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APPROACHING THE INTANGIBLE BENEFITS OF A BOUNDARY OBJECT

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To my Mother and my Father
ABSTRACT

Today’s information society is constantly increasing the quantity of digital information that organisations have access to and depend on. Despite this dependency, few descriptions exist of the benefits which this digital information can provide the organisation with. Examples of what the organisation can use the information for include business intelligence or in a business process. The absence of such benefit descriptions results in missed opportunities in organisational management and a failure to cultivate the artefact. In terms of a practical operational work role, this means that the artefact just exists and that there are no decisions, communication and discussions connected to it.

Earlier research about benefits in the Information Systems field is focused on describing the process of finding benefit factors from different IT investments and how these investments can be measured financially. The result of this was that it was only the measurable benefits that were taken into consideration. Later benefit management research has shown interest in the intangible benefit factors as well and added this as an activity in the evaluation process. Today’s view is that the benefit consists both of tangible and intangible benefit factors.

This thesis emphasises benefit factors found by means of qualitative research in organisations producing Technical Information (TI). TI is information connected to goods and services and is a part of a product. The intangible benefit factors found which are connected to TI are semantic interoperability and knowledge. Semantic interoperability is beneficial both for the organisation and the individuals – in the first case exemplified by a uniform working process and in the second as efficiency in the internal communication. Knowledge also provides benefit both to the organisation and the individuals – the organisation can operate
without depending on certain individuals and information gives the individuals mobility in their profession.
The next part in the thesis discusses information management’s impact on benefit factors. In the case of an autocratic approach, it is the organisation that benefits most, whereas a decentralised management style provides the individual co-workers with a greater number of benefit factors. This proves that information management is an important and decisive ingredient, and that it affects benefit factors.
One step in the direction of converting the intangible benefit factors into tangible ones is to visualise them. In this work the theoretical lens provided by a boundary object has been used. This lens adds a qualitative view on cross-boundary information and has efficiency approaches. These approaches are the syntactical, semantic and pragmatic. Via interpretations from the thesis’s two empirical cases, those approaches are “measured” by interpretations and visualised by the three leaves of a clover. This gives the opportunity to describe what information efficiency, in this case connected to a positive expectation, can contribute to the organisation or the individuals. By this procedure, different cases or time aspects can be compared, thereby providing a basis for decision-making, communication and discussion.
Future research in this area can be made in different directions – one is to investigate whether the intangible benefit factors can be turned into measurable ones. In this way, the internal organisation can be provided with better knowledge of the digital information’s impact. Another research direction is to investigate how the passage of time affects the benefit factors that digital information gives the organisation.

**Keywords:** benefit, intangible benefit, technical information, knowledge management, semantic interoperability, boundary object
SAMMANDRAG

I dagens informationssamhälle ökar mängden digital information som organisationer hanterar och är beroende av. Trots detta beroende, vilket kan exemplifieras information som beslutsstöd eller information kopplad till en arbetsprocess, finns det få nyttobeskrivningar gjorda om vad den digitala informationen tillför en organisation. I en organisation betyder avsaknaden av nyttobeskrivningar att betydelsen av artefakten inte kan beskrivas och därför saknas intresse av att styra och förädla den. I en praktisk operationell roll innebär avsaknaden av styrning att den enbart finns till och är något som inte beslutas, kommuniceras eller diskuteras om.

Tidigare nyttoforskning inom ämnet Informatik är dels inriktad mot att beskriva nyttan av olika typer av IT-investerings och att beskriva dessa i finansiella termer. Det sistnämnda innebär att det är enbart de mätbara nyttorna som beaktas. De icke mätbara har visats intresse i senare tids forskning och tillkommit i utvärderingssteget av nyttoprocessen. Detta gör att synen på nyttan är både de mätbara och icke mätbara nyttofaktorerna.


Nästkommande del i avhandlingen beskriver hur styrningen av informationen påverkar nyttofaktorema. I fallet med en enskild
styrande informationsägare skapas de flesta nyttofaktorerna i organisationens favör och i den mer decentraliserade styrningen skapas nyttofaktorerna till individens fördel. Detta påvisar att informationsstyrning är ett viktigt och styrande inslag, vars påverkan är stor.

Den tredje delen av avhandlingen ger en visuell beskrivning av de omätbara nyttofaktorema. För att göra detta har linsen ”boundary object” använts. En lins som tillför en kvalitativ syn på gränsoverskridande information. För att göra kopplingen till den positiva inverkan som nyttofaktorer har används objektets effektivitets dimensioner. Dessa dimensioner är de syntaktiska, semantiska och pragmatiska, vilka alla har en utgångspunkt i den kunskap som informationen kan förmedla på olika nivåer. Med hjälp av tolkningar från avhandlingens två empiriska fall visas dimensionerna i form av skattade uppfattningar och visualiseras i form av tre blad på en klöverblomma. Detta ger möjlighet att beskriva vad effektivitet, i detta fall kopplat till en positiv förväntat på vad information positivt kan tillföra organisationen och individen. Genom att använda detta tillvägagångssätt kan jämförelse göras mellan olika fall eller olika tidsaspekter och därmed vara underlag för beslutsfattande, kommunikation och diskussion.

Framtida forskning i området kan göras i olika riktningar – en är att undersöka hur de idag icke mätbara, ogripbara nyttofaktorema kan göras mätbara för den interna organisationen och därmed få en bättre bild av vad digital information tillför. En annan inriktning är att djupare beskriva hur tiden som faktor påverkar de nyttofaktorer som digital information tillför.
ACKNOWLEDGEMENT

There is an old saying: it takes a village to raise a child. I have come up with my own version: it takes a whole collective to keep on developing a human being. For me the collective is like different circles, from the broadest to the narrow. There are the ones in the wider circles who point your life and thoughts in a certain direction during a period of time. In the wider circle I put, with a lot of happy memories, all the teachers and students I meet during my time at IT-university in Gothenburg. Thank you for letting businesspeople enter the world of academia again. It is so fruitful and so much fun! And for letting me enter the world of PhD students – thanks to Mid Sweden University and especially the Information Systems group. One other group, not often mentioned in acknowledgements, are the ones who have not believed in me, let’s call them the denizens of the male glass-ceiling. You have given me a lot of energy to prove that you are wrong, so you must also have a place in the wider circle.

To narrow up the circles for this work I would like to thank Lena-Maria Öberg and Viveca Asproth who have been my supervisors. Thanks for all the input and the good discussions. I am looking forward to discussing more during the coming years. Thanks to Erik Borglund for thoughtful comments on my pre-seminar. Thomas Persson, you are most helpful when it comes to discussing academic topics, which I am so grateful for, being a long-term business person. Hanna Olsson has helped me with the figures – thanks a lot! I would also like to thank Ted Saarikko and Pernilla Ingelsson for all cooperation and patience when we have written the articles together.

And now to family and relatives – the dead ones and the living ones. You all have meant a lot to my development and I will always miss you, especially my loved Dad! Living relatives – my love to you. And
now for the closest circle of my collective – my Mother, my sons Kristian and Tobias - all my love to you in eternity.

Karin Åhlén

Östersund december 2013
LIST OF PAPERS


**My contribution to paper A - E**

Four out of five papers in this thesis are written in cooperation with other researchers. To get a grasp of my contribution to the different papers below Table 1 presents papers and the contribution made by the thesis’ author in each paper.
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Conducting seven interviews  
Transcribing  
Writing theoretical pictures benefit  
Writing method  
Writing empirical pictures  
Partly writing result and conclusion  
Presentation at research conference |
| B     | A semiotic perspective on semantic interoperability                               | Preparing interviews  
Conducting two interviews  
Writing theoretical pictures like top-down perspective  
Writing empirical pictures  
In cooperation writing analyse  
Presentation at research conference |
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<td>Information management, Lean and efficiency – are we focusing on the customer?</td>
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1. INTRODUCTION

Digital information is a vital part of our modern society (Langefors 1995). Digital information is information stored in some kind of database (Bollacker 2010). In earlier days information was seen as a logical artefact and not affected by any human understanding (Wiener 1948). Nowadays the subjective view of information is the dominant one and this can be explained by the info-logic equation which includes the individual human’s interpretation and pre-knowledge (Langefors 1995). These two parts form the actor-based interpretation of information which is done in form of decoding. The decoding means that you need some form of individual understanding to crack the code. This comprehension can be shared with others thus creating a common information base (Liebenau and Backhouse 1990). The base raises the knowledge level for the addressee and thereby provides a confirmation that information usage is a social process.

Every process – whether it be social or organisational – has to be understood in terms of its declared benefit factors (Ward and Daniel 2006). For example, for information to stay alive as a vivid, ongoing and vital part of the organisation there is a need to understand the positive impact the process and inherent parts have. In the beginning information technology, IT, was struggling to show evidence that it was economically beneficial for the organisation (Brynjolfsson 1993). To exemplify, IT in this case takes the physical form of hardware, software, data and communication technology (Beynon-Davies 2002). Its usage is to collect, process and distribute information internally in organisations or by us as individuals.

One step in the development was taken when the usage of benefit management and benefit methods were investigated. The methods that have been used most are measuring hardcore benefits like money earned on the investment, Return On Investment (ROI) (Ward and Daniel 2006). This method is useful when you are supposed to
measure machine investments where a direct bottom line effect can be seen. New research emphasises that in order to show the total benefit the intangible benefit is a natural ingredient as are the second source benefits (Frisk 2011). The mixture of tangible and intangible benefits can be summed up as the total benefit.

The tangible benefits are the benefit factors that can be measured in quantitative measurements – like money (Ward and Daniel 2006). The intangible ones are seen as the factors that are more subjective and which are a qualitative ingredient in the sum. For the intangible factors there are different views – one is that they are more connected to an organisational strategy which has to be implemented (Frisk 2011), another is that if a financial value cannot be connected to every benefit factor then there is no point to trying to measure them. One way to look at the intangible benefit factors is to categorise them as soft benefits and classify them as indirect and strategic benefit factors (Frisk 2007). The definition used here is based on an overall perspective which is covered by what today is thought of as the non-measurable qualitative benefit factors.

