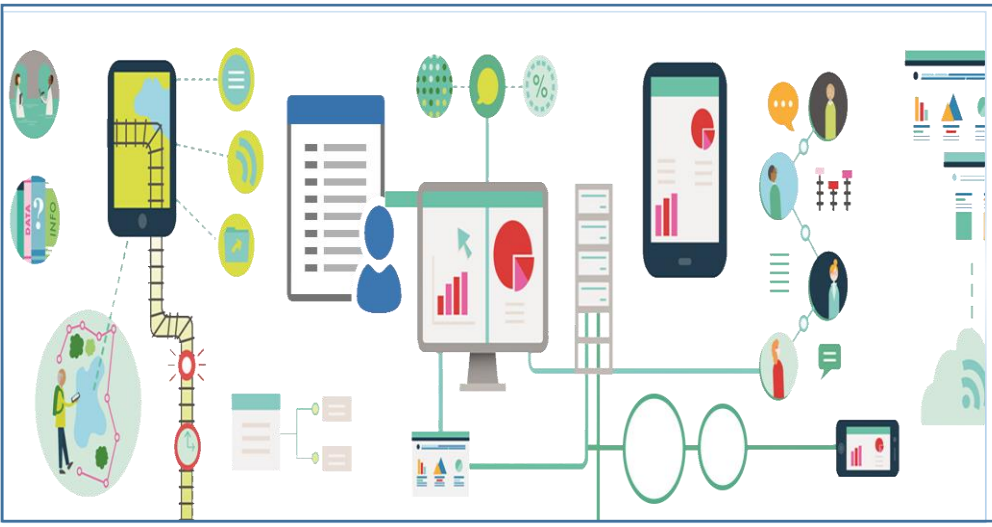
Developing an understanding of ERPs - A literature review of SCM literature



Master Thesis

Viktor Engborg

Sigurd Tenfjord

Supervisor: Gunter Prockl

cand.merc. / msc in economics and business administration supply chain management

Submission date: 15.08.2017
Page number: 112
Word count: 23388

Abstract

Firms current ERP environment is experiencing increasing levels of complexity. In this thesis, we have developed a foundational understanding aimed to aid this problem. In solving this, we have reviewed how ERP has developed over time. We created a scheme for classifying ERP, from two perspectives which we coined emphasis and applications groups. Via this classification scheme we observed a shift regarding the emphasis group. To ratify this shift and find aspects that our review had missed, we conducted several interviews with practitioners. This step gave us insight into the importance of context. Furthermore, we combined the insights from both the interviews and review, which resulted in a framework outline composed of the contextual factors, emphasis and application groups. This could act as a starting point from which future research can try and devise strategies. In conclusion, we have thereby been able to develop an understanding of how ERP has developed in a direction that has cause this increasing complexity. However, with insights from this thesis we have blazed a trail of how you can think about the issues regarding complexity.

Contents

1. Introduction

ERPs are experiencing increasing complexity due to the expansion of their applications portfolio. According to Gartner this requires a defined application integration strategy. They project that companies that fail to address these concerns with the increasing complexity of the ERP application portfolio, risk that cost and complexity will spiral out of control and any potential benefits will erode (Ibid). Gartner has predicted that 90 % of companies in 2018 will lack a strategy for dealing with this increasing complexity of the application portfolio (Ibid). Ultimately companies will thereby experience integration disorder, greater complexity and cost if they do not manage to successfully deal with these concerns. (Gartner, 2016)

The ERP environment is becoming increasingly federated and de-coupled, even though this promises increased agility you can only achieve this if you can address the increased complexity. However, firms do not have any guidance as to how they should deal with this increased complexity of the ERP environment. Even though, until 2018, 80 % of firms are expected to lack capabilities to have strategies for dealing with this ERP environment. (Ibid)

Furthermore, the ERP environment is likely to get even more complex going forward, which will put even greater pressure upon firms to handle this issue. This complexity will arise for even more sophisticated applications of ERP that might include AI and similar trends. Using technologies as such in the application of ERP is an unchartered territory and will increase and uncertainty and thereby complexity. (Accenture Tech Trends, 2017).

Coupled with this we can see an increased interest from end-users of ERPs to see more tangible result from their ERP investments quicker. All this puts tremendous pressures upon the firm to deliver results while at the same time experiencing a more complex environment. However, currently there isn’t a way to provide direction as to how a firm should act in regards to these pressures. We believe that creating a fundamental understanding of ERPs and its applications have developed can help to handle this increasing complexity. (Ibid)

1.2 Problem Statement

We have described that the current ERP environment has put increased pressures upon the firm. Furthermore, per Gartner, firms experience challenges in the ERP environment of today. This is due to that the environment of ERPs has gotten increasingly more complex, due to an expansion of their application portfolio (Gartner, 2016). Moreover, this added complexity has caused firms to not reap the benefits that these applications of ERP should provide. In addition, Gartner describes that firms are unable to deal with this environment due to the lack of strategies available for this specific problem. However, we argue that this problem is due to even more fundamental aspects than lack of strategy. In our view firms are unable to devise strategies as they lack the understanding of how the ERP environment has developed. Thereby firms can't devise strategies at they do not know what is driving their ERP environment. This means that the underlying motivation that has caused this development of an increased application portfolio, and ultimately complexity, isn't understood well enough. This means that even though the increased complexity can be traced to an increased application portfolio of ERPs, there is a lack of understanding as to why this has happened.

