of soft methods is often to obtain continuous learning and to find balance between complexity of the environment, and organisational & human adaptability. Even if complexity and problems are being view and discussed, soft methods seldom leads to clear and final answers (Checkland, 1985).

Zystems primary intention when performing an ICC-valuation is to reach a final result. A final result is to construct a rich description expressed in financial form that explains how an ICC will affect their customers' organisation. Zystems secondary intention is to increase their knowledge and experience from collaborations. This knowledge and experience is foremost regarding their customers' objectives and how benefits of an ICC best can be expressed in relation to their customers. Zystems customers' primary intention is not to gain a final expression of how an ICC will affect their organisation. Their primary intention is instead increased understanding

of their own organisation. However, this does not mean that the customers are uninterested of how an ICC might improve their performance. Gaining understanding of how an ICC will affect their organisation is therefore a secondary intention.

To perform a valuation of an ICC and consequently reach Zystems primary intention requires understanding of the specific customer's organisation. Customers understanding of their own organisational objectives have to be clear when starting the valuation phase. If not, a process to gain better understanding must be initialised. Zystems can in those situations act as a guide in the expression of objectives. This process is carried out in collaboration between Zystems and the customer. The collaboration usually leads to increased understanding of the customers own objectives. Zystems increases at the same time their experience of customers' objectives in general.

One result from the empirical study was that customers in the government sector have good understanding of their organisational objectives. They have therefore no need of guidance from Zystems when expressing organisational objectives. Zystems experience might be valuable first when selecting those objectives that can be handled in an ICC.

Even if the customers' understand their own objectives and cause & effect relation in their organisations, they do have difficulties in understanding how an ICC will affect their performance. Zystems possess general understanding of how an ICC may affect organisations. However, they sometimes have difficulties to understand how a specific customer organisation might be affected. Collaboration between the customer and Zystems has to be performed in these situations. These collaborations aim to combine customers' understanding of their cause & effect relation with Zystems general understanding of an ICC. The result from these collaborations is usually an increased understanding of how an ICC will affect a specific customer situation. Zystems will at the same time increase their general experience of collaboration with customers.

Customers' understanding of their own cause & effect relation is sometimes blurred. Zystems can in these situations guide the customers to increased understanding. The respondents in this case study claimed that they have a good understanding of cause & effect relation in their organisations. However, they possess none or low knowledge of how an ICC might affect their organisation. This is because organisations in the government sector lack of previous experience of the ICC concept. Zystems on the other hand possess low experience of specific customer situations, but have a good understanding of how an ICC might affect customer organisations in general.

Customers' understanding of their own organisation can be combined with Zystems experience from collaborations and general understanding of the ICC-valuation

process. This combined understanding and experience may lead to a final valuation of how an ICC will affect a customer's organisation. If not, both the customer and Systems have at least gained understanding and experience from this process.

The balance between the hard system-thinking of reaching a final result and the soft-system thinking of obtaining a learning process are seen evenly balanced.

Summary of final result and increased learning

In this section, a summary of findings from the section *final result and increased learning* will be presented.

- **Systems experience of objectives possible to handle in an ICC**
 - possess general understanding of how an ICC may affect organisations
 - sometimes have difficulties understanding how a specific customer organisation might be affected by an ICC
 - primary intention when performing an ICC-valuation is to reach a final result
- **Systems experience of cause/effect relation in an ICC**
 - secondary intention when performing an ICC-valuation is to gain experience and knowledge
- **Systems experience of objectives in customer organisations**
 - have a general understanding from previous collaborations with customers
- **Systems experience of cause/effect relation in customers organisations**
 - possess low experience of specific customer situations
- **Customers in the government sector's understanding of objectives**
 - have good understanding of their organisational objectives
 - no experience of how their objectives can be handled in an ICC
- **Customers in the government sector's understanding of cause/effect relation**
 - have good understanding of cause & effect relation in their organisations
 - no experience of how cause/effect relation can be handled in an ICC
 - primary intention is increased understanding of their own organisation

6.2.1.4 Picture of the world and interpretation of the world

Hard system-thinking is founded on theories regarding how an information system: is *structured*, *how it functions* and *how it changes*. These observations are done without including opinions and experience from the organisation. Soft system-thinking is on the other hand seen as open and comprehensive. Soft system-thinking also includes subjective feelings, values and experience from the organisation. These subjective opinions consist of interrelated parts that cannot be handled separately (Magoulas & Pessi, 1998). The soft system-thinking relates to intangible components in an organisation like for example recommendations, policies and usage of tangible components. Measuring costs and benefits for intangible components are in general more difficult than for the tangible components. This is because intangible components are based on interpretations rather than on hard facts (Checkland, 1985).

Zystems general experience of ICC and collaboration with customers are based on previously performed ICC projects. These experiences are not documented or based on hard facts. The experience is instead interpretations made by individuals. This experience may thereafter be shared with other colleagues. Combined experience may sometimes be treated as hard facts. It is therefore important to remember that experience is actually interpretations of the world and not picture of the world.

The government sector's understanding of their own organisations is also seen as interpretations of the world. The organisational objectives and cause & effect might differ dependent on selected respondent from the organisation.

The collaboration between Zystems and their customers is based on an interpretative view of reality. The intention should be to find a correct way instead of focusing on finding the ultimately correct way for an organisation. The discussion can be performed once again based on new experience if selected focus is seen as wrong. The ICC valuation method should therefore be seen as an interpretation of the world. Even so, the valuation method should be representative for an ICC and those organisations the method are applied on.

Balance between picture of the world (hard system-thinking) and interpretation of the world (soft system-thinking) is seen as a strong overbalance on interpretations of the world.

Summary of picture of the world and interpretation of the world

The following aspects are based more on interpretations than on hard facts:

- **Zystems experience of objectives possible to handle in an ICC**
- **Zystems experience of cause/effect relation in an ICC**
- **Zystems experience of stability of components in an ICC**
- **Zystems experience of objectives in customers organisations**

- **Systems experience of cause/effect relation in customers organisations**
- **Systems experience of stability of objectives in customers organisations**
- **Customers in the government sector's understanding of objectives**
- **Customers in the government sector's understanding of cause/effect relation**
- **Customers in the government sector's understanding of stability of objectives**

In hard & soft system-thinking, four balances were identified. These balances were analysed in relation to the complexity of the investigated environment. The second approach that will be analysed in relation to the complexity of the environment is adaptability to general & specific situations. This chapter is handled below.

6.2.2 Adaptability to general & specific situations

Conceivable balance within adaptability to general & specific situations will be established in this chapter. The approach was identified during theoretical studies and it is a central concept in the IT-management field. This will result in one balance that will be established in this chapter. This chapter will end with a summary that explain the approach in relation to the complexity of the investigated environment.

Methods created on the general approach often strive for high formalising, standardising, globalising and centralising. One reason to use the general approach is to enable common work-processes with distinct rules and responsibilities. One problem with general methods might be that users do not understand the whole picture and therefore have problems relating their contribution to the final result (Rentzhog, Processorientering - En grund för morgondagens organisationer, 1998). Magoulas & Pessi (1998) explain this approach as humans as artefacts. This is where people are seen as machines, whose purpose is to follow a fixed set of rules without questioning their relevance. The more formalised work-processes, the less flexible organisations become in adapting to changes in environment (Magoulas & Pessi, 1998).

Because hard methods are often constructed to mirror general situations, selected scope becomes limited and methods cannot be applied on problems outside its environment. Environment in this sense could for example be the integration area. This environment may be apparent in many other organisations and therefore reusable. When each method has limited scope, one single method will not work for all situations. Therefore, users must be aware of when a certain method could be applied (Checkland, 1985). A number of authors criticise this approach and instead propagate a decoupling from: formalised, standardised, globalised and centralised structures. It is claimed that instead of treating humans as artefacts, people should be seen as architects whose experience and knowledge are critical for organisational success. An architect can adapt to complex and changing environments (Magoulas & Pessi, 1998).

Adapting a specific structure on the other hand conforms to theories of soft system-thinking. Soft methods are dependent on characteristics of the organisation. These methods do not specify a limited number of interest areas like the general methods do. Instead, soft methods take on a wider perspective and interest areas often change over time. The content included in specific methods must therefore evolve and be adaptable to changes in the organisation. Therefore, a soft method cannot be applied on another organisation without changing its content to the specific characteristics of the situation (Checkland, 1995).