Who can then have the benefit of information – both in terms of having and using? One part of the answer to this question is that there exists a spectrum of different perspectives. One is the information exchanged between customer and supplier (B2C), another the information exchanged between different suppliers (B2B) etc. A rarely illustrated perspective is the internal organisation’s perspective. Inside organisations there are different aspects – the individuals, different departments and the entire organisation. Different actors in the organisation see different valuable aspects due to their different organisational roles (Fagerström 2003). Their daily work makes the organisation continuously move forward and therefore the work they accomplish in different work processes is essential to the organisation.
To become the wanted commodity that makes the organisation work more efficiently, information needs to be managed (Best 2010). This can either be done according to decided organisational goals (ibid) or in an individual-based approach, the goal of which is to provide factors like good data quality and search possibilities for colleagues’s work-related information (Davenport and Prusak 1997). As each individual work action is done as a small step to reach the organisational goal, the importance of the individual’s work situation is given prominence here.

What can then happen if the intangible benefit of information is not included in the total positive picture? One obvious result is that the total sum of what information provides the organisation with will be too low. The organisation can understand that there is a cost connected to absent information in the form of missed opportunities or higher production costs (Porter and Millar 1985). To turn this argument round creates a possible way of estimating a positive measurement of all the benefits of information. In any organisation realistic measurements are important and create a foundation for decisions and communication (Langefors 1995). Those resources that are not appropriately measured are often not used to the full and the organisational opportunities they offer are neglected (Best 2010). Why should the organisation devote resources to something that is seen as necessary but does not offer any high value? On the individual level problems can arise when information has not been managed properly, like for example in the case of low data quality (Wallace 2011). Certain work tasks can take a longer time to perform or can, in worst cases, not be accomplished at all.

The context for this thesis is two cases – two business-oriented organisations with technical information as business processes. The two organisations differ in their ways of depending on the internal information when they deliver their products to the customers. As will be seen further on, the management of the information differs between them. The perspective used here is that of the middle
management where knowledge about the organisation is the highest: they know what the the executive level discusses and decides about and also about the operative part of the organisation (Davenport and Prusak 1997).

The aim of this licentiate thesis is to describe, analyse and visualise the benefit of internal organisational digital information. To put emphasis on both of the included core components, the view of benefits used will be the intangible benefits and the digital information is operationalised by structured information. Internally in the organisation, the analysis will be made from a middle management perspective due to the fact that this organisational level has the power of operationally managing different parts of the organisation. Of particular interest in this thesis is to understand the impact on benefit factors from the management of structured digital information. Therefore the first research question is expressed as follows:

1. **Which are the intangible benefits from structured information and how are they affected by information management?**

Communication is an essential part of a middle management role, and it is directed both up and down. In the communication directed to the executive level the hard facts are wanted and used. As a initial step towards measuring the intangible benefits of structured information, the second research question is raised:

2. **How can the intangible benefit factors of structured digital information be visualised and juxtaposed?**

The context for this licentiate thesis is technical information which is described as information that enables a safe and environmentally-friendly development, usage, maintenance and destruction of products and services (Asproth 2011). Closely linked to technical information is the broader concept of technical communication (TC)
that is connected to the process including the technical information information (Nyström and Asproth 2013). Johnson-Eilola and Selber (Johnson-Eilola and Selber 2013) explain the term TC as communication about technology and summarise and characterise it as both a product and a process. For the coming description and analysis the term technical information will be used and as equivalent word structured information (see paper D).

Both the research questions will be answered by this thesis which consists of the following parts:

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In practice this means that a full understanding of the background and the logical arguments to the answers to the research questions is given by both the papers and the cover paper.
2. METHOD

To answer the above-raised research questions, a qualitative research method is used. This choice has been made for two reasons. The first and overwhelming one is that the research questions are to be answered by examining organisations and understanding the interactions between the organisation and applicable parts of the IS field – such as processes, technical artefacts (Jabar, Sidi et al. 2009). In this thesis the digital information is the applicable part. Myers (Myers 1997) frames the qualitative research like this:

“Qualitative research methods are designed to help researchers understand people and the social and cultural context which they live in.”

The second reason for the overall choice of research method is that the researcher, as discussed below, is influenced by social relativism (Hirschheim and Klein 1989).

In Walsham (Walsham 2006) the necessary parts for making qualitative research are described as are the available choices for both the individual or the whole research team. As individuals we make choices from our own personal standpoint and are also influenced by the standpoints that our corporate team have. To further exemplify the need to understand the researcher’s own viewpoint, Walsham (Walsham 1995) emphasises the two different roles of the researcher – one as the outside observer and the other as the involved researcher. Even though this is described in more distinct terms in Walsham (Walsham 1995) than in Walsham (Walsham 2006) the understanding of your own opinions and thereby subjectivity is necessary. To comprehend more of the choices for this thesis a clarification of the researcher’s viewpoint follows.

2.1 The researcher’s position

To understand the researcher’s position is to first understand the overall research context where the researcher moves, the field of
information systems: IS. The IS research context concerns knowledge about design and usage of IT from an individual, organisational and/or societal perspective (Wiener 1948). In the IS sector, there are a lot of different fields and my background is in IT Management. This track is summarised as the knowledge to combine design and usage of IS and IT in order to develop the information environment, an environment often defined by organisational boundaries (Magoulas and Pessi 1998). From my earlier working life, two decades in operative and management roles in different IT departments, I have come to see the individuals’ perspective as their awareness and subjectivity and observed how this forms perspectives which describe and handle the world. The perspectives of each and every individual have an impact and form the organisation and it is from this that my belief in the individuals is built. Another factor that has had an impact on my position is my involvement in the research project, Technical Information Centre, located at Mid Sweden University in Östersund.

I intend to combine my background with a theoretical framing taken from social relativism where the world is constructed by individuals observing different social actions (Hirschheim and Klein 1989). In social relativism the people working in the IS field are facilitators who understand that there are different perceptions of the world’s complexity (ibid). As mentioned, these perceptions emerge from the individuals and therefore a qualitative research method is used.

2.2 Qualitative research method

What is then the qualitative research method? It can be divided into three different paradigms: (1) positivist, (2) interpretative and (3) critical depending on the underlying philosophical assumptions (Myers 1997). Even if there are borders between these three paradigms, they are not always clear-cut. One common comment on the qualitative method is that it is equal to the interpretive paradigm which can thereby be removed. For this thesis the interpretative
paradigm is used, both for the theoretical base, empirical understanding and analysis. To briefly describe the interpretative paradigm, Myers’s (Myers 1997) stand point is used. This emphasises that the interpretative paradigm is the one that understands different phenomena from the meaning that people give them and that focus is on the complexity of the human sense. Operationally in this thesis this is done by the semi-structured interviews.

For the interpretative paradigm Klein and Myers (Klein and Myers 1999) discuss the following principles:

1. That human understanding is reached by constantly moving from the small parts to the overall (fundamental principle of hermeneutic circle)
2. That the research environment must be described for the readers to understand its influence (the principle of contextualisation)
3. A critical reflection on how the collaboration between the interviewer and the respondent forms the empirical data (principle of interaction)
4. A critical discussion about the understanding of the data through the chosen theoretical lens (the principle of abstraction and generalisation)
5. A crucial discussion when differences occur between the theoretical framework and the empirical data (the principle of dialogical reasoning)
6. Essential thoughts on the divergence in the informants’ narrative stories (the principle of multiple interpretations)
7. Distinctive thoughts of possible predeterminations in the informants’ told stories (the principle of suspicion)

One conclusion from the principles is that the informant is an interpreter and analyses the surrounding and actions from his/her perspective. Lee and Baskerville (Lee and Baskerville 2003) denote this by saying that interpretative research is characterised by
individuals and their interpretations. And that there still exist contrasts between the interpretive and the objective paradigm.

In this thesis all principles are used in different parts, both written and operationally. The first principle has broadly been involved in the understanding of the empirical material from case Alpha which has been used for more than one interpretation (see article A, B and C). This sundry usage has shed light on several interesting results in different parts of the analysis. The second principle, which is the one of contextualisation, is used in the rich description made of both the companies researched and the overall context of Technical Information, Alpha and Beta. The description includes both a detailed text of facts about the company and also from the selected informants. In the TI context the description is made as rich as possible even though the context is not often described in academic literature. Principle number three is thought of in every interview situation and in practice by things like not interrupting with my own opinion, starting discussion with my own examples etc. The fourth principle, the principle of abstraction and generalisation, is included in different parts of the thesis. In the method discussion section it is described how the research method used provides generalisation. To move back to Klein and Myers’s (Klein and Myers 1999) approach to the generalisation, the analysis includes a discussion about the chosen theoretical lens, in this case the boundary object. The same approach is taken with the contradictions that occur between the theoretical framework and the empirical findings, principle number five. For principles number six and seven my overall impression is that the informants’ statements in each of the two cases are pretty close to each other and thereby the answers are interpreted as believable. For this interpretation my own long term experience from the business side has been an asset and very useful for reflections. The analytic interpretations in the articles have also been done by several researchers and by a general discussion. Also, judging by the similar stories from the informants, the bias rate is interpreted to be low.
2.3 Work process research question one

In Figure 1, the overall work process for this thesis’ papers and the contribution to the first research question are described visually. The circle describes the start for each paper with its respective research question. The square represents the performed method for the paper, the rhomb the result in form of overall conclusions and the smaller square the corresponding paper. From each result a deeper understanding has led to a new research question and a new paper process started – depicted as an arrow. Together this forms an overall description of the phases included in the results for the research question.

As an operational description connected to the figure, my journey started with a general question about which benefits TI could provide and, in the search for an answer, a qualitative study was examined. The results in paper A showed that TI gives the intangible information a common language and knowledge. As a result of this answer two more studies were conducted. The first one, in paper B, examined the common language in the form of semantic interoperability and how the two ways to manage it affect organisational and individual effects. On an overall level the qualitative case study result was a common base for knowledge and work efficiency. Paper C’s study, a qualitative case study, aligns the question as to how long-term knowledge is of benefit for the organisation and the coworkers. The study implies that for the organisation the memory is increased and for the individual there is more freedom in their work role. Both of these answers indicate that the business opportunities can be higher. Paper D discusses the value-based production process in the TI context. As the previous three papers are connected to each other and the first part of research question no 1; this study is more in line with the overlying first research question’s second half where information management is a central part. The study’s direction is to provide an answer as to what impact this view gives when information management is not adequately valued. The impact in this qualitative case study is shown on business opportunities as well as on data quality. For the business
opportunities and the external customer the chances to broaden the delivery from the organisation are high. There is also an opportunity to improve data quality if a more value-based view can influence the process. Paper E is a summing up of previous research and forms a basis for further research. The method used in this case is a literature study and the perspective is an internal organisational one. Previous research gives the answer that found benefit factors always are due to their context and that the stakeholders’ view is important. It was discovered in the literature review that the word benefit is seldom defined, but more taken for granted and that the time aspect is seldom researched.
Figure 1: Work process for research question one
2.3.1 Included studies

The empirical qualitative studies included in the thesis have been conducted during a time frame of one year in two research settings. The settings were chosen from the perspective that they both contain the process of producing technical information, which is the result of my participation in the Technical Information Centre research project. These specific organisations are chosen due to their impact on either producing long-term, highly ranked, technical information or internally discussing the measurement process of intangible benefits. What the settings have in common is that the organisations are business-oriented companies and that they both use the technical information in connection with their own developed products. One minor exception is study no 2 where one interview was made in a financial organisation.