A disconnect thereby exist in firms' understanding of ERP and its application. To bridge this disconnect you need to understand what drives the development of the ERP environment. To understand what drives the development you need to understand how the environment has developed. Understanding why the ERP environment has moved in a certain direction and how will provide a foundation for devising strategies for tackling the complexity of the environment. Furthermore, in gaining this knowledge of the environment, the firm can see what ERP applications that will give them capabilities that will allow them to stay competitive. Firms that have a fundamental understanding of ERPs and their application and how they developed, are therefore in a good position to better determine the requirements of their ERP investments. What we will do in this thesis is thereby to establish an understanding of what it is that underlines that has driven this development in the ERP environment.

From an academic perspective, the problem we want to solve is therefore to provide a frame understanding how ERP has developed. However, there is a lack of a coherent bibliography

focused on understanding how ERP has developed. This means that the fundamental understanding of how an ERP has developed and why, haven't been carefully examined. Furthermore, this can provide the foundation for creating more concrete tools for devising strategies for tackling complexity related to ERPs, which was mentioned above. What we mean by developing and understanding is that we want to develop abilities and dispositions with respect to our object of knowledge, namely ERP and its applications. Understanding something essentially means that you can figure out a set of rules that explains it. In this thesis, we will therefore look at ERP development via our literature review and interviews. This literature review and interviews are thereby supposed to provide us with a set of rules that can explain what ERP and their applications are. Therefore, we hope to establish a framework outline with the governing rules that can provide an explanation for what ERP and its applications are. Understanding ERP and its applications therefore means that we want to have a framework outline with a set of rules that be used as a reference point to support intelligent behavior. This means that we want to allow for a deep understanding of this via establishing a framework outline that details the rules by which you can explain what ERP and its application truly is. This then in turn allow us not only to see why the environment has develop as it has but also to make intelligent decisions regarding ERP and applications. Establishing a foundation with this framework of rules is therefore, from an academic perspective what will allow us to ultimately tackle complexity, in the future.

From a more practical perspective, gaining this understanding will mitigate the fact that firms take on excess ERP applications. As firms, would have a fundamental understanding of the ERP environment and direction to the capabilities they would need, the process of determining ERP applications would be easier. This is different from today as companies do not even have an outline or directional help in this regard. Thereby it is hard not to follow certain technology trends and add ERP applications, sometimes without understanding why. Understanding what it is that has created the ERP environment, firms can at least get a direction as to what type of applications they need from an ERP.

Therefore, the main problem is that firms struggle to navigate the expanded application portfolio of ERP. Hence, the problem is that firms do not have anything that can help them to get direction

in regards to how they should tackle the increased complexity in the ERP environment. Moreover, firms lack fundamental understanding of what the causes of this change in the ERP environment has been. Firms would thereby need something that can allow them to handle the complexity from the increased ERP application portfolio. Understanding what it is that has led to this complex environment of ERPs can serve as a foundation for handling the complexity. This can then possibly serve to help with devising strategies for tackling complexity. Our hopes for this thesis is ultimately to equip firms with the outline of a framework which can help them to better understand ERPs and their applications.

Creating an outline for a framework to understand this ERP environment would provide firms with something that could give them direction before entering an ERP initiative. Thereby we believe that our thesis will be helpful when firms are planning ERP investment, where articulating your requirements is of uttermost importance. This is due to that it is something that is referred to throughout the investment process. Moreover, achieving this type of direction for ERP investment is very helpful, even on a more theoretical level. Many times, this complexity from increased applications are due to a lack of strategy, as mentioned in the problem introduction. This lack of strategy is something that could be mitigated by having a foundational framework for how to think about ERP initiatives. This framework can equip firms with a mindset which can put firms in a position where they can articulate their needs for their ERP investment. This subsequently mitigates the risk of adding too many applications, as you have a better understanding of what you want and why. Clearly articulating what a firm requires from their ERP investment, is therefore something that would prove helpful for the problem we have described.

1.2 Research Question

How can the development of a fundamental understanding of ERPs and its application help firms reduce complexity?

The question we ask ourselves in this thesis if therefore if we can develop, at least parts of, this fundamental understanding for ERPs and its applications. To develop this understanding which, we deem a vital part in solving the overall problem we have described, we will use a literature and empirical evidence.

1.3 Research Purpose

The purpose of our research is to create a fundamental understanding of ERPs and their applications. We believe that by this a firm will be in a better position to tackle the complexity surge that is apparent in the ERP environment of today. This thesis would thereby give firms a way in which they would better understand what type of ERP applications they would need. This would thereby give the firms a sense of direction and help firms to not take on unnecessary complexity. By unnecessary complexity we mean that firms seem to add applications that they do not need, hence increasing complexity. We deem that this stems from a lack of understanding of how the environment has developed. These additions of the unnecessary applications are thereby due to that firms lack direction within the ERP environment. In understanding how and why ERPs and their applications have developed in a certain direction you can achieve a mitigative effect. This is due to the firm can understand what it is that has forced the creation of its current environment. Understanding your environment is a key step in staying competitive. If you can understand your environment it is easier for you to make decisions that fit your firm. Even though we won't be able to devise a specific strategy for dealing with the complexity in this thesis, it will serve as a good foundation for that.