The individual components of Zystems ICC offering have evolved in tune with their increased experience of the concept. Examples of individual ICC components are applied techniques, standards, processes and rules. Zystems have a broad knowledge and experience of customers' objectives gained from several customer projects. Nevertheless, they sometimes have trouble understanding each customer's specific objectives. Essential in these situations is that the customer has a clear view of their own objectives. Zystems use their experience in these situations to understand their customers' situation. This process is carried out in a discussion between Zystems and the customer. A result from the discussion is usually a declaration of customer-specific objectives. The objectives that can be fulfilled by using an ICC are thereafter selected.

Methods are applied to analyse how the ICC will affect an organisation and how to solve experienced problems. Zystems aspire to use methods that consider individual organisation characteristics. Furthermore, they desire to be able to use methods in a way that suits individual organisations. They have no possible way to handle this adaption currently. The more heterogeneous objectives are the more difficult they become to handle. The amount of declared objectives expressed by customers could be vast. This is especially problematic in the government sector. This sector consists of several disparate departments and organisations with very different purposes. Understanding of objectives is therefore seen as crystallized but with vast homogeneity between departments and organisations.

Zystems environment consist of several industries and sectors, one of the sectors is the government sector. The government sector could never be valued by using a general method that emphasises only a few characteristics. This sector has a range of objectives that are important dependent on the specific situation. The improved ICC-valuation method must therefore adapt to specific customer characteristics. The method or its content cannot change in every situation it is applied on. This is because the adaption process would require immense resources to handle. The objectives of the improved valuation method shall be adaptable to specific characteristics but at the same time be applicable on several situations. According to Røvik (2000), there are some general issues that affect almost all organisations during a certain period of time. The general approach will therefore enable, to a certain level, a structure regarding common issues for many organisations. A

general method can therefore be applied on many organisations without considerable adaption. According to Zystems experience from previous ICC projects, objectives can be divided into three groups:

- Objectives important in almost all organisations
- Objectives important in a specific industry/sector
- Objectives important for one or a few organisations

If the customers' objectives are divided in these three groups, following steps might be eased. This means that the brake-down of objectives and the valuation process might not have to be performed for every specific situation. Experience from occurred situations is collected and the process does not have to be performed each time valuation is carried out. The improved ICC-valuation method must therefore enable gaining of experience from made valuations.

The balance between adaptation to general and adaption to specific situation are seen as evenly balanced.

Summary of adaptability to general & specific situations

In this section, a summary of findings from the chapter *adaptability to general & specific situations* will be presented.

- **Zystems experience of objectives possible to handle in an ICC**
 - experience of previous handled objectives can be reused
- **Zystems experience of objectives in customer organisations**
 - broad general knowledge and experience of customers' objectives gained from customer in different industries/sectors
 - sometimes have trouble understanding each customer's specific objectives
 - understanding of customer specific objectives can be eased through collaboration with the customer
 - objectives can be divided into three groups:
 - important in almost all organisations
 - important in a specific industry/sector
 - Important for one or a few organisations
- **Zystems experience of cause/effect relation in customer organisations**
 - experience of previously handled cause/effect relations can be reused on similar situations
- **Customers in the government sector's understanding of objectives**
 - crystallized but with vast homogeneity between departments and organisations

In adaptability to general & specific situations, one balance was identified. This balance was analysed in relation to the complexity of the investigated environment. The third approach that will be analysed in relation to the complexity of the environment is high & low methodology knowledge. This chapter is handled below.

6.2.3 High & low methodology knowledge

Conceivable balance within high & low methodology knowledge will be established in this chapter. The approach was identified during theoretical studies and it is a central concept in the IT-management field. This will result in one balance that will be established in this chapter. This chapter will end with a summary that explain the approach in relation to the complexity of the investigated environment.

It is difficult to construct a method that complies with varying knowledge. Methods are therefore often constructed for a general or a specific situation (Rentzhog, Processorientering - En grund för morgondagens organisationer, 1998). Methods for general situations generally require a lower level of methodology knowledge since the focus is on areas of interest that are static over time. Methods for specific situations on the other hand require a higher level of methodology knowledge. This since areas of interest change over time and interpretations are required to identify characteristics of the organisation (Goldkuhl, 1993).

Bergentstjerna et al. (1999) claim an apparent correlation between uncertainty and the level of methodology knowledge. Not everybody possesses high level of methodology knowledge. A balanced method may contribute to reduced uncertainty, not elimination of uncertainty (Bergentstjerna, Johansson, & Wojtasik, 1999). Methods should be selected based on how they comply with the problematic situation.

The customers in the government sector claim they have a rather low level of methodology knowledge. There have been several projects aiming to increase methodology knowledge of their employees, but these projects have in general been unsuccessful. Several respondents from the government sector experience that an upcoming problem takes long time to solve if it have not occurred before. Almost no experience of how to solve problems is shared between departments and organisations in the government sector. An explanation of this ineffective relation, expressed by the government sector, is lack of methodology knowledge and clear processes of how to gather experience.

The consultants at Systems use methods in their daily work or have previous knowledge of using it. Experience of methods is also communicated inside the organisation. If an employee use or construct a new method to solve a certain situation, it should be communicated to colleagues in Zystems internal organisation. By spreading the use of methods, experienced problems situations might be solved more efficient when these situations reoccur. Increased

methodology knowledge usually has a correlation with increased experiences. Methods do not always have to be complicated. Methods can instead be expressed as ways of thinking based on gathered experience. This experience can be valuable when handling upcoming problematic situations.

Zystems possess a high level of methodology knowledge as stated above. Employees in the government sector on the other hand possess a low level of methodology knowledge. The ICC-valuation method could contain a range of methods for the valuation process if it only was to be used by Zystems. However, the valuation method must also consider the low methodology knowledge possessed by the government sector. The employees from the government sector do not have to lead the valuation process, but they should be able to understand how the process is carried out. Based on observations from performed workshops carried out during this study, employees from the government sector were claimed to have enough methodology knowledge to understand how methods are used. They cannot use the method on their own but could understand the process if they have guidance in the process. Methods should be selected, when possible, based on the customer's method experience. This is to further consider the government sector's limited level of methodology knowledge. The balance between high and low methodology knowledge is seen as evenly balanced.

Summary of high & low methodology knowledge

In this section, a summary of findings from the chapter *high & low methodology knowledge* will be presented.

- **Zystems level of methodology knowledge**
 - high level of methodology knowledge
 - experience of methods is communicated within the organisation
 - can lead the valuation process
- **Customers in the government sector's level of methodology knowledge**
 - low level of methodology knowledge
 - almost no experience of methods is shared within the organisation
 - need guidance in the valuation process

In high & low methodology knowledge, one balance was identified. This balance was analysed in relation to the complexity of the investigated environment.

In this chapter, the three approaches have been analysed in relation to the complexity of the investigated environment. The complexity of the environment was identified in the empirical result. The hard & soft system-thinking resulted in four conceivable balances. The adaptability to general & specific situations resulted in one conceivable balance. The high & low methodology knowledge also resulted in one conceivable balance. These conceivable balances will in the next chapter be analysed in relation to the six expressed demands.