The papers are listed with their methodology, aim, a summary of the empirical material and which research question it is a part of the answer to in Table 2. The first four studies are explorative in their nature and the fifth study is based on a literature study.

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Aim</th>
<th>Empirical material</th>
<th>Number of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single explorative case study</td>
<td>Present a developed model of intra organisational benefits of Configuration Management</td>
<td>Semi-structured interviews from one organisation</td>
<td>Seven</td>
</tr>
<tr>
<td>Study</td>
<td>Methodology</td>
<td>Aim</td>
<td>Empirical material</td>
<td>Number of interviews</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>B</td>
<td>Multiple explorative case study</td>
<td>Investigate semantic interoperability used from two different views – top-down and bottom-up</td>
<td>Semi-structured interviews from two different organisations</td>
<td>Two</td>
</tr>
<tr>
<td>C</td>
<td>Single explorative case study</td>
<td>Investigate how long-term preservation of information has an impact on knowledge and organisational memory</td>
<td>Semi-structured interviews from one organisation – same empirical material as in study no 1</td>
<td>Eight</td>
</tr>
<tr>
<td>D</td>
<td>Single explorative case study</td>
<td>Examine a value-based process for production of Technical Information</td>
<td>Semi-structured interviews from one case</td>
<td>Five</td>
</tr>
<tr>
<td>E</td>
<td>Literature study</td>
<td>Based on previously identified research; theoretical benefit aspects are discussed from different organisational aspects</td>
<td>Literature review based on fifteen articles from MISQ and additional scientific literature</td>
<td>--</td>
</tr>
</tbody>
</table>
2.4 Work process: research question two

An overall description of the work process for research question two which contains the following activities (Figure 2): the circle describes the start with the research question and the squares each activity and the result in the rhomb. In this study, the activities consisted of the selection of a theoretical lens, the empirical case study Alpha and Beta and the analysis of the combination of the theoretical lens and the case study. As a result, the intangible benefits are shown in a juxtaposed position.

Figure 2 Work process research question two

2.4.1 Choice of theoretical lens

To provide a more comprehensive and general research approach to almost all the included empirical material, a new theoretical lens is provided for research question two. This activity is done even though the nomenclature of this thesis is a consolidated one where this can be excluded. So which theoretical lens to choose? The choice felt on the boundary object due to two principles in the theory – it is a social-based theory that supports the use of information as a communication tool which is used by different communities (Bowker and Star 1989; Carlile 2002; Yoo, Henfridsson et al. 2010) and also that the boundary object is one of the bases for transfer of knowledge in the context of product development (Carlile 2002). Both of these
bases are in parallel to what the existing context for this thesis is – technical information as an internal communication tool and technical information as an internal organisational knowledge base.

The usage of this lens is to analyse, visualise and juxtapose the boundary object’s benefits. The juxtaposition can be used to visually compare different boundary objects. The factors used will be the ones used for an effective boundary such as syntactic, semantic and pragmatic; the ones which identify effectiveness for both the organisation and the internal individuals (Carlile 2002).

So have any other theoretical lens been considered? Another idea was to use information quality and its related factors – like accuracy and timeliness (Wallace 2011) or some commonly used benefit model including intangible benefits, like the PENG model (“Prioritering efter nyttogrunder”) (Dahlgren, Lundgren et al. 2001). Information quality was not chosen due to the fact that it only looks into technical facts from the data and lacks the social impact data, information and knowledge have. The example of the benefit model - the PENG model – still has its base in measurements derived from money in its occurring definition. This base comes from the underlying Return on Investment theory. As I have not yet decided whether this is the right direction to provide measurements, neither this model nor any other will be used.

2.4.2 Company Alpha and Beta and their boundary object
Company Alpha belongs to a global industrial group with a total number of approximately 12 500 employees, 2000 of which work at Alpha. Alpha was bought by the industrial group in 2006. Alpha works with the production and maintenance of electronic defence systems, mostly involving radar technology. The boundary object in this case is the technical information which is limited to the standardised product information. This product information is built on a system which has been used in the organisation for about sixty years. The information provides knowledge about the original
product components and also new maintenance components in a repaired product. More detailed description of Alpha and its boundary object can be found in paper A, B and C.

The second case is named Beta and is actually one company which has outsourced the real construction of technical information. Since Beta and the outsourcing company are working together in the production process of technical information they will here be seen as one case. The boundary object in Beta is the technical information that is provided to the external customer and also used inside the organisation. The technical information consists of installation, operation, maintenance and quality manuals. The manuals include both text and different blueprints. A more detailed description of Beta and its boundary object can be found in paper D.

2.4.3 Method

The methodology framing for the second research question is a multiple case study containing two inherent studies (Creswell 2007; Yin 2009). In Yin (Yin 2002) a case study is defined as:

“an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”.

The case study as such implies a base for positivistic framed research, but clearly it can be used in interpretative research (Walsham 1995; Klein and Myers 1999; Jabar, Sidi et al. 2009). The selected empirical data come from different sources such as interviews, documents and different kinds of observations, where the primary source is seen as the semi-structured interviews conducted. For the second research question the empirical material comes from the two organisations Alpha and Beta.
2.4.4 Data collection and analysis

In the work of searching for theoretical pictures for boundary object the scientific database SCOPUS is used. The search words used are “boundary object”, “boundary practice” and “boundary discourse”. The search results are listed in Table 3.

Table 3 Search for theoretical lens

<table>
<thead>
<tr>
<th>Search word</th>
<th>Used years upon searches</th>
<th>Number of hits</th>
<th>Further usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundary object</td>
<td>All</td>
<td>742</td>
<td>Selection upon years and then reading abstract</td>
</tr>
<tr>
<td>Boundary practice</td>
<td>All</td>
<td>29</td>
<td>Selection upon reading abstract</td>
</tr>
<tr>
<td>Boundary discourse</td>
<td>All</td>
<td>15</td>
<td>Selection upon reading abstract</td>
</tr>
</tbody>
</table>

For the first combination of search words – “boundary object” – the hits were used to find the relevant literature. Therefore a further selection was made by limiting the used years to 1998–2013 in order to find the newest research and also literature that has had the time to be cited. The number of hits found was 212: a reasonable number to look into. To further limit the articles, they were listed by citations and the abstracts read through and included if they were interesting enough for this work.

Empirical data sources used in qualitative methods can be organisational documents, interviews and/or discussion groups (Creswell 2007). In search for the answer to the second research question semi-structured interviews were made, an implication for the used method case study. As mentioned before the collected empirical material comes from two different organisations with their internal technical process of producing and maintaining technical
information used as a boundary. In plain language, two contexts that are interpreted and described by individuals belonging to either Alpha or Beta. In Table 4, it is shown which case each informant belongs to.

**Table 4 Informants**

<table>
<thead>
<tr>
<th>Informant</th>
<th>Working role</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Project manager development</td>
<td>Alpha</td>
</tr>
<tr>
<td>B</td>
<td>Team manager Software Development</td>
<td>Alpha</td>
</tr>
<tr>
<td>C</td>
<td>Team Manager Customer Support</td>
<td>Alpha</td>
</tr>
<tr>
<td>D</td>
<td>Team Manager Customer Documentation</td>
<td>Alpha</td>
</tr>
<tr>
<td>E</td>
<td>Team Manager Mechanics Construction</td>
<td>Alpha</td>
</tr>
<tr>
<td>F</td>
<td>Process Coordinator Configuration.</td>
<td>Alpha</td>
</tr>
<tr>
<td>G</td>
<td>Team manager construction methods</td>
<td>Alpha</td>
</tr>
<tr>
<td>H</td>
<td>Team manager Technical Information</td>
<td>Beta</td>
</tr>
<tr>
<td>I</td>
<td>Team manager Technical Information</td>
<td>Beta</td>
</tr>
<tr>
<td>J</td>
<td>Responsible outsourcing</td>
<td>Beta</td>
</tr>
<tr>
<td>K</td>
<td>Project manager delivery</td>
<td>Beta</td>
</tr>
<tr>
<td>L</td>
<td>Project manager delivery</td>
<td>Beta</td>
</tr>
</tbody>
</table>

All interviews were done by the researcher, recorded and transcribed verbatim. Different angles on the interpreted material are brought to life by constructing the empirical base and by this creating the reality that the cases will be a base for in this applied research (Patton 2002). The interpretation is made as an inductive interpretation (Patton 2002; Walsham 2006). The interpretation of the empirical base and the theoretical base was done in iterative steps that brought ingredients of iterative steps into the analytical process. An additional ingredient of inductive analysis is the fact that the interview questions were semi-structured (Patton 2002).

The content in the previously mentioned empirical material was divided into categories connected to boundary objects – syntactic, semantic and pragmatic views. This is regarded as a unit of analysis
with categorical distinction (Krippendorff 2012). Analysis was undertaken in an iterative fashion, where the author compared the empirical material with the theoretical lens.

### 2.5 Summary of included papers

In this section, papers A-E are briefly introduced. The problem, the aim, research approach, main result and contribution to thesis from each paper are described. The description details the contribution to the thesis’s research questions.

**Paper A**


**Problem:** Paper A is partly based on practitioners’ declaration that configuration management (CM), a complementary process within product development, has a weak position. The practitioners describe that one reason for this is that the benefit factors of this particular process are not clearly expressed. The other base for this paper is that, from an academic viewpoint, the CM process is not widely researched into and academic knowledge is low. From the perspective of the thesis, the answer to the research problem forms a basis for the intangible benefit aspects of the structured information.

**Aim:** The purpose of the article is to develop a model built on literature where identified intangible benefits are shown and also add empirical data from this study’s identified benefit factors.