In conclusion, ERPs demand a lot of resources in terms of both financial and human capital. Furthermore, firms generally struggle to clarify their goals and needs in regards to ERPs which has led high costs and unrealized benefits. Thereby in providing firms with a frame of understanding its ERP environment and position their business needs in regards to this, firms can

navigate the new and complex ERP environment. Gaining this understanding can thereby to help firms to choose applications that fit with the needs of their business. This is done by providing an understanding of how the current environment of ERP have developed as this provides an outline to achieve this fit of business needs and application capabilities. Hence, limiting the amount of complexity while gaining the capabilities you need, from the ERP applications. However, concrete tool or strategy for achieving this will not be in the scope of this thesis. The uttermost importance of this thesis is therefore to understand the fundamentals that make up the ERP environment, how it has developed and thereby how you can use this to tackle complexity.

1.5 Limitations

As previously mentioned, the focus is around providing fundamental understanding of the ERP environment of today, in order to navigate and stay competitive as a firm. This conveys that the thesis could have a strategic dimension. However, the focus is on ERP and its development and this is not from a strategy perspective. The thesis is thereby limited in regards to what areas of the described business problem that we can solve. This thesis is therefore not focused on giving the final solution to how a strategy for tackling ERP complexity can be developed. Instead the primary focus is to develop an understanding of the fundamentals at be, that can guide firms in a direction to possibly construct such a strategy. This means that we will not consider specific strategic aspects of how to tackle the ERP complexity described above.

Furthermore in regards to ERP applications we are only concerned with what they enable rather than how they operate. We will thereby not concern ourselves with the more technical aspects of the applications of ERP but rather what capabilities they can provide a firm with. Therefore, we will not look into how a specific technology is used within ERP. We are more so concerned with understanding and seeing general patterns of the development of ERP. This is as said to see what it is that has changed, in what direction and what we can learn from it and what it can be used for. Moreover, we are not concerned with explaining or solving integration or implementation challenges of ERP. How you should implement or integrate is thereby something that is outside of our scope. The thesis is therefore as mentioned, to be seen more as a something that can provide a partial solution to the problem we address.

This thesis will thereby primarily serve as a first step to solve this problem, as the focus of the thesis is around developing a general understanding. This is both in regards to how ERP has developed, which serves as a foundation for building this understanding, and of the current environment. We will thereby use a historical perspective to build this understanding. The historical perspective entails that we will try to build the understanding by looking at the development of ERP over time. However, this is focused on the general trends and patterns in regards to ERP development and not in regards to any specific technology. This thesis is thereby providing the broad strokes of the ERP development and brings a framework that can be used to understand and navigate the ERP environment of today.

Moreover, due to time-constraints we were forced to limit ourselves in regards to which ERP applications we wanted to focus on. Thereby we choose to focus on ERP applications for SCM. We choose to limit ourselves to SCM as it is our area of expertise and furthermore that the first instances of ERP-like systems were within functions related to SCM. This will thereby affect the creation of the framework as all our articles are dealing with ERP applications that that has a connection to SCM execution. This furthermore means that we have not considered modules of ERP like CRM or Finance and Accounting. The framework may thereby only partly explain or help with the ERP complexity problem. Moreover, the framework itself is based on our literature sample. Thereby, as our approach is inductive, we use what we can uncover in this specific set of articles. This means that our literature sample has impacts upon the things we uncover in the literature review. Our findings, results and interview-frame will thereby be a representation of our sample and therefore could have looked different with another sample.

Our research question is general and could therefore potentially have many different perspectives. Therefore, we need to limit ourselves as the issue we want to solve could have many different outcomes, depending on the perspective. We will therefore in this thesis use a supply chain point of view when we go about to solve our research question. This means that we will be influenced by supply chain concepts when we conduct e.g. our literature review. Other perspectives such as information systems or organization theory has thereby been left out and these aspects of the problem won't be given as much consideration.

In terms of generalizability, it is limited since we were only able to gather a limited amount of empirical data. The data we have will thereby serve more as an example of that our framework has concrete value and is directly applicable and provide business value. However, as this is a theoretically-driven thesis, the goal is to provide a foundation for concepts, frameworks or hypotheses that could serve future research. We do however believe that our results have value as a directional guide for practitioners as well as for academia.

2. Methodology

2.1 Research Approach

This thesis will have a qualitative approach. A qualitative approach distinguishes itself in that the researcher actively works with the collected data (Fejes & Thornberg 2009:32). This entails that we will process our data in some manner, to enable that it can be used for our further analysis (ibid). A qualitative approach is suitable for this thesis as we want to develop the foundation for future studies (Justesen, Mik-Meyer 2011:13).