6.3 Conceivable balances in relation to the expressed demands

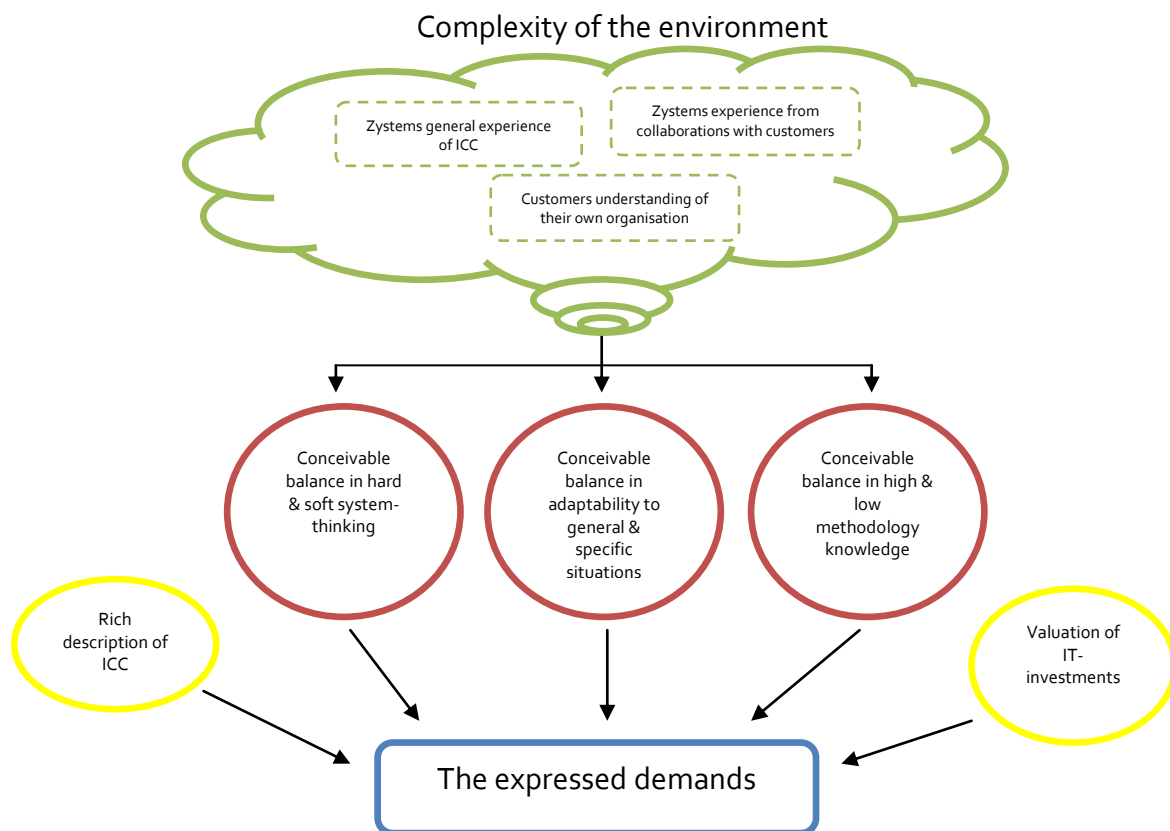
The conceivable balances are in this chapter analysed in relation to the expressed demands. The conceivable balances within the three approaches were identified in previous chapter. The balances were established based on the complexity of the environment. The relation between complexity of environment, the conceivable balances and the six demands are explained in the figure below. The six demands are the following. The method shall:

- *Include both tangible and intangible benefits*
- *enable break-down of tangible and intangible benefits into activities*
- *handle unique customer situations*
- *be able to quantify intangible benefits*
- *handle revenue growth and cost-saving*
- *consider different levels of methodology knowledge*

How each demand is affected by the conceivable balances is explained in the chapters below. Two demands will be handled together. These demands are enable break-down of tangible and intangible benefits into activities and handle unique situations. The reason why they are handled together is that they are closely linked together and it would be hard to handle them separately. The demand of considering different levels of methodology will not be handled on its own. This demand is instead included in several of the other demands. The four combined demands are presented below:

- *Include both tangible and intangible benefits*
- *enable break-down of tangible and intangible benefits into activities and handle unique customer situations*
 - *consider different levels of methodology knowledge*
- *be able to quantify intangible benefits*
 - *consider different levels of methodology knowledge*
- *handle revenue growth and cost-saving*
 - *consider different levels of methodology knowledge*

Some of the demands are affected by one conceivable balance while others are affected by several. Which conceivable balances that affect which demand will be described in detail in every sub chapter. Dependent on how the conceivable balances affect each demand, methods and theories must be applied in order to handle the demand. These methods and theories are from the rich-description of ICC and the valuation of IT-investment chapter. How each demand will be handled is described in the end of each section.



Each demand will be handled in relation to the conceivable balances. Dependent on how they are affected, theories and methods will be included to handle each demand in the new ICC-valuation method. The four combined demands are analysed in the sections below.

6.3.1 Include both tangible and intangible benefits

Conceivable balances included to handle this demand are:

- *Hard and soft system-thinking*
 - *Tangible & intangible benefits*
 - *Picture of reality & interpretation of reality*
 - *Static & changing environment*

How these balances affect the demand is explained under each section. Following this, a clarification of how the demand will be handled in the new valuation method is presented.

Tangible & intangible benefits

As stated in the balance between *tangible & intangible benefits*, an ICC can handle both technical (tangible) and organisational (intangible) benefits. The balance between tangible and intangible benefits was claimed as evenly balanced in general. Systems shall not force their customers into selecting either tangible or intangible objectives. They can however recommend their customers to express both tangible and intangible objectives. Not all objectives can be handled in an ICC. Selection of objectives that can be handled in an ICC is carried out in this stage in the ICC-valuation method.

If the ICC concept could not handle either tangible or intangible benefits, the ICC-concept would be useless to customers. If the ICC-valuation method was limited to either tangible or intangible benefits the scope of use would be too narrow to describe the ICC's potential benefits.

Picture of reality & interpretation of reality

The balance between *picture of reality* and *interpretation of the reality* was identified with a strong overbalance on interpretation of the reality. This was mainly because collaboration between Systems and their customers is based on an interpretative view of the reality and not on hard facts. Systems experience from previous ICC projects and selections of objectives are also seen as interpretations. The ICC-valuation method should therefore be seen as an interpretation of the reality. Even so, the valuation method should be representative for the ICC concept and those organisations the method are applied on.

If instead balance was on picture of the reality, solely hard facts would be included when constructing and using the valuation method. The valuation method would be troublesome to use in practical use if solely based on hard facts. Made statements from both Systems and the government sector could not be used without being fully studied. Even if this troublesome process was performed it might not lead to one picture of reality. This is because there are several opinions of what the reality really is.

Static & changing environment

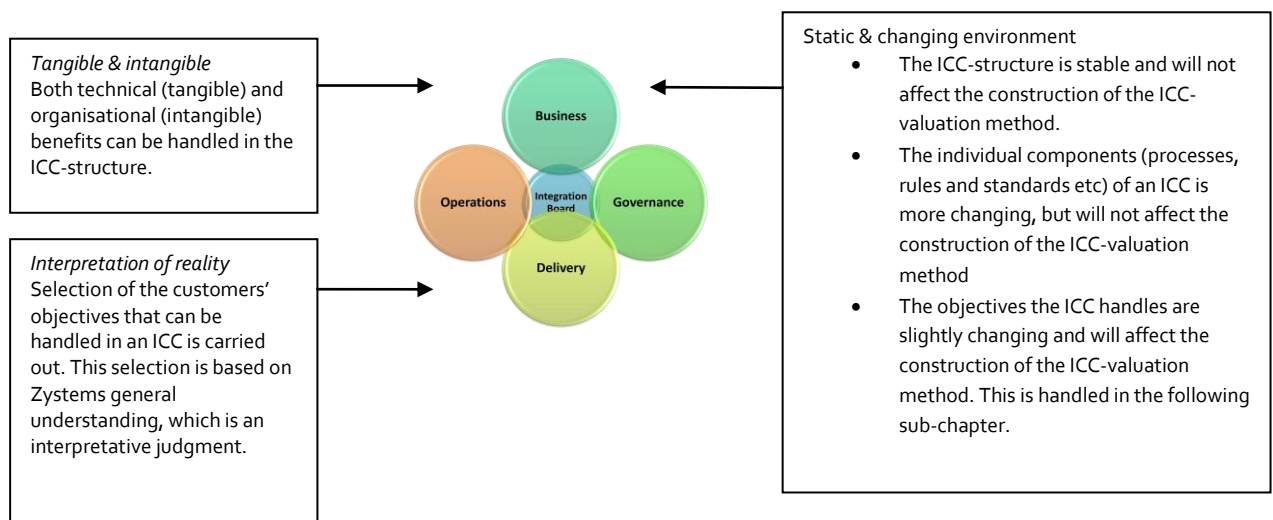
The balance between *the environment seen as static* and *environment seen as changing* was identified with a slight overbalance on the environment as changing. The fundamental ICC-structure was seen as stable. The individual ICC-components (processes, rules, standards etc.) were stated as more changing than the ICC-structure. Changes in these individual ICC-components will however not affect the stability of the ICC-structure. The new valuation method structure could therefore be constructed as stable. The objectives that are handled in an ICC were claimed as slightly changing in the government sector. This will affect the construction of the valuation method. How this will affect the construction is handled in the next chapter.