**Research approach:** In this study the first step was to make a literature review where identified intangible benefits were categorised in a model. Complementary empirical material were
described from seven semi-structured interviews held with practitioners on a middle management level. In the analysis the identified intangible benefit factors from the literature review and also the factors identified from the interview study were compared and summarised.

**Result:** In the empirical data collection are almost all of the intangible benefit factors from the literature review confirmed. Proven factors all concern the CM process and can be further categorised into factors like general business process factors and also factors connected to the solo CM process. The general business process factors are, for example, categorised into change management and order and control. The factors connected to the CM process are explained as design to requirements and quality assurance. Newly found benefit factors are derived from the process information.

**Contribution:** The paper’s contribution is to give a solid base for the first research question in its context: technical information. The paper clarifies those intangible benefit factors that are connected to the digitally structured information – the base for after-market design and common language for design. These two factors are further examined in paper B and C. The common language for design is refered to as semantic interoperability and the base for after-market design is seen as the knowledge base in the organisation – both the individual and the organisational.

**Paper B**

**Problem:** Data and information are two different terms which are connected to each other by both objective and subjective parameters (Langefors 1995). This is a fact that we have to consider, especially
today when sharing data is so easy: to just share data does not mean that we have a common understanding or more specifically a semantic interoperability. In most research contexts the semantic interoperability is either examined in a technical context or in a specific domain, not from a IS field perspective.

_Aim:_ The aim of this paper is to approach semantic interoperability from an IS perspective by examining how it can be positively discussed in terms of human understanding. The used perspectives which are compared will be different management approaches.

_Research approach:_ In this study a multiple case study was used where interviews from two business organisations were done. The study uses a theoretical framework, TFI-model (Liebenau and Backhouse 1990), and therefore the study is to be classified as explorative.

_Results:_ The result is based on two different approaches to managing semantic interoperability – top-down and bottom-up. The analytical lens, the TFI-model (Liebenau and Backhouse 1990), expresses three organisational layers: informal organisation, formal organisation and technical systems. The top-down perspective to semantic interoperability expresses an implementation of formal standards that are intended to promote uniform action throughout the organisation. The standards are implemented by an artefact such as an IS. The bottom-up perspective is described as the principle of non-separability (Churchman 1971). The designer of the system must be familiar with the terminologies to conceptualise the existing situation as well as the desired future state.

The result shows that the top-down perspective works with the TFI-model’s layers as supporting (informal), understanding (formal) and governing (technical) and the bottom-up perspective uses them as governing (informal), understanding (formal) and supporting (technical). The top-down management is governed by formal directives distributed via technical systems and supported by means
of informal structures in order to improve contextualisation. The bottom-up perspective is governed from cultural, informal structures present in the organisation with technical systems merely serving as a supporting role.

**Contribution:** The paper’s first contribution to the thesis is to give a wider understanding of the earlier found benefit factor semantic interoperability. In this paper the benefit factor semantic interoperability shows to provide other intangible factors like work efficiency and extended knowledge parts. The second overall contribution can be derived from the used management perspectives – top-down and bottom-up which corresponds to the second part of the first research question.

**Paper C**


**Problem:** Internally in today’s organisations we are aware that reuse of knowledge, in the form of standardised information, and experience, are resources that are difficult and costly to duplicate and that are therefore of benefit. Difficulties arise when knowledge and experience have to be preserved over a long time period, almost half of a century.

**Aim:** The aim of this paper is to discuss the challenges in managing stored knowledge of complex product development and maintenance over a long period of time.

**Research approach:** This qualitative case study is categorised as an explorative study since its framework consists of a combined base from two different areas: knowledge management and
organisational memory. The case study contains eight semi-structured interviews and uses an inductive analysis.

**Result:** For an organisation, the knowledge perspective can be discussed in terms of the organisational stock or the individual workers’ flow of action (Bontis, Crossan et al. 2002; Styhre and Gluch 2010). The results show that a long-term preservation of stored knowledge deals with all the past decisions and a future that is hard to predict. This study emphasises that via long-term training, the individuals’ flow of action increases their freedom as well as their intra-organisational mobility. When the organisation uses their standardised information, access to their own stock of knowledge is given, which is stable over time and created by the organisation independent of single employees. The study also implies that long-term preservation of knowledge is helped by a close link between the stock of knowledge and the organisational memory. In this case the link is the standardised information present in production processes as well as in the corporate culture.

**Contribution:** The paper contributes to a more solid understanding of the benefit factor knowledge from the paper A and develops the answer for the first part of the first research question. It shows that structured information can give knowledge to different parts of the organisation – the individuals and the whole organisation. Knowledge in itself contributes to different intangible benefits such as help for individuals to work rotate and for the organisation to provide more business opportunities.

**Paper D**
**Problem:** The value chain consists of the product and information belonging to it and both of these two parts should be treated equally (Porter and Millar 1985). If, for cultural reasons, the inherent parts in the total delivery are not valued evenly, what will be the consequences?

**Aim:** The aim of this paper is to examine what happens when an organisation has an internal blinkered view on information management when a holistic view is expected. The consequences are discussed in the impression it conveys to the customer.

**Research approach:** To fulfil the paper’s aim two academic fields – Quality Management and Information Management – were combined. The study was conducted as a qualitative study with one case, two organisations cooperating in one TI production process. The new combination of theoretical pictures makes the study explorative by nature. Empirical pictures were collected from five semi-structured interviews. Analysis is done from this particular case to a more general level and therefore it belongs to the inductive aspect (Patton 2002).

**Result:** The main result in paper D is that the organisation’s failure to listen to the external customer affects all three areas – the information, information management and process development – are highlighted in the analysis. The result implies that the studied organisation has great opportunities for developing their information production process. This development could both be in terms of their internal mutual relationship as well as with regards to the external customer with the help of Lean and also by applying a more holistic view on the included parts in the value chain. The customer consequences are divided into two parts – creation of external customer values and creation of value for the internal customer explored in terms of efficiency. The internal organisational view of the production process is only from the perspective of cost efficiency and no income calculations are done. As a result of this view, the
external customer’s requirements on the information are not investigated.

**Contribution:** The contribution of this paper is connected to both parts of the first research question. This paper discusses the understanding of how to create internal efficiency as well as the impact for external stakeholders of the internal management of information. This gives a view to the benefit factors which suggests that they are not only created depending on the internal forces - but also that other stakeholders can provide goals and activities to achieve them. Another part of the contribution is to show how low management interest affects the information produced.

**Paper E**

**Problem:** In today’s society organisations have access to a lot of digital information, like the organisation’s Enterprise Resource Planning systems, ERP systems (Beynon-Davies 2009). The digital information is seen as important and is used in order to communicate, used as a base for decisions and for prioritisation in important business areas (Langefors 1995; Beynon-Davies 2009). Still there is little discussion and demand from organisations to know the benefit from their internal information (Lederer and Mendelow 1988).

**Aim:** The purpose is to discuss the nature of the benefit of information, For example, what is universal – is it the benefit factors or is it the process?

**Research approach:** The base for the paper is a literature study. The literature used journals with high ranking in the IS field. The
literature was interpreted in extension from different internal organisational views, like overall organisational benefit from information or the benefit from an internal management perspective. The different categories were then compared and discussed. In the literature review, a reflection was done of how the word benefit was defined.

**Result:** The result of the paper shows that there is little research done in the field of the benefit of information, most research has its base on the benefit of technical artefacts like IS. With an intra-organisational base, the study shows that the nature of benefit factors differs and that they depend on their context. The context can be described in terms of the strategic goals that the organisation has. The empirical material shows that the time factor is rarely used, indicating that the benefit factor is not compared or developed during time. The study shows that there is more generality to be found when it comes to the benefit process as such, in this case exemplified by the measurement process. Another result from the literature review is also that the usage of the word benefit is seldom defined; it is mostly used as a logical positive word.

**Contribution:** The contribution of this paper is based on the aim of the thesis as understanding the benefit of information internal in organisations. The knowledge base for the first research question is broadened out to understand what benefit factors are dependent upon (context and stakeholders) and what is seldom used (time). The general aim of benefit is also deepened connected to the blurred understanding of what benefit is.
3. RELATED RESEARCH

In the research questions the word benefit is included. This section of related research provides an overall description of previous research in the field of IS. As the words benefit and value are used as synonyms in the research literature, one word is used here and that is benefit. Another investigated field for related research is the field of information management, which contributes as base for the second part of research question one. Both of these sections sum up this thesis’s use of them.

3.1 Benefit

3.1.1 Benefit paradigms

The distinguished Nobel Prize winner, economist Robert Solow, stated in 1987 that we see computers everywhere except in productivity measurements. By this he meant that there was no economic value to invest in this relatively new technology since it did not provide any tangible benefit for the organisation (Brynjolfsson 1993). This statement was a starter for a new paradigm, the productivity paradox, which searched for ways to understand and show that IT investments brought economic benefits to organisations. The economic models, like Return of Investment (ROI), did not show the real economic value of the IT investment. These models did not take into consideration that the investment was also dependent on context variables, such as organisation, management and/or processes. Historical research showed that the organisational processes were not changed to the extent that the new investments could have produced maximal benefit (Protti 2002). Another example of defects in the early benefit measurements were that they were solely looking into one part of the investment, for example the technology or the functionality (Moreau and Back 2000).

In the past, the tangible benefits were the only ones used in order to decide whether the IT investment ought to be made or not (Frisk 2011). Often the measurable benefits were done before the
investment was made and there were rarely any evaluations done. To do an economic calculation in advance was to get a glimpse of whether there could be any possible chance for the investment to be economically advisable. Despite bad financial returns, organisations continued to invest in IT. One way to provide better investment foundations, which the organisations saw, was to start taking intangible factors into consideration in the IT-investment models. A new paradigm was born.

This new paradigm, the interpreting benefit evaluation, is emphasised by Lagsten (2009) to give more pragmatic advantages by stimulation learning and its openness towards stakeholders. The interpreting approach can be divided into different categories depending on the output which is to be judged; for example goals, result, user requirements or stakeholder wishes. Goal oriented evaluation methods compare outcome with the goal set and, if it has been reached, the investment has created this result. This method is easy to understand and deal with, but it has been criticised for not handling cause, effect and not supporting newly emerged benefits. Stakeholder oriented evaluation methods means that the evaluator has to decide who the stakeholders are and assess their opinions. Stakeholders prioritise benefits differently and this can cause conflict between them. Lagsten (2009) believes that stakeholder-oriented methods are a complement to other evaluation methods and cannot be used as the only evaluation method. Further development has been done in the evaluation methods and the opinion of today is that risk and new business advantages should be taken into consideration in new investment decisions.