This thesis will approach the research problem with a literature review method, to solve our research question. A literature review means that we by processing and organizing our literature data hope to solve our research question and thereby contribute to the academic community as well as practice. This fits well with our thesis as a literature review in its essence is about organizing and processing data, to be able to analyze it. Qualitative research thereby usually creates a starting point for more empirical research, which can prove the validity of your results (Ibid).

Even though we will use empirical data within the thesis, this will primarily be used to support the framework rather than being the foundation of its creation. In this thesis, the empirical data will be gathered in form of interviews. The interviews are semi-structured in nature which means that we have a set of questions, but their order isn't determined. A semi-structured interview is more focused on uncovering the objective "truth" of the problem. Hence, we do not want to have a fully structured interview as you aren't as free in the interview setting. This setup fits well with the purpose of the thesis as we want to create an objective understanding of ERP development and its applications. (Kvale, 2006)

The findings we uncover from these interviews will therefore serve to ratify or complement results from the literature review. A more in-depth description of our method in regards to the interviews is described in its respective section within this chapter (2.5 Interview Frame).

A literature review method is at its core about using literature, instead of empirical data, to try to come up with solutions our research question. We will as have mentioned use empirical data in the form of interviews, but it isn't the primary source used to solve the research question. Journal articles will therefore make up the lion share of our data. In selecting our articles, we have used a criterion based system, in combination with database search strategies, which will be described in more detail further down.

Using a method like literature review is suitable is our case as we deem that there is not any clear consensus on how to tackle the problem we want to solve. Hence, there aren't any established theories or tools on how to solve this issue. Thereby a literature review is suitable, as we want to develop a sound theoretically grounded understanding of ERP. In developing this, we can provide a solution to our research question. We that there is a gap between theory and practice in how firms should tackle the complexity of the new ERP environment. Therefore, we want to bridge this gap by contributing with a review of current literature and provide a direction for how to tackle complexity (Ridley, 2012:24). This can thereby work as a synthesis for solving the problem at hand. A literature review is therefore a beneficial design to achieve the purpose of this thesis. The synthesis between theory and practice could provide firms with an applicable tool that can direct them in the right direction for tackling complexity in the ERP environment. Tackling complexity is as we mentioned partly aligning needs of the business with the right number of applications. It is in this regard we think that our thesis can help in directing firms. This direction can come from devising clearer requirements for ERP investment as previously mentioned.

Another reason why we chose this method is that we wanted to create a consolidated review of how the ERP environment has changed, as this is missing. In understanding the environment, we can provide the best possible framework as we gain a holistic picture of ERPs development. Moreover, as applications have been pointed out as a source for this complexity, it is essential to understand what has underpinned this change and if there is any pattern regarding this change.

The research perspective for this thesis is critical realism, which describes our ontology (Mik & Meyer, 2011:15). A realistic research perspective fits well with the purpose of our thesis, as we believe that objective truth exists regarding the object of our research. The critical aspect is also fitting as it acknowledges that we understand that our perceptions affect our results (ibid). This means that we are critical towards using one perception of something, as the objective truth. This impacts our thesis as we seek to find multiple sources for our research. In using multiple sources of data, we are supposed to get closer to an objective truth if we use more opinions (Ibid). Moreover, if we lack multiple sources in some areas we acknowledge that these might not belong to this objective truth. This is therefore a major reason as to why we have used interviews in conjunction with the literature review.

In terms of epistemology, our view is represented in confirmation holism. This means that we need a whole set of statements (whole theories) to confirm an individual statement or not, rather than only with an empirical test. We will therefore try to use a diverse set of sources within this thesis, both in terms of articles and the empirical data. As we thereby will use different concepts and sets of statements in answering our research questions, this is a fitting epistemology. Due to this view of science, the implication is that our analysis will be inductive in nature. (Quine, 1951)

Our point of departure for our analysis is therefore in established theories. This way of conducting your analysis is called grounded theory. This entails that we will that we will review our data, in this case literature and interviews, and try to uncover repeated ideas or elements. These recurring patterns are then coded in some manner. The coding will be based around the patterns and be that we could determine from the literature sample. Reviewing this coded data will reveal patterns which we will then be able to put into categories. These categories will be framed by the perspective of this thesis; hence it will convey a supply chain perspective. This will provide the base for our results. The analysis will therefore bridge these categories with the empirical data, which we will use to answer our research question. The thesis will thereby also serve as a foundation for future studies where empirical data can be used to prove if our findings have universal application. (Eriksson & Wiedersheim-Paul, 1997:229; Strauss & Corbin, 1990)

2.2 Literature Search

Literature search is defined as a horizontal and detailed information research of all kinds of relevant literature, which can be compatible to the specific research questions. (Described in Ridley, 2012:41f). The literature search forms an integral part of the literature review itself as it provides the foundation for what literature that we will analyze. It subsequently forms the basis of the literature that will be used in our literature review and thereby also for our thesis as a whole. (Ibid)

To answer our research question in this thesis we will, as mentioned, use a literature review method coupled with interviews. A literature review method therefore entails that we will synthesize articles, which we have searched for, to create knowledge that can help us in answering the research question.