If the ICC-structure was seen as constantly changing, the valuation method would have to contain a changing structure. A constantly changing ICC-structure would be difficult to handle since the ICC-structure is fundamental in the valuation method. Changes that do occur in the ICC-structure would affect the valuation method as well. If the objectives were fully stable over time, the brake-down processes would be eased. This since these processes would only have to be performed once for each objective. The more changing the objectives are, the more repetitive the brake-down process has to be performed.

In this section above, the demand; include both tangible and intangible benefits was analysed in relation to three conceivable balances. In the section below, the rich description of the ICC-concept is selected to handle this demand.

Enable handling of include both tangible and intangible benefits

The ICC-structure is included in the new ICC-valuation method to handle the demand of including both tangible and intangible benefits. In the figure below, the ICC-structure is linked to the discussed balances included in this section.



In the section above, the first of the four combined demands were analysed. This resulted in a description of how the demand will be handled in the new ICC-valuation method. In the next section, the second demand will be analysed. This demand consists of two combined demands as explained earlier. The combined demand will be analysed below.

6.3.2 Enable breakdown of tangible and intangible benefits into activities & handle unique customer situations

The two demands, enable break-down of tangible & intangible benefits and handle unique customer situations, are here handled together. The reason why they are handled together is that they are closely connected and it would be hard to handle them separately. The two demands will from now on be handled as one combined demand.

Balances included to handle this demand are:

- *Hard and soft system-thinking*
 - *Picture of reality & interpretation*
 - *Final result & increased learning*
- *Adaptability to general & specific situations*
- *High & low methodology knowledge*

How these balances affect the demand is explained under each section. Following this, a clarification of how the demand will be handled in the new valuation method is presented. In the previous chapter, the ICC-valuation method was claimed to handle both tangible and intangible objectives. This was handled by including the ICC-structure in the valuation method. In this chapter, the objectives will be broken down to strategic objectives. The objectives shall enable brake-down regardless if they are tangible or intangible. The only requirement is that selected objectives shall be able to handle in an ICC.

Final result & increased learning

The final result in this stage is to brake-down selected objectives into strategic objectives in an ICC. To reach this final state was claimed by Zystems as their primary intention. Customers in the government sector also claim the final result as important, but as their secondary intention. The customers instead regarded the learning processes as their primary intention. This is where they can increase their knowledge of their own organisation and how it may be affected by an ICC. Zystems regarded the learning process as their secondary intention. Zystems aim to increase experience of how objectives can be broken-down to strategic objectives. Next time a similar objective occurs, the brake-down process does not have to be performed.

The brake-down process shall therefore be seen as a way to reach the final result as well as increased knowledge and experience.

If the process either focused on the final result or the learning process, neither Zystems nor their customers would be satisfied.

Picture of reality & interpretation of the reality

A discussion is usually carried out initially between Zystems and their customer. This discussion aims to express and select objectives that are relevant when valuating an ICC-investment.

As expressed in the analysis of conceivable balances earlier in this thesis, Zystems can help their customers in the process of identifying objectives and cause & effect relation in their organisation. The customers seldom possess appropriate knowledge of how an ICC functions in relation to their organisation. Zystems can in these situations take an active role and guide the customer in the process. Purpose is here to select objectives and cause & effect relations that can be broken down to strategic objectives in an ICC.

This process is solely based on Zystems and the customers' interpretation of the reality. Zystems experience from previous collaborations with customers and their general experience of ICC are based on interpretations. Likewise is the customers' knowledge of their own organisation. The interpretative approach will affect the ICC-valuation method when carrying out the brake-down process. The brake-down process is based on discussions between Zystems and their customer. Made findings from these discussions are not claimed as the only correct solution. The process can be performed again if the strategic objectives identified in the brake-down process are seen as wrong.

If this process would be performed based on hard facts, no collaborations and discussions between Zystems and customers would be necessary. The process would instead be based on a number of objectives that are appropriate for all organisations. These objectives would thereafter be broken down to strategic objectives and be regarded as appropriate for all organisations in the same environment. To rely the brake-down process on hard facts are not seen as practically feasible.

Adaptability to general & specific situations

Brake-down of specific objectives can always be carried out regardless if they are specific for a certain customer or general for several organisations. The brake-down process will be performed in the same way despite the type of objective. The difference is that specific objectives are only applicable on one or a few unique customers and the general objectives are applicable on several customers. An already broken down objective does not have to be carried out again if another customer possess the same objective. Some sort of generality of objectives ought to

be established in order to use resources more efficiently and at the same time ease the ICC-valuation process. Zystems suggest separation of objectives into three groups:

- Objectives applicable on almost all customer organisations
- Objectives applicable on customer organisations in a specific industry/sector
- Objectives applicable on one or a few customer organisations

Objectives that are applicable on several customer organisations are favourable. Nevertheless, customers also acquire objectives unique for their organisations. The objectives in the government sector were claimed as heterogeneous. This means that organisations and departments in the government sector have different objectives. The brake-down process must therefore be carried out on several objectives. To handle the generality of the ICC-valuation method, the objectives shall be included into one of the three groups expressed above.

If only general situations were handled when valuating an ICC, customers' unique objectives would not be included. The valuation process would be eased, the customers would however not be satisfied. If all situations were treated as specific, the brake-down process would have to be performed for each objective. It would be theoretically possible, but the valuation process would require too much resource and be too excessive to carry out.

Static & changing environment

The environment regarding the ICC-structure was claimed as rather stable. How this stability affected the construction of the valuation method was described in the previous chapter when handling the demand; *include both tangible and intangible benefits*. Objectives were not managed in the previous chapter and will instead be handled in this section. The government sector claimed their objectives as slightly changing over time. The expressed objectives can thus be treated as stable for a period of time, for how long this stability lasts cannot be stated. This means that the brake-down process do not have to be performed every time the valuation method is used.

If the objectives were seen as totally stable, already gained experience of how a specific objective is broken-down could be applied on several customer situations. In those situations where the objectives are frequently changing, the objectives would only be applicable for a short period of time. The brake-down process would have to be performed repeatedly in those situations. This would therefore require high resources that would result in an extensive ICC-valuation process.

High & low methodology knowledge

Zystems have a high level of methodology knowledge and possess good experience of how an ICC can affect an organisation. If the customers' objectives and cause & effect relation were clear, Zystems could potentially break-down objectives to strategical objectives on their own. Selection of appropriate methods could ease the

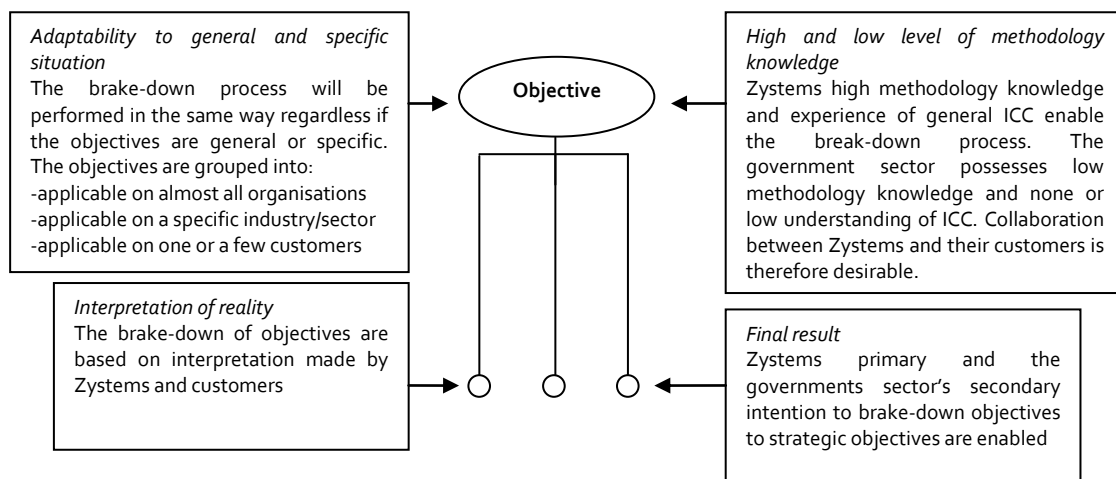
break-down process. Methods that will be applied in this process are expressed further down in this chapter. Systems customers in the government sector possess low level of methodology knowledge and have none or low understanding of ICC. Customers are therefore not able to carry out the break-down process on their own. The best solution here is to combine the customers' knowledge of their own organisation and Systems experience of ICC and of handling methods.