3.1.2 Benefit management process
The benefit management process consists of different steps (Ward and Daniel 2006). The overall aspects are to decide on the perspectives which need to be used – who experiences the benefit aspect, what kind of benefits they are and time perspective when benefit is measured or experienced (Delone and Mclean 2003; Barua,
Konana et al. 2004). From a management perspective the tangible aspects are the most useful ones (Hu, Frisk et al. 2006). This means that the benefit from something needs to be easy to measure and have good measurement points from a lifecycle perspective and by this be easy to compare. In a management board figures are compared and the development is seen. These measurements play an important role as a common base for discussions, decisions and communication. Figures also contribute by dividing up complex problems into more precise forms and thus help to achieve the strategic goals (Protti 2002).

3.1.3 Evaluation of benefit factors
How can the organisation perform evaluations? Lagsten (2005) gives different examples of this. One example is that the evaluation is done by means of a joint program by professional evaluators. The conclusion of the evaluation needs to be of interest in order to be used. Another example of evaluation is to make a study which creates a foundation including evaluation objects, specific factors and values. In this case the situation can give the same object different factors and values. Another example of evaluation is that evaluation means to decide measurements, define those and their relation to each other and also the quality of the evaluation object. The complaint about the most commonly used evaluation methods is that they give information about the past and therefore the direction is directly dependent on things that have happened in the past (Kauffman and Tsai 2009). Measurement is also often seen as an objective thing which contains the facts (Dyke, Kappelman et al. 1997). In their following discussion a number of concerns about measurement are raised such as respondents’ different interpretations about what the factors mean – a cognitive discrepancy. The chosen evaluation model can also contain factors that are plaited together.

As mentioned before, the business side seldom performs investment evaluation (Bannister and Remenyi 2005; Hu, Frisk et al. 2006). This
is due to the fact that there is a problem in deciding which method to use; no one method seems to be the most suitable one. The benefit factors that the organisation wants to evaluate are not included in the method and the tested method is therefore not experienced as good enough. Investment can also change characteristics during its lifetime and it can be difficult to make a comparison between different results. The benefit factors being compared can have little or nothing in common.

3.1.4 Benefit of digital information
What was then measured historically? It was the technical artefact that was measured – how well did the business logic fit and support the process and so on (Ward and Daniel 2006). The information as such is rarely seen as beneficial or valuable. It just exists! The artefact digital information is too abstract to be valued, or maybe it has been that way until now (Janssen, Charalabidis et al. 2012). It is when the information is used that it becomes beneficial and one example of this is the new technology such as mobile devices and the usage of their applications. Here a completely new industry has begun to grow. Another example of when information is becoming beneficial is when organisations can sell their information to others using different business models (Vickery 2011). Delone and Mclean (2003) discuss the fact that information, an output from an IS, can be measured at different levels. The levels are the technical level, where the accuracy and efficiency of the system are measured; the semantic level that is how well the system transmits the intended meaning; and the effectiveness which is the effect the information gives the receiver.

The view of when information increases benefit vary and are often researched under strict conditions (Karger and Jones 2006). One view is that it is the information sharing that gives most benefit which implies that there can be a decision making process included or a supply-chain process. To reach as much benefit as possible the information has to be of high quality, easy to understand and also
that there is a feedback loop culture in the organisation where complaints can be taken care of. (Janssen, Charalabidis et al. 2012).

3.1.5 Benefit in comparison to success

The definition of the word benefit depends on the context and also depends on the organisational culture as such (Lee, So et al. 2000; Ahlin 2013). When discussing benefit in some contexts it means just the positive parts of something, the negative parts are not claimed to benefit (Ward and Daniel 2006). Another way to term the total impact information has is to discuss net benefit (DeLone and McLean 1992; Delone and Mclean 2003) where both the negative and the positive impacts are included. One word close to benefit is success. No specific definition exists for this word either, it is also dependent on the context (ibid). For example, to understand the success of a user’s reflection upon a search there are three factors that must show a good result: the user should find exactly what he/she wants; be satisfied with the operational way to perform the search; and have no dissatisfaction whatsoever (Griffiths, Johnson et al. 2007). In Delone and Mclean’s success model there are several factors that show impact on success, the problem is when and where to use which factor and also the comparison between them. One of the factors is net benefits which show that the authors see success as a more general object than net benefit. In the comparison of different success results a discussion can always occur as to whether it was the factor that implied the success or if there was some other underlying reason for the good result.

3.2 Information Management

The second theme for the related research is Information management (IM), which is discussed in terms of being:

“the economic, efficient and effective coordination of the production, control, storage, retrieval and dissemination of information from external and internal sources, in order to improve the performance of the organisation” (Best 2010).
From this definition, one can see that the information is looked upon as a manageable resource which has to be governed from a lifecycle perspective and where different questions are raised during different lifecycle parts. Best (2010) argues that the resource distinction is based on the condition that it can be created, reused, modified and used simultaneously by more than one person. Detlor (2010) has a more operational definition of IM stating that its goal is to support both individuals and organisations to access, process and use information efficiently and effectively. The context for IM has developed and broadened from just being seen as a solid hardware part to being a part of the organisation (Orlikowski 1992). This insight shows that social actors have an impact on the IM providing a more human-based management approach. Orlikowski digs deeper into this by discussing human actors that influence the IS development and implementation and also how IS impacts the human actions – classified as the technology of human action and technology as the medium of human action.

In every organisation there is a struggle to introduce a new management process – it needs to show measurable results (Flett 2011). The aim of introducing IM is to develop the performance of the internal organisation, something that is hard to measure (Best 2010). One operational way to do this is to understand and measure the knowledge base which is bigger with shared and integrated information (Koh, Ryan et al. 2005). In IM the time aspect is included in the goals since the user or organisation will retrieve or capture information when they need (Chen and Kamara 2008). The time aspect influences how information is interpreted and used, in close conjunction with the organisation’s standards and culture (Orlikowski 1992; Orlikowski 2007). In the latter discussion Orlikowski diminishes the impact of the technological part of the system which becomes more and more a part of the process itself.
As in all systems the information that is locked in and just affected by internal factors is easier to manage than in an open system, since its behaviour is more predictable (Janssen, Charalabidis et al. 2012). Information in an open system receives feedback and therefore a structure for feedback is necessary as is a loop for implementing changes impacted by feedback. In the open system, the feedback given by a person or another organisation influences the information design, and leads to both benefit and delimitation. The more recently developed open source movement adds impressions to the information management and impacts the view on digital information (Mueller 2008). From the historically more closed system to a wide-open system – the steps are many and it is hard to achieve an overview of the impacts. As a result, arguments for a closed IS can be many as well as arguments for an open IS, depending on the content and the context. The important issue here is the knowledge that no system direction is right or wrong, just context-dependent.

In the operative guidelines for IM the perspective is the lifecycle on the digital information (Reponen 1993). The guidelines are produced internal in the organisation and are therefore a result of its view on the topic (ibid). The perspective on how information can be managed varies on a scale from total autocracy to the other end point of the scale: in an anarchistic way (Davenport, Eccles et al. 1993). The total autocracy is named as monarchy by Davenport, Eccles et al.

Overall management activities included in the IM process are planning, deciding and focusing on management of the whole lifecycle of all organisational information (Reponen 1993; Best 2010). In order to do this the manager need knowledge from the business side and specific domain competence about IM (Reponen 1993). The operative IM process includes information usability, information sustainability, information integration, information access and collaboration and collaboration, information life-cycle, information governance and security as needed for the organisation and users (Flett 2011).
Until now the discussed view of IM has been more or less goal-oriented from what and how the organisation is managed and its goal. Davenport and Prusak (Davenport and Prusak 1997) discuss in other terms and define it from a more holistic view. Information ecology is oriented around how people create, distribute, understand and use information and refers to the internal information environment of an organisation. The users’ behaviour refers to their situation as they use information in relation to work-related situations. To operationally understand the users and their information behaviours it is necessary first of all to develop a clear understanding of who the users are and their information needs. Their information needs can be described in terms of what information they search for and what kind of information they share internally with others. The second is to understand the structure of the work-related problems the users face. The third is to understand how users search for information and which information they prefer. Davenport and Prusak (1997) describe information ecology by using the following terms, described in Table 5.

**Table 5 Terms in ecology (Davenport and Prusak 1997)**

<table>
<thead>
<tr>
<th>Term in information ecology</th>
<th>Refers to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational mission</td>
<td>Overarching goals and activities of an organisation</td>
</tr>
<tr>
<td>Corporate information goals</td>
<td>The way information helps to assist the organisation to accomplish its missions</td>
</tr>
<tr>
<td>Information management plans</td>
<td>Formal policies and standards an organisation has to structure and control information resources and services</td>
</tr>
<tr>
<td>Information culture</td>
<td>The attitudes and norms organisational participants hold in issues such as information ownership and information sharing</td>
</tr>
<tr>
<td>Term in information ecology</td>
<td>Refers to</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Information politics</td>
<td>Political barriers that obstruct the movement of information across departmental boundaries</td>
</tr>
<tr>
<td>Physical settings</td>
<td>The physical surroundings that create special boundaries and demands on information behaviour</td>
</tr>
<tr>
<td>Information staff</td>
<td>Organisational person that is needed to give and interpret information</td>
</tr>
<tr>
<td>Information handling</td>
<td>The rules and routines utilized for the management of records and archives</td>
</tr>
</tbody>
</table>

The base line for IM used in this thesis is the contribution digital information can have for the individuals and their work role. This base line is influenced by the information ecology and also by Orlikowski (2002). She emphasises that we as individuals play a role in the information culture with our knowledge, expectations and experience when we use information. The information culture in its turn influences the organisation’s own structure of control mechanisms and accomplishes the impact and benefit information culture has. This is described in earlier parts of her work as a result which should be measured – both on the individual and on the organisational level (Orlikowski 1992).
4. THEORETICAL LENS

4.1 Boundary objects

The theory connected to boundary objects is used in a lot of different disciplines throughout the academic world, like health care, IS and teaching, and is quite well-known (Lainer-Vos 2013).