A literature review begins with deciding what type of sources you will use to gather your literature sample. For this review, we have chosen to use the search engine Business Source Premier as our prime data source. This search engine has been recommended by the university and used by many well-cited researchers; therefore, we deem it to be a reliable source to search for articles with. We continued by searching for keywords, on the mentioned search engine. These keywords were chosen based on our research question. As our research question related to ERP applications, complexity in a supply chain context, we needed keywords that could yield articles that could help us to solve such a problem. The keywords we ended up using in our initial search were therefore “Supply Chain Management” and “ERP”. Moreover, we chose to search for these keywords together and in the entire article. This means that our search yielded results were all of our keywords were mentioned, somewhere in the article. We also used truncation to get results from words that were similar, in order to not miss out on articles that could provide value to the thesis. Even though our keywords were general we deemed that this was needed in order to get the full picture of how ERPs and their applications have developed.

Due to that we had general keywords our initial search yielded an unbearding amount of results. As the sample size of articles was too great, we tried to refine our search to get it down to a more manageable size. This was done by trying to find more precise keywords, in relation to our

research question. Moreover, we created combinations of the keywords to further refine our searches. Once we had reached a manageable size of about 1000 articles, we used a list of criterions to be able to easily distinguish if an article was relevant for our research question.

Thereafter we used different combinations of these keywords to provide us with articles from different perspectives of the problem. These different searches of course yielded several thousands of search results. Given the purpose of our thesis we needed to be more specific to be able to provide a valuable end-product. To further narrow down our search we chose to first, only search on academic full-length texts and only on journal articles. We wanted full length academic journal articles and because we believe that published articles will give us more leverage for our conclusions than other type of articles or textbooks. Furthermore, many of the articles in the first searches were about more social aspects or too focused on the technical aspects of ERP and its applications. This led us to search for articles only within the area of business management. The intention of this was to thereby limit the occurrence of technology or sociology-focused articles.

Articles that didn't fulfill these requirements were discarded. Examples of such articles were those that focused on i.e. how ERP effects the organization but not in terms of what the ERP or application was used for. Moreover, articles that were to sector-specific were also discarded as they couldn't provide information in a more general way that would be need for our research purpose.

Finally, we acknowledged the occurrence of duplicate articles and subtracted them from the search results.

Aside from this method for literature search, we have complimented our original sample. This has been due to that as the thesis progressed, the research questions and focus shifted. Hence, we needed literature that could reflect the new focus and research questions. However, we still used the same overall process for the search, but we were more explicit in terms of our keywords.

2.3 Data Selection Strategies

To assure that the articles we found were of relevance, in a systematic and coherent way, we used the SQ3R method. This method for text analysis is composed of two parts. It starts of by

skimming through the articles or data you have collected. Thereafter, you survey the articles or data in greater detail, if you found it relevant after skimming it through. When developing this survey, you create internal questions or criterions and see if you can find answers to these within an article. If you find that the article fulfills the criterions, it becomes part of the article sample. When an article has become part of the sample then you read over it again, however more thoroughly. This process concludes with writing small summaries of each article. These summaries serve as the final selection basis, to see whether the data can be useful for your research or not. Moreover, the summaries help you to navigate and get an overview of what the main points of the articles in the sample is. (Ridley 2012:63f)

In using this method, we make sure that we use articles that are relevant for our research question, in a systematic manner. Moreover, it provides us with a systematic approach to remedy this otherwise subjective selection process.

Selecting the articles in this literature review is encompassed of reading through, analyzing and reviewing said articles. It is therefore imperative to develop a strategy for how to extract information from your data set in an effective way. Therefore, we have created a list of criterions that serve as focal points that guide us in our search for relevant articles. This list helps us to stay focused on what types of articles we are looking for. Furthermore, it provides us with a basis for the synthesis of our articles. Moreover, it helps us to categorize articles within different subsets. This reviewing process enables us to visualize our findings and thereby helps us to get a holistic view of our articles. (Ibid)

This reviewing process meant that we ended up with a set of articles, which we deemed beneficial for answering the thesis's research questions. When reading through all these articles, using the SQ3R method, we used a framework to help us focus on what parts of data we were looking for, as well as for helping us to synthesize the literature. This framework consisted of 6 different sections. These sections were: "Article & Author", "Problems Addressed", "Research Question", "Type", "Conclusion" and "Illustration" (See Table 1).

Article & Author	Problems adressed	Research questions	Research design & methodology	Type	Conclusion	Illustrations

Table 1

(Source: Own Creation)

This structured approach for analyzing articles, allows us to easily get a good overview of the articles and what they are about. Moreover, this makes our synthesis of the articles easier. As an example, the type field was in this framework to help us categories what type the article was. Meaning that due to that we will build some type of framework this makes the process of creating a framework much easier. Furthermore, it helped us to process the articles that were part of the sample in a thorough but lenient way and ultimately see it they fitted with and would contribute to our research purpose.

2.4 Research Execution

The research execution is a description of how we have chosen to structure the entire thesis. It therefore gives the reader an overview of the entire thesis in terms of how we have structured it and the thinking behind this structure.