In this section above, the combined demand consisting of; enable break-down of tangible & intangible benefits into activities and handle unique customer situations was analysed. This combined demand was analysed in relation to four conceivable balances. In the section below, methods from valuation of IT-investment are selected to handle this demand.

Enable break-down of objectives to strategic objectives

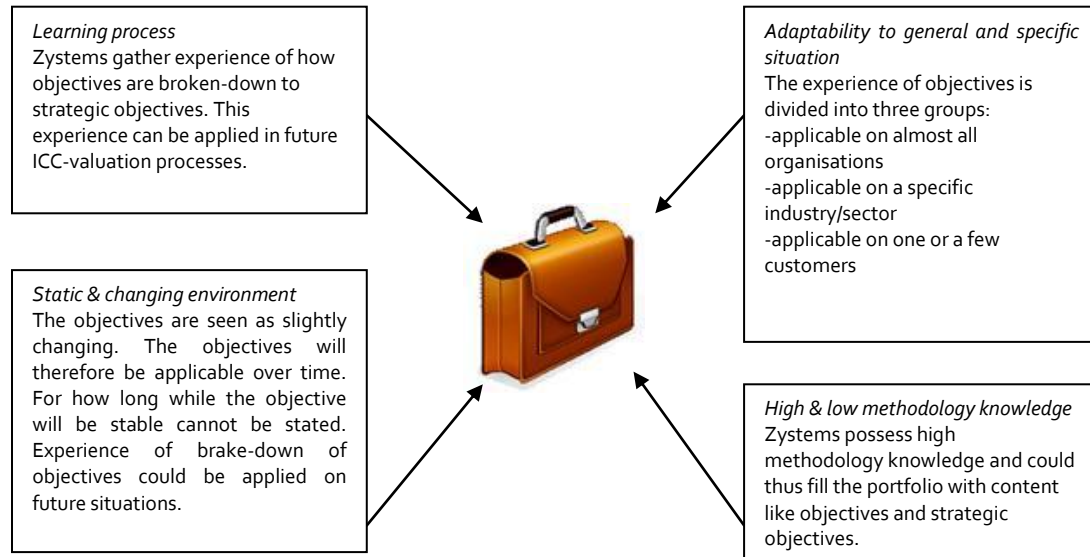
The BSC (Balanced Score Card) is included when handling the break-down process in the ICC-valuation method.

In the figure below each section in relation to the BSC method is presented.



Enable gathering of gained experience from ICC projects

The portfolio management is included when gathering gained experience from ICC projects in the ICC-valuation method.



In the section above, the second of the four combined demands were analysed. This resulted in a description of how the demand will be handled in the new ICC-valuation method. In the next section, the third demand will be analysed. This demand is to quantify intangible benefits. The demand will be analysed below.

6.3.3 Quantify intangible benefits

Balances included to handle this demand are:

- *Hard and soft system-thinking*
 - *Picture of reality & interpretation*
 - *Final result & increased learning*
- *High & low methodology knowledge*

How these conceivable balances affect the demand is explained under each section. Following this, a clarification of how the demand will be handled in the new valuation method is presented. In the previous chapter, selected objectives were broken-down to strategic objectives. The objectives could be broken-down regardless if they were tangible or intangible. The only requirement was that the selected objectives were able to handle in an ICC. In this chapter the strategic objectives will be valuated to quantitative form. Quantitative form are benefits converted into numerical form that can be included in a calculation. The objectives shall be able to be valuated to quantitative form regardless if they are tangible or intangible.

Picture of reality & interpretation

When the strategic objectives have been selected, next step is to valuate these to quantitative form. This is carried out during collaborations between Systems and the customer. Systems play an important and leading role during these collaborations due to their experience of their customers' situations and their general experience of ICC. This valuation process is solely based on Systems and the customers' interpretation of the reality. Systems experience of their customers' situation and their general experience of ICC are based on interpretations. Same statement is a fact for the customers' knowledge of their own organisation. All the previously mentioned interpretations will affect how the valuation process is carried out in the ICC-valuation method. Made findings in the valuation process are not claimed as the only correct solution. The valuation process can be performed again if selected strategic objectives that are valuated to quantified form are seen as wrong.

No collaboration between Systems and customers would be necessary if this valuation process would be based on hard facts instead of on interpretations. . The valuation process would in this situation include quantified strategic objectives appropriate for all organisations in the same environment. To rely the valuating process solely on hard facts are not seen as practically realistic.

High & low methodology knowledge

Systems possess a high level of methodology knowledge and have good experience of how an ICC can affect an organisation. Systems customers on the other hand possess low level of methodology knowledge and how their strategic objectives can be valuated in an ICC. If the customers cause & effect relation was perfectly

expressed, Zystems would be able to perform the valuation process on their own. Appropriate methods to carry out the valuation process will be applied. Applied methods included in this process are expressed further down in this chapter. The customers are in contrast to Zystems not able to carry out the valuation process on their own. The best solution is to combine the customers' knowledge of their own organisation and Zystems experience of ICC and their skills of handling methods.

Final result & increased learning

The final result in this stage is to value identified strategic objectives to quantitative form. Reaching this final state was claimed by Zystems as their primary intention. Customers in the government sector also claim the valuation of strategic objectives as important, but only as their secondary intention. The customers instead expressed the learning processes as their primary intention. This learning process includes increased knowledge of their own organisation and how it may be affected by an ICC. The learning process for Zystems includes increasing their experience of how strategic objectives can be valued to quantitative form. This learning process was claimed as important by Zystems but only as their secondary intention. Experience of valued strategic objectives can be reused next time a similar strategic objective occurs. This means that the valuation process do not have to be performed again.

The valuation process shall therefore be seen as both a way to reach the final result and to increase knowledge and experience.

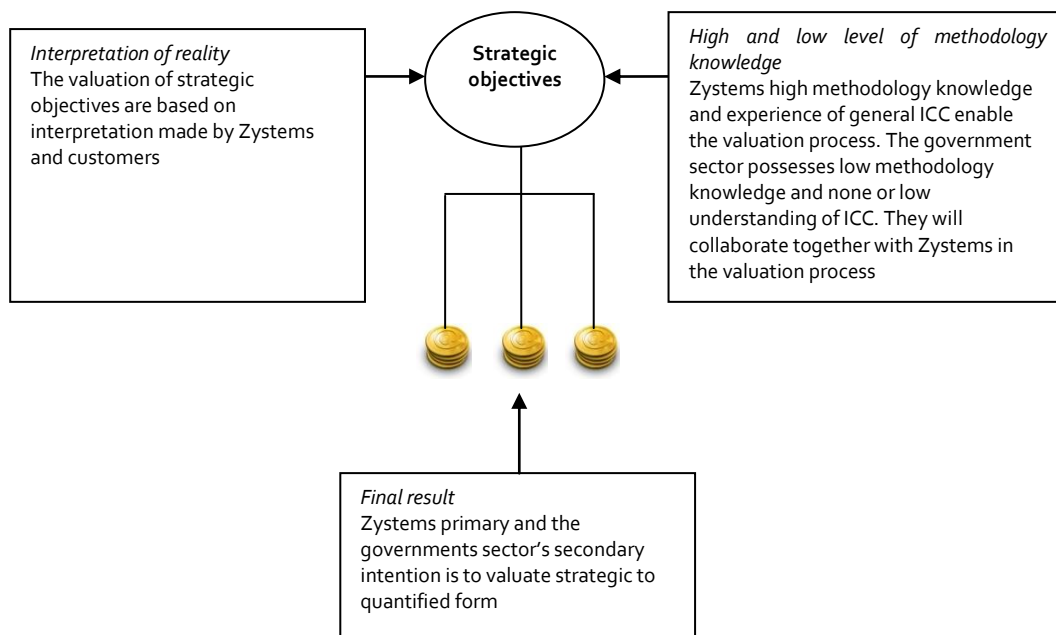
If the valuation process focused on either the final result or the learning process, neither Zystems nor their customers would be satisfied.