Boundary objects and their implemented meaning and contextual movement started out in the form of a sociology theory based upon communication of information used by different communities (Bowker and Star 1989). The boundary objects are by nature inter-contextual. They are used by different departments and may be considered as existing in the space “between” boundaries and can thus be employed by different individuals, no matter which organisational unit they belong (Carlile 2002). Bowker and Star (1989) define boundary objects thus:

“Boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites.”(p.297)

For the boundary object to be used by different departments or other different yet similar contexts the characteristics of the object is that it is adapted to its context and is standardised on an overall level (Allen 2009). The usage of the boundary object is done differently by different departments and differs during different time periods (Akkerman and Bakker 2011). Another meaning of the boundary object is close to what is known as a boundary crossing activity and is more similar to a shared activity between different activities.

In concrete terms, boundary objects can assume the form of repositories, standardised methods, models or overviews (Carlile 2002). The repositories can be in the form of a database that is used as a shared resource to solve problems. The standardised methods are also
commonly used methods for problem solving. The model’s function is to provide an overall view of complex presentations. A common approach for introducing boundary objects is to start using some fragments of a common language or syntax between disparate stakeholders, professionals, divisions et cetera (Boland and Tenkasi 1995). Carlile (2002) emphasises that the boundary object plays a concrete role in product development to form a way for individuals to manage knowledge across certain boundaries.

The immediate benefits of a boundary object are its ability to explicate differences as well as dependencies across boundaries and also its judgement for different goals (Fleischmann 2006). From an individual perspective, the boundary object provides an infrastructure by which one may better understand overall processes and work together to create and/or improve existing knowledge. Another good usage of the boundary object is to create and maintain a more efficient communication between different professionals (Huang and Huang 2013).

In the near context of boundary objects the looser boundary concepts are discussed (Allen 2009). This is, at least in other disciplines than IS, seen as a starter on the road to becoming a more robust boundary object. On the pathway from boundary concept to boundary object, the transformation, a scenario of discussions and negotiating is included and also one of fights and non agreements. This process often has its base in some lack or problem which has a considered impact, or in a shared problem area, such as an unknown problem with a web site (Akkerman and Bakker 2011). The transformation and its negotiation-driven pathway put the boundary object in a political situation where different opponents’ contrasting goals are included. As such the transformation can include new power structures and turn different hierarchies upside down. One part included in the transformation is the boundary crossing where individuals start their own journey of learning and practicing in a new area (Akkerman and Bakker 2011). The transformation of a
boundary concept, or as well a boundary object, often occurs in a political process.

Interpreting the emergent features of boundary objects (plasticity in interpretation and robustness of identity) in the light of these boundaries, an opinion of the boundary object is something that spans the syntactic- and possibly the semantic boundary in order to maintain integrity, and supports general knowledge without displacing localised interpretations relevant to a specific context. A conclusion of this is that boundary objects are neither static nor particularly easy to identify. This point is made clear by Star (2010) who attributes three dimensions to boundary objects: interpretive flexibility, structure and scale. The first dimension of interpretive flexibility basically entails that boundary objects allow different usage and interpretations based on one’s interest or skill-set. The second dimension expresses the variety of material- and organisational structures that form boundary objects as they are typically based upon requirements derived from tasks. Finally, the third dimension is one of scale (and granularity) that affects what is useful to perceive as a boundary object.

While formalised, designated systems might make for efficient boundary spanning, they are not a requirement for the phenomenon as such. In their discourse on activities that cross boundaries, Leifer and Delbecq (1978) note that where formalised systems are absent, informal systems emerge to fill the gap. While these informal systems may be efficacious, they are also less efficient in that they generate more information than their formalised counterparts. The user as such is unfamiliar with the organisational structure and does therefore not find what he/she is looking for (Albrechtsen and Jacob 1997). Levina & Vaast (2005) expand on the notion of the formal and informal as they describe nominated boundary spanners and boundary spanners-in-practice; the former referring to roles that are by design intended to bridge organisational gaps and the latter individuals who serve the same function as their skill-set or have
experiences that encompass more than one organisational role. Carlile (2002) emphasises that the knowledge as such can build boundaries, both to be used as a challenge but also as a way to form different work roles and their own specialisation. This specialisation contains a certain amount of fragmentation which is avoided by individuals by crossing built boundaries (Akkerman and Bakker 2011). The boundary object can also be seen as a memory where the organisation stores important facts in different databases or repositories (Ackerman and Halverson 1999). Orlikowski (2002) finds several other boundaries that have impact on the work role – such as temporal, geographic, social, cultural, historical, technical and political. This forms one part of the knowledge base for their specific work role.

To continue with only the knowledge boundary and the discussion of what an effective boundary object can provide, a starter can be the syntactic boundary object (Carlile 2002). The effective boundary object in this form provides a common language and is done operationally in the form of representation. The semantic approach of a boundary object gives the organisation more knowledge and approaches to learn more about their different needs and also to specify them clearer. In this case the approach is characterised by representing and learning. A pragmatic boundary object is a object that can help the process where individuals’ knowledge is combined. For this approach the character added is transforming. It is emphasised that for each one of these boundaries there is need for a special kind of boundary object.

The theory of boundary objects has been interpreted in many different ways. The usage has not been distinctly based in the original purpose of a boundary object. Lainer-Vos (2013) discusses this width in terms of treatment of the object as an actor which instead should be the usage of the effect between the object and their user. This is a usage of the theory as a relational concept where the origin of the relations is discussed. Star (2010) has also promoted
certain issues for the boundary object concept starting out by saying that there are different aspects connected to the object but that interpretative flexibility is rarely used. Star (2010) also mentions that the dynamic process of forming a boundary object is often forgotten – the negotiating and movement of it.

For the theoretical approach there are several ways to deal with the boundary object and to clarify its role in this cover paper. One path to continue with is the angles of interpretative flexibility, structure and scale. As the empirical material is to be finally visualised in the form of perceived intangible benefits these approaches are conceived in order to focus on the technical part of the structured information. The effective boundary object provides a positive impact on the organisation which is in line with the benefit it should provide. The effective boundary object also takes into consideration what the organisation uses it for and thereby gives an interpretative approach to the information. Therefore the theoretical lens that is the boundary object will be viewed from the syntactic, semantic and pragmatic approaches described above.

The knowledge that is transformed between different internal departments is operationally stored as the structured information and according to Carlile (2002) divided into the syntactic, semantic and pragmatic approaches. Carlile discusses the approaches one by one and not together. A boundary object is viewed for example from a syntactic or a pragmatic viewpoint. Here the different approaches will be summarised, used as a whole and visualised in the total as a knowledge transformer operationalised by the structured information. To illustrate this a usual carrier – a lorry - describes the load – knowledge. The carrier is built by the syntactic, semantic and pragmatic view which all are needed to produce the load, see Figure 3 Summarised boundary object.
Figure 3 Summarised boundary object
5. ANALYSIS

In this analysis section the research questions will be answered through analysis and discussion. The questions will be analysed in numerical order.

5.1 Analysis research of question one

- RQ 1: Which are the intangible benefit factors from structured information and how are they affected by information management?

In the benefit management process there are several steps included – one of them is the evaluation step (Ward and Daniel 2006). In an ordinary investment situation this is often done – the economic investment needs to be decided upon and also managed. Like all other assets the structured information in an organisation provides benefits, seldom measured, just discussed in terms of intangible benefits (Janssen, Charalabidis et al. 2012). Emphasised from the intangible benefit model in paper A, the actual process provides different positive effects. Some of them are connected to a process, which can be viewed as indirect benefit factors from the digital information. Directly connected to the information is the common base for after-market design semantic interoperability. The first benefit factor - the base for after-market design in form of statistics – is internally extracted as knowledge, meaning that the information is formed by its interpretation by humans (Langefors 1995). As in all other kinds of benefit, the stakeholder’s view has to be involved (Lagsten 2009) and also the study’s static time perspective (the lifecycle of the product) (Ward and Daniel 2006). The result shows that knowledge has two different internal stakeholder views – the organisation and the individuals; in knowledge management named
organisational memory and knowledge as flow of action. In Table 6 these two stakeholders’ intangible benefits from knowledge of structured information is described. To all of those connected to the organisation as stakeholders, the seventh bin (Stein and Zwass 1995; Karsten 1999) of information space, where negotiations to form the most beneficial outline have been and are done.

**Table 6 Benefit from Knowledge**

<table>
<thead>
<tr>
<th>No</th>
<th>Stakeholder</th>
<th>Benefit of knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organisation</td>
<td>Capture, preserve and reuse engineering designs</td>
</tr>
<tr>
<td>2</td>
<td>Organisation</td>
<td>Post-delivery logistics</td>
</tr>
<tr>
<td>3</td>
<td>Organisation</td>
<td>Profitability</td>
</tr>
<tr>
<td>4</td>
<td>Organisation</td>
<td>Not dependent on individuals</td>
</tr>
<tr>
<td>5</td>
<td>Organisation</td>
<td>Uniformity in individuals’ mindset</td>
</tr>
<tr>
<td>6</td>
<td>Organisation</td>
<td>Individuals are formed with the culture</td>
</tr>
<tr>
<td>7</td>
<td>Organisation</td>
<td>Stability in organisation</td>
</tr>
<tr>
<td>8</td>
<td>Individual</td>
<td>Freedom in work role</td>
</tr>
<tr>
<td>9</td>
<td>Individual</td>
<td>Internal mobility</td>
</tr>
</tbody>
</table>

From the organisation’s view, paper C shows us that knowledge gives the two first specific benefit factors such as the possibility to store and reuse different types of design and also post-delivery logistics. Both of these two benefit factors are formed from the specific organisational domain and can be expressed in more overall terms. For the remaining five organisational benefit factors, derived from papers B and C, the benefit factors are expressed in more overall general terms and are non-domain-specific. Numbers five and six express a way for the organisation to form its behaviour and also to manage the impression it creates. In paper C, numbers eight and nine, the individual benefits are declared as freedom in their work role and independently of a specific organisation or role.
From the second intangible benefit factor, semantic interoperability, the stakeholders’ view is also that of the organisation and the individual, Table 7, (paper B).