We start by providing the reader with an introduction of the problem we are trying to solve. This is primarily to build a framed environment to help the reader to understand what the research is about and its potential value. Thereafter we educate the reader on what methods we will use to answer our research questions. This follows with an ethics chapter where reflect upon the ethical concerns we encountered in thesis process. Furthermore, we define terms that are used to a great deal in our thesis. The thesis continues with the literature review chapter. In this chapter, we begin by presenting the literature that we have and how it was gathered. Moving from this section of the chapter, we define what ERP and SCM is with the help of our sample. This is done in order

to provide an understanding toward how these two cornerstone terms of our thesis are defined. This is an important step as they are terms and usually not clearly defined. Therefore, the reader needs further framing to understand how we have defined these terms.

The thesis progresses with the actual review section of the literature review. Reviewing the articles means that we will go through the articles and try to review it and see what the articles can tell us. Articles might show a certain pattern of composition and if this is identified we categorize and structure the articles in different ways. All this reviewing will eventually lead us to conclusions of the literature review. This section will be one in which we will present what we have been able to uncover with the review. This will then provide the basis for the results of our thesis.

After the review, we will have an interview chapter. This chapter will present the interviews we did and the reasons why they were done. Moreover, the interview subjects will be briefly described. After that we will present the data that the interviews could yield. This chapter will end with a concluding section where we will summarize the most important takeaways from the data.

In our summary, we will synthesize the different types of data that we have worked with in this thesis. This means that we will analyze the literature review and interview data.
In analyzing them first separately and then together we allow us to synthesize them and see similarities and differences. This analysis is based upon grounded theory and hence uses our interviews and literature review to make connections between them. This analysis will be an incremental part in bridging the data to results. With the analysis, we therefore form a synthesis for our results.

We will begin the results section with a summary of the synthesis from the analysis. This is made so that we can have a fluid transition between the two chapters. Thereafter we will present our findings in terms of an outline of a framework, which will be focus on the changes in why ERPs are used, coupled with its applications. This framework will be presented both in general, as well as in detail. This description is a step-wise process, as we have created a framework with different levels of analysis. Moreover, we will present how this framework should be viewed,

with help of the synthesis of the interview data and literature review. We will conclude by summarizing the applicability of the framework, its limitations and future research.

In our conclusion, we will present the conclusions that we made and with these answer our research questions. Furthermore, we will touch upon topics which we deem will be of concern, going forward. We will also provide suggestions for future research and what implications the findings will have for managers.

2.5 Interview-frame

We have mentioned that interviews will be a part of this thesis but not elaborated fully on its method. To avoid confusion from the rest of the method chapter we will go through the interview frame and hence method, within this section. More detailed descriptions of e.g. how the actual coding was conducted will be presented in the interview chapter. This method section thereby provides the overall methodological considerations we had regarding the interviews specifically.

Our interviews will serve a complementary function for our thesis, which we previously mentioned. The rationale for using interviews at all is, in our case, to ratify and thereby give a more solid foundation for our findings from the literature review. As a literature review is used, we will produce results with unintentional bias the interviews will work as a proxy to see whether the findings hold in practice. It is thereby aligned with our research approach as we strive to portray and objective truth of the subject at hand. Thereby using multiple sources as interviews and a literature review helps towards that end.

Hence, we will conduct what is called semi-structured interviews. This is due that as mentioned, we seek to uncover more information than the mere question reflect. Therefore, our questions will be structured in a way that will allow the interview subjects to stray away from the specific questions. However, it is semi-structured due to that we have a specific issue that we want to solve and we are therefore need to make sure we get useful data. Therefore, the questions are structured to somewhat frame the interview subjects to the topic at hand. Semi-structured interviews are therefore a balancing act in which you try to gain the benefits of structure and openness simultaneously. (Kvale; 2006)

The interview questions are shown in Appendix 1, and these are based upon the findings that we found in the literature review. The literature review is therefore the basis of the interviews. Hence, there is a close interconnection between the literature review and the interviews. The purpose of the interviews is more so to confirm the findings of the literature review. The first part of the interview frame focuses on understanding the context in which the interviewee work with ERP. These questions focus on gaining knowledge of what the interviewee does and in what context. This is important to frame before going further through the interview, as it might have an influence on the motivations for using ERP as well as its application. (Ibid)

The second part of the interview frame is concentrated on understanding the motivations for using ERP in this specific context. This section is supposed to draw a connection between the literature review and the interviews. We will in this part see if the findings in the literature review can be found in the interviews as well. However, this is only one side of the findings that we want to prove with the interviews.

The third part of the interview frame is structured around the application of ERP in this context. This means what the ERP is primarily used for in this context. Here we want to see what ERP application that are in use and why. This part will conclude the interview frame and with this part we hope that we will find how practice align with our findings in the literature review. The interviews primary purpose is therefore to see whether practice align with what we found in the literature review. The interviews thereby symbolize a practical dimension of our thesis, which supposedly will give us the most current data, as articles will always be more of a lagging indicator on the subject matter.