In this section above, the demand; quantify intangible benefits was analysed in relation to three conceivable balances. In the section below, methods from valuation of IT-investment are selected to handle this demand.

Enable valuation of strategic objectives into quantitative form

The PENG-method is included when handling the valuation process in the ICC-valuation method.

In the figure below, each section in relation to the PENG-method is presented.



Enable gathering of gained experience from performed valuation processes

The portfolio management is included when gathering gained experience from performed valuation processes in the ICC-valuation method.



In the section above, the third of the four combined demands was analysed. This resulted in a description of how the demand will be handled in the new ICC-valuation method. In the next section, the fourth demand will be analysed. This demand is handle revenue growth and cost-saving. This demand will be analysed below.

6.3.4 Handle revenue growth and cost-saving

Balances included to handle this demand are:

- *High & low methodology knowledge*

How this balance affects the demand is explained in the section below. Following this, a clarification of how the demand will be handled in the new valuation method is presented. In the previous chapter, strategic objectives were valuated to quantitative form. It was established that the strategic objectives could be quantified regardless if they were tangible or intangible. In this chapter, the quantified values shall be described in an appropriate way. The final result shall include both revenue growth and cost savings.

High & low methodology knowledge

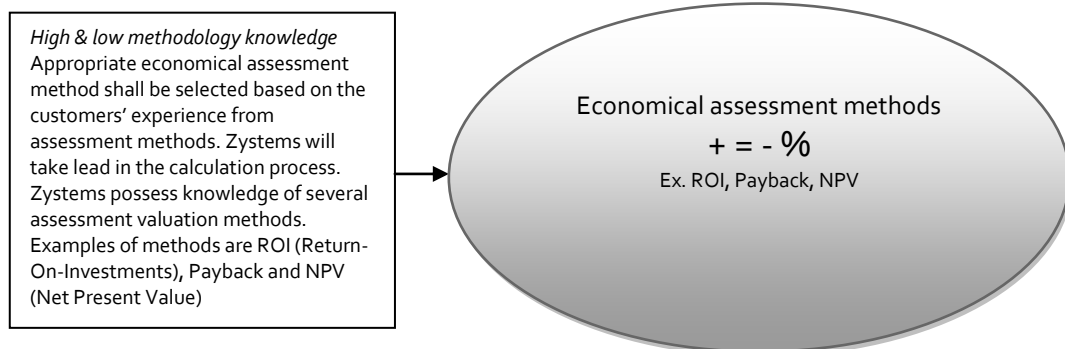
Zystems possess a high level of methodology knowledge and have experience of how a final result can be described to customers. The final ICC-valuation result will be expressed and calculated by selecting appropriate economical assessment methods. The customers in the government sector possess low methodology knowledge but they usually have experience from one or several economical assessment methods. In this stage, there is no requirement to possess experience of how an ICC functions. Even if experience of ICC is no requirement, the customers shall not perform the calculation process on their own. One reason why they shall not perform the assessment process on their own is partly because they do not have, in general, the required assessment methodology knowledge. The other reason is that Zystems want to be an active part in the whole valuation process and the calculating the final result is a critical moment for both Zystems and their customers. Selection of assessment methods shall be based on the customer's previous experience of using methods for calculating financial results or other methods that the customer prefers.

In this section above, the demand; handle revenue growth and cost-saving was analysed in relation to one conceivable balance. In the section below, methods from valuation of IT-investment are selected to handle this demand.

Enable assessment of final result expressed in revenue growth & cost savings

The economical assessment methods are included when handling the calculation process in the ICC-valuation method.

In the figure below, high & low methodology are viewed in relation to the economical assessment methods.



In the section above, the last of the four combined demands was analysed. This resulted in a description of how the demand will be handled in the new ICC-valuation method.

In the chapter, four combined demands were analysed in relation to six conceivable balances. Dependent on how each demand was affected of the conceivable balances, appropriate methods were selected to handle the construction of the ICC-valuation method.

In the next chapter, the construction of the ICC-valuation method will be presented. The construction of the valuation method is based on findings from the analysis of conceivable balance in relation to the four combined demands. The construction of the ICC-valuation method will be presented in the next chapter.

6.4 Construction of the valuation method for ICC-investments

The construction of the ICC-valuation method is based on findings from the analysis of conceivable balance in relation to the four combined demands in the previous chapter. Construction of the valuation will follow the logical structure and findings from the analysis. In this chapter, a description of how the four combined demands will be included in the ICC-valuation method will be presented. The construction is based on the rich description of ICC and methods from valuation of IT-investment. The final ICC-valuation method can be viewed in figure 12 below.

Include both tangible and intangible benefits

This demand is handled by including the ICC-structure. The ICC-structure can orchestrate both technical (tangible) and organisational (intangible benefits). The ICC-structure consists of five components. Business is one of the included components. This component will be broken out from the ICC-structure. This component handles the customers' expressed objectives and only those objectives that are able to handle in an ICC will be selected. The other four ICC-components will be handled as perspectives that are included when managing the brake-down process. The four perspectives are:

- *integration board*
- *governance*
- *operation*
- *delivery*

Enable break-down of tangible and intangible benefits & handle unique customer situations

As expressed earlier these two demands are handled as one combined demand.

This demand is handled by including the BSC (Balanced Score Card) and the portfolio management. The BSC method is applied when braking down selected objectives into strategic objectives. The process is performed in the same way regardless if the objectives are tangible, intangible, general and/or specific. In this ICC-valuation method, the objectives are expressed by the customers. Selected perspectives are the four ICC-components expressed above. BSC aims to brake-down the business objectives in relation to selected perspectives. Dependent on selected perspectives, the objectives are broken-down to strategic objectives. The portfolio management is included to gather experience from performed brake-down processes. If an objective has already been broken down previously, this experience can be gathered in the portfolio and reused if seen applicable. One example of how the BSC is used is presented in appendix 1.

Quantify intangible benefits

This demand is handled by including the PENG-method and the portfolio management. The PENG-method is applied to orchestrate the valuation of strategic objectives into quantitative form. The strategic objectives were identified in the

previous demand. The PENG-method aims to brake-down the strategic objectives into activities. The broke-down activities are then valuated in relation to benefits of using an ICC. One example of how the PENG-method is used is presented in appendix 2. The portfolio management is included in this phase to gather experience from conducted valuation processes. Experiences are gathered in the portfolio after each performed valuation process. Likewise when handling the brake-down process, the valuation process do not have to be performed if experience from earlier valuation processes are available.

Handling revenue growth & cost savings

This demand is handled by including the economical assessment methods. The economical assessment methods are used when describing the final result in the ICC-valuation method. The final result includes both revenue growth and cost savings. Selection of economical assessment method that is selected depends on the customer's previous experience of using methods. Three economical assessment methods are included in this stage. The three methods are: *ROI (Return On Investment)*, *Payback* and *NPV (Net Present Value)*. These methods are examples of methods that can be used in the new ICC-valuation method, but other methods can be selected if preferred.