**Table 7 Benefit from semantic interoperability**

<table>
<thead>
<tr>
<th>No</th>
<th>Stakeholder</th>
<th>Benefit factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organisation</td>
<td>Uniform actions</td>
</tr>
<tr>
<td>2</td>
<td>Organisation</td>
<td>General way to understand information</td>
</tr>
<tr>
<td>3</td>
<td>Organisation</td>
<td>High data quality</td>
</tr>
<tr>
<td>4</td>
<td>Individuals</td>
<td>Efficiency in discussion</td>
</tr>
<tr>
<td>5</td>
<td>Individuals</td>
<td>Adjust information</td>
</tr>
</tbody>
</table>

All of these factors are non-domain-specific and give the organisation input for the central management of their information towards semantic interoperability in order to receive these different benefit factors. The first two give an opportunity to inform about both actions and understanding and the third to circlewise give a better result from the information. The fourth factor relates back to the organisation’s first two factors and the last factor is in favour of the individuals who can adjust their information to become their needed efficient work tool.

From both of these two overlying benefit factors, the knowledge and the semantic interoperability, the found result is emphasised in positive effects, the net benefit (DeLone and McLean 1992; Delone and Mclean 2003), both for the organisation and the individual. None of the factors are evaluated by a benefit management process in the organisation, merely discussed from the positive impact that information has (paper E). This confirms Bannister and Remenyi’s (2005) and Hu, Frisk et al.’s (2006) results showing that few organisations make evaluations and specifically not for the digital and structured information. Also confirmed is the fact that the understanding of what benefit is depends on the context and the
organisational culture (Lee, So et al. 2000)(paper E). An analysis of Table 6 and Table 7 suggests that an underlying understanding of benefit can lead to efficiency for the organisation and, as a part of that, result in efficiency in the work role for the individual.

In the search for the answer to the second part of the first research question, there is a comparison between the information management as a way to raise the efficiency in the organisation by using the tool information (Best 2010) and a perspective of benefit as a way to also raise the efficiency in the organisation (Ward and Daniel 2006). The connection between these two views lies in the management perspective where the organisational goal can be the highest priority (Flett 2011). In paper B, two the management perspectives top-down and bottom-up are used as analytical lens for information management. The top-down approach refers to a standardised way for individuals to behave in the whole organisation (DiMaggio and Powell 1983) and the bottom-up to the management priority task to coordinate (Kirkbride 1993). Using the information management view, the top-down can be seen as implementation of autocracy and the bottom-up as a feudalistic implementation (Davenport, Eccles et al. 1993). The current way of discussing information management is more in harmony with the information ecology, where the individuals and their requirements on information is of the highest priority (Davenport and Prusak 1997). For the organisation an autocratic approach uses semantic interoperability as a way to generalise the way information is understood and also how individuals should act upon it. Mentioned benefit factors are in favour of the organisation. When the organisation uses information ecology and provides governance that is more holistic, the intangible benefit factors discovered are to the benefit of the individuals. A summary of the two clear management styles is found in Table 8.
Table 8 Management type and benefit factor

<table>
<thead>
<tr>
<th>Management type</th>
<th>Benefit factor</th>
<th>Stakeholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralised</td>
<td>Uniform actions</td>
<td>Organisation</td>
</tr>
<tr>
<td>Centralised</td>
<td>General way to understand</td>
<td>Organisation</td>
</tr>
<tr>
<td></td>
<td>information</td>
<td></td>
</tr>
<tr>
<td>Centralised</td>
<td>High data quality</td>
<td>Organisation</td>
</tr>
<tr>
<td>Decentralised</td>
<td>Learning from doing</td>
<td>Individuals</td>
</tr>
<tr>
<td>Decentralised</td>
<td>Adjust information</td>
<td>Individuals</td>
</tr>
<tr>
<td>Decentralised</td>
<td>Efficiency in discussion</td>
<td>Individuals/Organisation</td>
</tr>
</tbody>
</table>

As viewed from the Table 8, the information management style has direct impact on the benefit factors and is in direct connection to the stakeholders’ goals. The discussion can also turn to the topic of whether the individuals in the organisation as a whole are seen as the whole organisation and thereby the decentralised management type is in favour of the organisation’s perspective (Orlikowski 1992).

A third aspect of information management and its impact of benefit factors is seen in paper D. From this information culture (Davenport and Prusak 1997) and management view (Best 2010) where the structured information has no impact on the business goal and is more or less something seen as an artefact that drives costs with no income in sight. Despite the fact that the information is seen as a clear expense, the management of the information is done in a consensus culture and taken care of by the individuals, forming a mixture between federalism and anarchism. This fastidiousness occurs due to the pride individuals have in their work despite the lack of interest from the management. And as a result from this very few benefit factors are reached, if any.
One conclusion from all these three ways of managing information is that it has impact and provides a direct line from management to those benefit factors. There is also a connection to the stakeholder who will have the most benefits from different management ways. The centralised management described provides factors that are mostly directed towards the stakeholder organisation and the same pattern occurs for the decentralised management type. Of course there can always occur a discussion over whether there exist any differences between the organisations’ and the individuals which in these cases it seems to be.

To wrap up the first research question the word benefit and related research will be discussed. From paper E one result is that the word benefit is rarely theorised or defined, the word is more or less disseminated and used as a word for something positive, good, useful or as simply as a word to put in the key words in academic papers. Benefit is not the only area occurring in this way – mentioned earlier in related theory is success (DeLone and McLean 1992; Delone and Mclean 2003). In the academic field this means a blurry and widespread research and can be one of the contributing factors to the fact that the evaluation models are not applied to the business field and thereby are rarely used (Hu, Frisk et al. 2006).

5.2 Analysis of research question two

– RQ 2: How can the intangible benefit factors be visualised and juxtaposed?

For the past three decades, the benefit research in the IS field has moved from only investigating the economic benefit (Brynjolfsson 1993) to the more pragmatic view of learning involved in the evaluation process and openness to stakeholders (Lagsten 2009). One thing that has not changed is the grounds for making an evaluation – the organisation needs to take decisions, communicate and discuss
the investment or asset (Ward and Daniel 2006). In the more recent research both the tangible and the intangible benefit factors are viewed as important, even though the intangible ones are described in words.

To move on with the answer for research question two - the intangible benefits of information - the boundary object is chosen as a tool for visualisation due to its roots in a social angle with information as a help for different groups with existing boundaries between them (Bowker and Star 1989; Carlile 2002; Yoo, Henfridsson et al. 2010) and the view of information as being a knowledge carrier (Carlile 2002). In the existing boundary object theory the effective boundary object is used. In connection to the effective object there are three attributes – the syntactic, the semantic and the pragmatic effects (Carlile 2002), see Figure 4.

**Figure 4 Overview boundary object factors**

The syntactic leaf provides a common language, the semantic more knowledge and the pragmatic helps the process including the individual’s knowledge (Carlile 2002). The visualisation gives live to how the common, static internal view of the boundary object – in the definition described in terms like its “local needs and how to maintain a common identity across sites.” (Bowker and Star 1989).
Not visualised in this figure is, for example, the relationships between the different boundaries (Fleischmann 2006), other contextual differences (Allen 2009) or the timescale (Akkerman and Bakker 2011). In correlation to the benefit management process the relationship between the included components, the contextual differencies and time scale should all be included in a thorough process and taken into consideration (paper E). To start the juxtaposed visualisation Alpha and Beta’s boundary objects are briefly described.

5.2.1 Alpha’s boundary object

**Syntactic boundary object:** In organisation Alpha there is a high degree of semantic interoperability, supposedly to raise efficiency in the organisation, however there is no discussion about what kind of components are being asked for (see paper B). Pictures are not needed and those who have been in the organisation for a while use the semantic as a knowledge base as well. From the logic in the boundary object they can understand the product’s category, which of course is something that takes time to learn. At least half a year is the common understanding.

**Semantic boundary object:** In Alpha the knowledge perspective is used distinctively throughout the organisation and this was also one of the main purposes why the boundary object was implemented in the first place. A common answer to the question as to why the implementation took place is the idea of “order and structure” for a very complex production process with a lot of different dependencies. In the background to the implementation history, is the knowledge of how complex the product is and also the knowledge of what happens in the long run if incorrect or defective information is stored. Therefore the different departments take their responsibility by providing correct information to the boundary object in what they call a baseline project. As the boundary object also contains a knowledge base for the different products and their
actual revision this is also used for general modifications of utilised products.

**Pragmatic boundary object:** For Alpha the pragmatic part of the boundary object is big for certain processes and is increasing for others. The information stored internally can be accessed by all employees and contributes to the common knowledge of the complex product process. Examples of activities that are connected to the boundary object are testing, verification, maintenance and statistic foundation.

**Figure 5 Alpha´s boundary object**

To summarise the load carried, see Figure 3, internally in Alpha the benefit the boundary object (Carlile 2002) brings to the internal organisation is high. This is illustrated by the clover leaf where the petals are dimensioned from an interpreted benefit effect to the internal organisation, see Figure 5. The relatively high impact can be a result of the main purpose for the implementation of the object which was to bring “order and structure” to a very complex production process with a lot of different dependencies over department boundaries.
5.2.2 Beta’s boundary object

**Syntactic boundary object:** The semantic base for Beta’s boundary object is used for modularity and can thereby internally discuss different models and specifications to a small degree without problems in different groups. The structured information is often complemented with pictures or the individuals’ own knowledge bases.

**Semantic boundary object:** The knowledge view of Beta’s boundary object is used internally only by the installation staff. They, or other firms’ installation staff, use it when they configure the products and start the production and the information and its content is not used for any other purpose, such as education. Beta’s strategical plan includes greater and easier access to the information and by this the internal knowledge base increases. Due to internal prioritisation this is not yet affected.

**Pragmatic boundary object:** The pragmatic parts of Beta’s boundary object are used in a one-way internal process. The design engineers have the knowledge of the construction and they expect the boundary object to be created from their own knowledge base. This creates a special kind of time-line where the boundary object always is last in line and they use no knowledge from the persons, the technical informants, creating it. The responsibility to create the pragmatic boundary object is remitted to the informants. The pragmatic view from the designers is so deep in Beta that they want to know how much effort they use in order to teach others, especially the technical informants. What the technical informants supply is the pragmatic view of how the presentation of the boundary object is to be presented. On some rare occasions the technical informants’ pragmatic view is used for external marketing. For the maintenance process the boundary object is supposed to be a verification that maintenance is done correctly. This pragmatic approach can be the view of newcomers; those staff members with greater knowledge do
not see this as necessary. It can also be a view of the organisation’s culture.