Regarding data selection for our interviews, the interview subjects were at large chosen out of convenience. This means that we used our network to find suitable interview subjects. Due to pressures in regards to time, this was the option we had if we wanted to include interviews as part of our thesis. Even though this will question the validity of the results, we made sure to tackle

this issue by having a rigid analysis framework. Making sure that this interview frame is ensuring objectivity is therefore even more vital.

For the analysis of the interviews we used coding. The codes that we sue will be based on findings from the literature review. Codes are useful as an analysis method as it helps you to structure interview data in a neat manner. Getting this data structured also sets it up well for upcoming analysis. As our codes will be based upon the literature review we can analyze whether the literature review pattern aligned with those of the interviews. This phase will be further elaborated on in the Interview chapter, as most of the method will be influenced by what we find in the literature review.

3. Quality & Ethics

3.1 Quality Criterions

Concerning studies with an inductive approach their goal is usually that the result should have some level of generalizability (Justesen & Mik-Meyer, 2011:37). As we are conducting a literature review with limitations, we need to reflect upon if our selection and thereby the results of the thesis can be generalized toward a larger population (ibid). We argue that our thesis is representative and that the results can used for larger populations. This is due to the fact that we argue that we have a general and holistic outlook for our thesis. Furthermore, we will use triangulation to increase the validity for our study. The triangulation refers to the fact that we have used several articles to support our findings. It would have been beneficial if there had been quantitative studies that we could compare our results with a method that, according to Yin, R.K. is called analytical generalizability (Described in Justesen & Mik-Meyer, 2011:37f). However, the lack of other similar studies makes triangulation the best possible option for increasing reliability and validity of our results. This triangulation will be further strengthened with the data we get from the interviews that we will conduct.

Regarding the quality of the interview subjects we have chosen them due to convenience and availability. Hence, there is potentially a quality issue in regards to the interviews. Hence, it is

therefore of importance that we have a structured approach to our interviews to ensure that quality is held. Furthermore, not only the approach but the ethical considerations in regards to interviews are even more important. We therefore need to make sure that the quality isn't tainted due to us as interviewers and that the subjects are given all information they need. Moreover, as we do semi-structured interviews, we mitigate that our structure will have too much effect upon the quality of our interviews. This is due to that the very structure of the semi-structured interview leaves more power in the hands of the subject and the interviewers are supposed to serve a more guiding role.

3.2 Ethics

We have only used information that has been accessible to us via our university's library system and databases. Furthermore, we have been conducting interviews or observations and therefore we have had ethical concerns to take into consideration. When we interviewed the subjects we made sure that they understood what they were interviewed for. Furthermore, we asked whether the wanted anonymity in the thesis. Moreover, we made sure they understood for whom this data would be showed and in what context. This is important to assure as the subjects should know what their information is used for and for whom. Moreover, it assures that the information we can gather is something they are willing to share. As the guideline for ethical considerations if any arose during the project, we have used the ethical guideline that has been developed by the Swedish Researcher's council. (Vetenskapsrådet, 2002)

3.3 Source Review

The methodology literature has been either recommended by the faculty or written by accomplished academics in their field. In the data sample, we've used several different sources. These articles have been published by well-known or cited professors and professionals. Moreover, the articles have gone through a rigid reviewing process. We therefore assume that our sources have a high quality and can be considered reliable. Other sources like books or periodicals are either well-known publications or widely used. Hence, these should also be considered to have high quality and reliability.

In regards to our interview subjects they are all representatives or directors of their companies. Albeit we do not have a great number of subjects, they are individuals who have a position within their companies that can allow us to get valuable information. It furthermore means that they have a good sense of the business and thereby can provide interesting insights in that regard as well.

4.0 Literature review

4.1 Methodology of literature review

To provide a comprehensive bibliography of the literature regarding the development of ERP and its applications in SCM, we conducted a search of ERP & SCM literature between January and March 2017. In this search, we were interested in main journals and conferences and searched for academic activity relating to ERP and applications within SCM and its development. The period we were interested in was from late 1990's up until today. This cut-off is due to that we wanted to have a sample size which time-span was a bit longer. This is due to that as we are interested in creating some type of framework outline and specifically to see development of the reason to use ERP. Moreover, what applications that have been used and possible patterns in regards to both ERP and applications. To enable this, we therefore needed articles that had time-frame long enough to talk about the earlier iterations of ERP, with the mindset of that era. The 1990's is particularly interesting as it is the decade when ERP began to be widely used; hence it is why that was our cut-off year for the literature search.