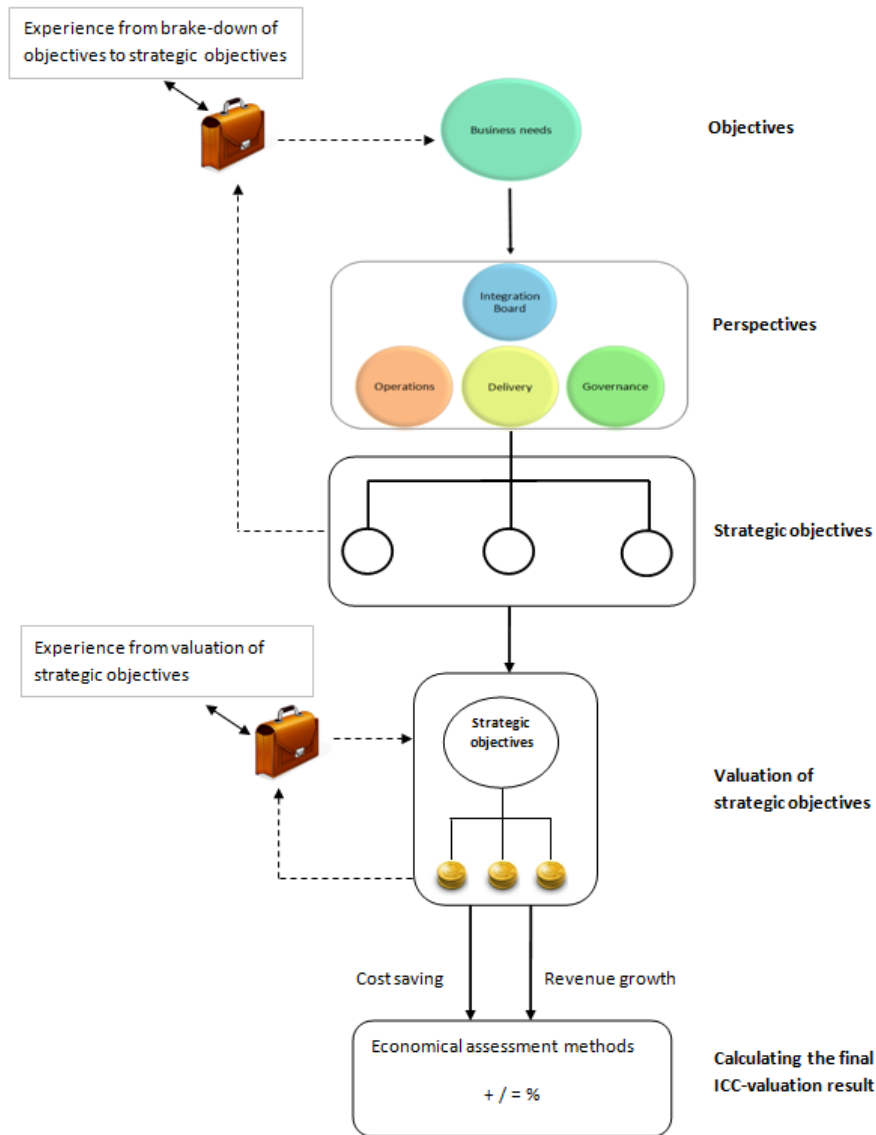


Figure 14 the ICC-valuation method (own construction)

In this chapter, the construction of the ICC-valuation method was carried out. The construction was based on the four combined demands. To be able to handle these demands, the rich description of ICC and methods from valuation of IT-investment were included. In the next chapter, a discussion is presented. The discussion will consider three different topics. The discussion is introduced in the next chapter.

7 Discussion

In this chapter, discussions will be carried out for three different topics. These three topics discuss whether the new ICC-valuation method is applicable outside the investigated environment or not. The discussions will be presented below.

Is the constructed ICC-valuation method applicable on other ICC concepts?

The constructed ICC-valuation method is founded on a rich-description of the ICC concept. The rich-description includes definitions of ICC concepts from the theoretical study and Systems definition of their ICC. Systems and the other ICC definitions were claimed as similar. The difference was that Systems ICC-concept was more structured and handled connection between the ICC-components in a logical way. Systems definition of an ICC is therefore representative for an ICC-concept in general. The constructed ICC-valuation method is thus claimed to be applicable on other ICC-concepts.

Is the constructed ICC-valuation method applicable on other consultant firms?

The constructed ICC-valuation method is dependent on Systems experience. Experience of their customers' objective and cause & effect relation is important. Systems general experience of ICC and methodology knowledge is also important to consider. The valuation method is also based on the stability of Systems ICC. The ICC valuation process would not be possible to handle without this experience and collaboration with customers. If another consultant firm should use the ICC-valuation method, they must possess experience of their customers' objectives, cause & effect relation and how an ICC functions. The consultant firms must also have a stable ICC and possess high level of methodology knowledge. If not, the valuation method has to be constructed in another way. If these requirements are fulfilled, then the constructed ICC-valuation is claimed as applicable on other consultant firms.

Is the constructed ICC-valuation method applicable on other organisation outside the government sector?

The constructed ICC-valuation method is dependent on the government sector's understanding of their objectives, cause & effect relation and level of methodology knowledge. The governments sector has good understanding of their objectives and cause & effect relation. However, the sector has low level of methodology knowledge. The customers in the government sector would not be able to carry out the ICC-valuation process on their own without Systems help. If organisations outside the government sector would use the method, one difference might be other expressed objectives. Even if customers possessed the skills to carry out the ICC-valuation process on their own, Systems would still be an active part in the process. The ICC-valuation method is claimed as applicable on other organisation outside the government sector, if they are able to collaborate with Systems or another consultant firm in the valuation process.

In this chapter, three topics were discussed regarding how the new ICC-valuation method could be applicable outside the investigated environment. The findings were that the ICC-valuation method could be applicable outside the investigated environment dependent on a few conditions. The first condition was that the user must possess experience of the customers' objectives, cause & effect relation and general ICC knowledge. The second condition was that collaboration between the consultant firm and the customer must be executed. In the next chapter, conclusion of the thesis will be carried out. The conclusion aims to answer the purpose and the research question of this thesis. The conclusion is presented in the following chapter.

8 Conclusion

In this chapter, conclusion of the thesis will be presented. The conclusion chapter aims to answer the purpose and the research question of the thesis. A description of how the purpose and the research question are fulfilled will be presented below.

The purpose of this thesis was to construct a method for valuation of ICC-investment. One of the conditions was that the method should consider six expressed demands. These demands were identified in a previous study conducted by the authors of this thesis. The six demands were the following. The method should:

- Include both tangible and intangible benefits
- enable break-down of tangible and intangible benefits into activities
- handle unique customer situations
- be able to quantify intangible benefits
- handle revenue growth and cost-saving
- consider different levels of methodology knowledge

These six demands had to be investigated in relation to the environment where the ICC-valuation method should be applied. The valuation method should be applied by Zystems when valuating benefits of an ICC on current and potential customers in the government sector.

The research question was:

How can a valuation method for ICC-investments be constructed considering the six expressed demands?

In order to answer the purpose and the research question, the complexity of the environment where the ICC-valuation method should be applied was investigated. The complexity of the environment was identified during an empirical study. The empirical study was carried out in two case studies. The first case study involved respondents from the consultancy firm Zystems. The second case study involved respondents from the government sector. The empirical result from the two case studies resulted in a number of interest areas. The identified interest areas could be separated into three sections. The three sections and the interest areas are presented below:

- *Zystems general understanding of an ICC*
 - *Experience of objectives possible to handle in an ICC*
 - *Experience of stability of components in an ICC*
 - *Experience of cause/effect relation in an ICC*
 - *Zystems level of methodology knowledge*
- *Zystems experience from collaborations with customers*
 - *Experience of objectives in customer organisations*
 - *Experience of stability of customers objectives (over time)*

- *Experience of cause/effect relation in customer organisations*
- *Customers understanding of their own organisation*
 - *Understanding of objectives*
 - *Understanding of stability of objectives*
 - *Understanding of cause/effect relation*
 - *Customers level of methodology knowledge*

The complexity of the environment was expressed based on these interest areas. How the identified complexity of the environment would affect the new ICC-valuation method had to be analysed. The complexity of the environment was therefore analysed in relation to three identified approaches. These three approaches were identified during the theoretical study and belong to the IT-management field. These three approaches were:

- Hard & soft system-thinking
- Adaptability to general & specific situations
- High & low methodology knowledge

This analysis established how these three approaches could be balanced in relation to the complexity of the environment. The result of the analysis was four conceivable balances for hard & soft methodology knowledge, and one conceivable balance for each of the remaining two approaches. To clarify how these conceivable balances would affect the construction of the new ICC-valuation method, they were analysed in relation to the expressed demands. In this analysis, the six demands were converted into four combined demands. The reason why these demands were combined was because they could not be handled separately. Two of the demands were connected together into one combined demand and another demand was included in three of the four combined demands. The four combined demands are presented below:

- Include both tangible and intangible benefits
- enable break-down of tangible and intangible benefits into activities and handle unique customer situations
 - consider different levels of methodology knowledge
- be able to quantify intangible benefits
 - consider different levels of methodology knowledge
- handle revenue growth and cost-saving
 - consider different levels of methodology knowledge

These four combined demands were analysed in relation to the previously established conceivable balances. The result of this analysis was a description of how each of the four combined demands could be handled in the new ICC-valuation method. The first one of the combined demands was handled by including the ICC-structure, expressed in the rich description of an ICC. The three remaining demands were handled by including methods expressed in the valuation of IT-investment

chapter. Findings from this analysis resulted in construction of the new ICC-valuation method.