Figure 6 Beta’s boundary object

Beta’s boundary object is used to a low extent in the organisation and the benefit factors are low, see Figure 6. As for Alpha this is illustrated by the closer flower where the petals are dimensioned from an interpreted benefit effect to the internal organisation. One thing that can have big impact of this could be the internal organisation’s cultural view on the boundary object (paper E).

5.2.3 Juxtaposed boundary objects

The visualisation of the two boundary objects shows differences between them, for example the low usage of the semantic factor in organisation Beta in comparison to organisation Alpha, see Figure 7.
Figure 7 Juxtaposed boundary object Alpha and Beta

From the static juxtaposed picture the usage of the structured information in the form of a boundary object shows that differences in the usage can be visualised. On a general level they can be juxtaposed and differences in their efficiency discovered. The differences depend on the scale and granularity that the viewer decides is the best and must in a further discussion and possible decision situation be treated with respect to its base. All intangible benefit aspects, as well as the boundary object, are affected by its context, organisational goal, time aspect and in the long term the possibility to influence.

5.2.4 Method discussion

As earlier mentioned the method used will be discussed in terms of generalisation with the foundation stone that one of the goals for a researcher is to create more understanding for a certain topic (Creswell 2007). Operationally this is done in studies and research projects and one aims is to create this understanding by drawing general conclusions. Therefore the discussion about how generally applicable every conclusion is can be interesting. For an interpretative study there can be several, not mutually exclusive, categories of how to create generalisations: (1) development of concepts, (2) generation of theory, (3) drawing of specific implications, and (4) contribution of rich insight (Walsham 1995). In
Lee and Baskerville (2003) the generalisation made from a case study is referred to as a level-2 interference where the generalisations are made from the empirical material to new theory building. Categorisation is good knowledge but still the question remains as to how to create generable conclusions in interpretive research. One view from Walsham (1995), based on social science and compared with the natural science, is that interpretive research formulates tendencies. Tendencies which are verified by data from the past and for the future can be seen as a kind of predictions. Lee and Baskerville (2003) emphasis this as generalising from particular instances to general notions.

To be more specific in the discussion about generability, Lee and Baskerville (2003) discuss and frame the necessity for it in the IS field. They describe that the usefulness of theory concerns not only scientists but also practitioners. Therefore generability has many purposes, such as managing and solving problems that the organisations of today experience.

In this thesis there have been several bases for the creation of general conclusions. The first part of this is the included papers which each have their own results and conclusions. The answer to the first research question is formulated from a common base of the five papers. The second step to make a more general conclusion is by using a new lens – the boundary object. By using this lens as a general approach, a comprehensive view of the empirical material is accomplished. To summarise, these steps put different angles of formulation of tendencies and also the creation of general understanding.
6. CONCLUSION

The conclusion will be divided into different parts starting off with a short answer to the research questions, followed by a double-barelled contribution part and suggestions for further research.

6.1 Summary of research questions and found answers

This thesis wants to shed light on two research questions where the first analyses the intangible benefits from structured information and how they are affected by information management.

With a base from earlier benefit research and performed studies the intangible benefits are discussed in terms of knowledge and semantic interoperability. The perspective used is an internal one and therefore the benefit factors’ stakeholders are the organisation and the individuals (Lagsten 2009). Both of the two benefit factors mentioned provide positive effects for the organisation and the individuals.

In view of the benefit factor knowledge the organisation is provided with both domain-specific benefit factors focused on their main process. In this thesis this is exemplified by the design process in a manufacturing company and the knowledge to maintain the maintenance logistics. To any organisation the intangible benefit factors are likely to be expressed by the expected, but not calculated, increase in earnings and do not need to count on the individuals. For the individuals the knowledge creates freedom, both in their existing work role and in their own independence.

The semantic interoperability as benefit factor by its nature contributes to generalised, non-domain-specific, benefits. For the organisation this is discussed in terms of a uniform way to understand the information which directs actions performed in the same way. From the individual perspective, an efficiency in discussions appears
meaning that the spoken or written words are understood without disturbance.

One way to look upon the specific benefit factors is to see how it can be managed from its base, in this case the structured information. The information management provided here – the autocratic, the feudalistic way and the mixture of federalism and anarchism – all emphasise that shown benefit factors are a result of the shown governance. Autocracy creates factors in favour of the stakeholder organisation, the feudalism for the individual and the last mentioned mixture very few benefit factors. The impact rate is therefore seen as high and useful to the organisation that wants to improve their desired benefit factors.

The second research question answers how the intangible benefit factors can be visualised and juxtaposed. In the search for the answer a new theoretic lens – the boundary object theory is introduced. From this theory base the attributes of the effective boundary object are applied and this forms a static and momental picture. This picture includes the syntactic, semantic and pragmatic parts of the boundary object, all visualised in the form of a clover leaf. For a juxtaposed view two cases contribute to showing that the internal benefit factors can be translated into the boundary object’s attributes. The leaves of the clover are sized from an appreciated measurement and can thereby be juxtaposed. In this thesis appearing as only interpreted and by eyemeasurement, not affected by its relationship to other parts or time scale.

6.2 Contribution

The short description of the purpose of this licentiate thesis is to describe the intangible benefits of internal structured information and the influence information management has on the intangible benefit factors and also to visualise how intangible benefits can be shown. The purpose of the thesis and its contribution can be divided into two parts for the two communities: the academic and the
business-oriented. Each of these two communities have a general interest in the research topic and it is also of interest for the researcher to reach them both.

6.2.1 Academic contribution
The academic contribution provided by this licentiate thesis is based around the model of a boundary object’s factors. This model gives a base for an analytic lens which helps the further development of measurement of intangible benefits. In its simplicity the visualisation of the analytical lens is a static base for the role different boundary objects play in an organisation. The base is formulated by a positive view and that the benefit factors have a positive impact.

6.2.2 Business oriented contribution
In addition to the above mentioned contribution to the academic world, contributions for the business world can also be found. This has been done in order to give the business sector an increased understanding of the effects which the intangible benefits of structured information can provide both for the organisation and individual coworkers and also illustrate the impact of used information management. The concrete effect of this is that the business side will become more aware about these intangible benefits – semantic interoperability and knowledge. For a more distinct discussion the structured information can be viewed by the syntactic, semantic and pragmatic factors and be visually described in these forms. As the visualisation can be made in the temporal aspect comparison can be made and management can increase their governance over their information.

6.2.3 Further research
In the area of discovering the benefit of digital information there exist several interesting research issues to continue with. One is to provide a model and method for internal organisational definition and measurement of their intangible benefits for information. Ideas
for this right now include for example the balanced scorecard (Protti 2002) and ideas of Bhagwat and Sharma (Bhagwat and Sharma 2007) where different business perspectives are included. Another method to measure includes the step of creating a panel who decide on what is to be measured and another panel who decide on the scale and the operative measurements (Moore and Benbasat 1991).

Other interesting research is the understanding of how intangible benefit factors are influenced by time as a factor. As seen in Ahlin (2013) the benefit factor is affected by the definition of benefit, the different perspectives as to what is evaluated, who is the stakeholder and the time aspect. In the same article investigated benefit factors are seldom discussed in terms of when they increase, decrease, appear or disappear.
7. APPENDIX

In this appendix the two interview sets with their overall question sets and corresponding questions are shown. First Alpha’s and then Beta’s.

<table>
<thead>
<tr>
<th>Question set</th>
<th>Interview question</th>
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<tbody>
<tr>
<td><strong>General questions</strong></td>
<td>What is your organizational role?</td>
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<tr>
<td></td>
<td>For how long have you been working in the organization</td>
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<tr>
<td><strong>Configuration Management</strong></td>
<td>What is the connection between your working role and configuration management?</td>
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<td></td>
<td>What does configuration management mean to you?</td>
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<td></td>
<td>Describe the configuration management process? Is it well documented?</td>
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<td></td>
<td>How do the organizational structure for configuration management look like?</td>
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<td></td>
<td>How well do the information systems support your work in the configuration management process?</td>
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<tr>
<td><strong>Configuration Management benefits</strong></td>
<td>What will configuration management contribute to your team?</td>
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<td></td>
<td>In order to fulfill organizational goal or be more effective, what is the</td>
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<td></td>
<td>contribution from configuration management?</td>
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<td></td>
<td>Are there any numerical measurements from configuration management?</td>
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<td><strong>Organisational aspects on</strong></td>
<td>Other organizations refer to your configuration process as best practice; do you</td>
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<tr>
<td>configuration management **</td>
<td>know why?</td>
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<td></td>
<td>How is the configuration management process evaluated?</td>
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<td>Is it any communication from management regarding the configuration process and if;</td>
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<td></td>
<td>how is it done?</td>
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<td></td>
<td>How do the organization look upon configuration management?</td>
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<td>Has the organizational view changed about configuration management now and in the</td>
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<td></td>
<td>past?</td>
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<td></td>
<td>What improvements can be made in the configuration management process?</td>
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<tr>
<td>Question set</td>
<td>Interview question</td>
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<tr>
<td>General questions</td>
<td>What is your organizational role?</td>
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<td></td>
<td>For how long have you been working in the organization?</td>
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<td></td>
<td>Previous experience of IT?</td>
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<tr>
<td>IT production process and its development</td>
<td>What is the connection between your working role and the production process?</td>
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<td></td>
<td>What is your view of Technical Information? Both what it consists of and the reputation of it.</td>
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<td></td>
<td>Walk through of production process of IT. Is it well documented? Do you work like this?</td>
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<td>In the future - in your opinion, how should the process look like?</td>
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<td></td>
<td>Who can decide about actions in the process?</td>
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<td></td>
<td>How do you, or the company, find customer(s) both outsourcing and end requirements?</td>
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<td></td>
<td>How is development of the process done?</td>
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<td></td>
<td>How is knowledge exchanged between the two parts?</td>
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<tr>
<td>IT production process values</td>
<td>What is the general value of IT?</td>
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<td></td>
<td>In which activity/activities are customer value generated?</td>
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<td></td>
<td>In which activity/activities are waste generated?</td>
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<tr>
<td>IT production process effectiveness</td>
<td>In your opinion - are the right things done in the process?</td>
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<tr>
<td></td>
<td>In your opinion - are the things done right in the process?</td>
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<tr>
<td>IT production process measurement</td>
<td>On what base is the process measured?</td>
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<td></td>
<td>What are the measurements?</td>
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<td></td>
<td>What do you think the measurement should be in order to develop more customer value?</td>
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</tbody>
</table>
8. REFERENCES


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