How can a valuation method for ICC-investments be constructed considering the six expressed demands?

All of the six expressed demands were directly or indirectly included in the new ICC-valuation method. The new ICC-valuation method enables:

- Inclusion of both tangible and intangible benefits
- break-down of tangible and intangible benefits into activities
- handling of unique customer situations
- quantifying of intangible benefits
- handling of revenue growth and cost-saving
- considering of different levels of methodology knowledge

The new ICC-valuation method fulfills the six expressed demands and is considered applicable for the intended environment where the ICC-valuation method should be applied. The constructed valuation method therefore meets the stated purpose and the research question of this thesis.

Except for fulfilling the six expressed demands, the new ICC-valuation method also enables two other factors. These two factors are:

- handling of general customer situations
- quantifying of tangible benefits

These two factors were not mentioned in the six demands, but they are however important to consider. They have therefore been included in the new valuation method for ICC-investments.

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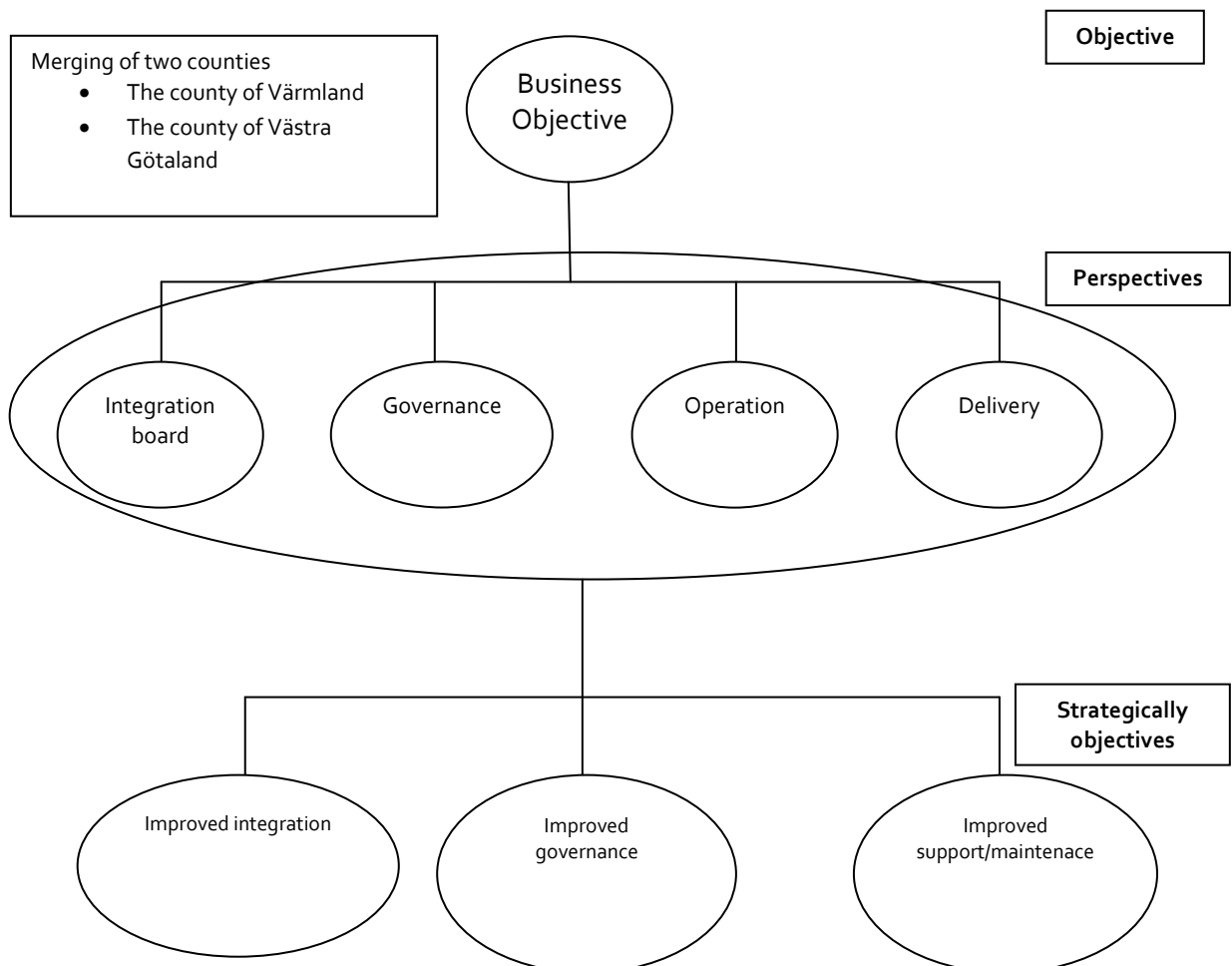
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9 Appendix

Appendix 1

BSC (Balanced Score Card)

This is an example of how a business objective can be broken-down into clear objectives. In this example, the business objective is to merge two government counties. How the merging will be realised is viewed from an integration perspective. The four perspectives will therefore consist of an ICC structure. In this example, the perspectives are: *integration board, governance, operation* and *delivery*. A number of strategic objectives will be defined dependent on the stated business objective and the four selected perspectives. The stated strategic objectives after brake-down are: *improved integration, improved governance* and *improved support/maintenace*.



Appendix 2

PENG-method

This example is a continuation from the example described when handling Balanced Score Card. Improved integration was one strategic objective identified in last example. The strategic objective will be further broke-down and valued by using the PENG-method.

The strategic objective Improved integration can be broke-down into three sub-activities. These are: *improved security*, *use of standards* and *less integration needed*. In this example only use of standards are broke-down further. Also the other two activities at level 1 are possible to brake-down further, but this is not carried out in this example. When the overlaying activity is broke-down into several sub-activities the activities should be structured in a logical flow.

When the activities are structured into a logical structure a valuation of benefits can be performed. Valuation can either be broke-down or be built from the bottom and up. In this example, the benefits are valued from the bottom-up. However, iteration will occur between the levels.

The first step in the valuation step is to put a percentage on how much time spent on each activity. Time spent is seen in relation to other activities belonging to the same overlaying activity. For example, the sub-activity *finding errors* possess 20% of total time and the other activity *correcting errors* possess 80% of total time spent on the overlaying activity *common protocols*. The percentage represents the state before the investment was made. When weighing of each activity is performed. Then weighing how much that can be saved or earned on each activity when the investment is made. As an example we claim a 50% reduction in time regarding error searching by using an ICC. We also state that the hourly cost for one employee is 500 sek and the organisation spend approximately 40 hours a week on searching errors.

The potential yearly saving will therefore be:

- $40 \text{ h} * 12 \text{ months} = 480 \text{ h/year}$ spent on searching errors
- $480 \text{ h/year} * 500 \text{ sek} = 240000 \text{ sek}$ total spendings on searching errors
- $240000 * 50\% \text{ savings using an ICC} = \mathbf{120000 \text{ sek early saving}}$

The saving potential for each activity can be seen in figure below. When each activity has a weighing, then the valuation process can be applied on other situations including the same strategic objective. This requires that the organisations have similar objectives and characteristics. One characteristic is for example how much time they spend on searching for errors in relation to how much time they spend on correction of errors. If some activities, weighing and characteristics differ then changes can easily be made to better mirror a certain situation. The example is viewed as a figure below.

Employee hourly cost= 500 sek

← Strategic objective

← Sub-activities level 1

← Sub-activities level 2