Name of Journal	#	Authors
Business Process Management Journal	1	Ekman et al, 2014; Rahimi et al, 2015
Business Strategy and the Environment	1	Hazen et al, 2016
Communication of ACM	2	Kumar, 2001; Downing et al, 2010
Computers in Industry	2	Verdouw et al, 2010; Helo et al, 2014
Decision Sciences	1	Ward & Zhou, 2006
Enterprise Information Systems	2	Gonzálvez-Gallego et al, 2013; Addo-Tenkorang et al, 2017
European Journal of Operations Research	1	Gunasekaran & Ngai, 2003
Electronic Commerce Research	1	Nurmilaakso, 2009
Electronic Journal Information Systems Evaluation	1	Mavengere, 2014
Expert Systems with Applications	1	Lin et al, 2010
Industrial Management and Data Systems	3	Small, 1999; Frank, 2004; Helo, 2004
Industrial Marketing Management	1	Makkonen & Mervi, 2014
Information	1	Jinno et al, 2017
Information Systems Management	1	Ross, 2005
Information Systems & e-Business Management	1	Dutta & Roy, 2003
International Journal of Computer Integrated Manufacturing	1	Zhao & Fan, 2007
International Journal of Operations & Production Management	2	Croom, 2005; Co et al., 1998
International Journal of Technology & Enhanced Learning	1	García-Peñalvo et al, 2011
International Journal of Organisational Design and Engineering	1	Dietz et al, 2013
International Journal of Logistics Management	2	Camara et al, 2014
International Journal of Physical Distribution & Logistics Management	1	Golicic et al., 2002
International Journal of Production Economics	3	Goutsos & Karacapilidis, 2004; Hallikas et al, 2008; Romero & Rodriguez, 2010
International Journal of Information Management	1	Soto-Acosta & Meroño-Cerdan, 2008
Internet Research	1	McLaren et al, 2002
International Marketing Research	1	Overby & Min, 2001
IUP Journal of Supply Chain Management	1	Zeier et al, 2009
Journal of Business Research	1	Schlie & Goldhar 1995
Journal of Business Strategy	1	Lord, 2000
Journal of Computer Information Systems	1	Siau & Tian, 2004
Journal of Electronic Commerce	1	Gibson, 2004
Journal of Enterprise Information Management	2	Møller 2005; Panda & Rath, 2015
Journal of Internet Commerce	2	Siau & Shen, 2002; Rodriguez, 2006
Journal of Management Information Systems	3	Clemons et al, 1993; Gosain et al, 2005; Montoya et al, 2010
Journal of Operations Management	3	Devaraj et al, 2007; Klein, 2007; Vickery et al ,2003
Journal of Supply Chain Management	1	Deeter-Schmelz et al, 2001
Knowledge & Process Management	1	Skog & Legge, 2002
Logistics Information Management	1	Rizzi & Zamboni, 1999
American Journal of Business	1	Treleven et al, 2000
MIS Quarterly	1	Subramani, 2004

Organization Science	1	Barki & Pinsonneault, 2005
Procedia Computer Science	2	Capitão et al, 2012; Gnimpieba Z et al, 2015
Production and Operations Management	1	McAfee, 2002
Production Planning and Control	1	Wang et al, 2005
Sensors	1	Chen et al, 2014
Sloan Management Review	1	Lee et al, 1997

Repository 1

The result of this search is presented in the table above (Repository 1). As we can see from this table we didn't explore this subject purely from one academic community. Furthermore, we can see that we used complementary fields which are related to ERP systems, such as information systems, international business, supply chain management and operations management. This broad foundation of articles from different academic fields provides us with a sample with many different perspectives and angles. It is therefore very beneficial in helping us to understand the complex nature of ERP systems and its environment. Hence, as our research question is related to the increasing complexity in the ERP environment it is helpful to have a diverse sample to get a solid base for analyzing such movements of the environment.

We previously described in our methodology chapter, the broad strokes of how our approach, search, selection and execution were completed. We will now provide a more detailed description of this process. This is done to provide transparency of the research process and all the steps that has led to the creation of all our tables.

To begin with, to find relevant articles we devised four criterions to help with making these selection decisions. This ensures that we have a structured approach as well as guidance to our search process. The first criterion was regarding what source the article was from, which means whether it was e.g. from. a conference or book. We decided that we only wanted to consider journal articles, conference proceedings or book chapters, to ensure the quality level of the thesis. Secondly, March 15, 2017, was chosen as the cut- off date for our search, to avoid a never-ending revision of articles. Hence, articles published after this date hasn't been taken into consideration. Another criterion was that an article had to meet at least one of these search criterions to be included in the sample. Lastly, there could still be ad hoc selection of articles, which were based on manual searches for specific aspects that were missing in the original sample. This unlocks the possibility that articles that didn't match the initial keywords still could be considered. This was

crucial as our research question and scope changed during the writing process of the thesis. Hence, other types of articles were needed to answer the final research question we ended up with.

In addition, we didn't just search for ERP, but also for alterations like "enterprise systems" and "enterprise software". This was done to detect articles that were in the context of ERP but maybe wasn't indexed as such. We did the same exercise with the other keywords we used and for the same reason. This was how we ended up with the set of articles that we can see in the table above (Repository 1). However, we haven't described how we continued with and reviewed the articles in regards to the criterions. Therefore, we will now describe the reviewing process in detail. These include concrete criterions and frameworks that we used to end up with the final article sample in the table above (Repository 1).

Once an article had passed the first steps of the reviewing process they were screened more in detail to determine whether: (1) ERP systems was the sole or primary field of research, (2) the study referred to some complementary aspect of an ERP such as ICT as it has complementary features to ERP and SCM (3) the study talked about specific applications of ERP. These screening criterions were used to be able to see which types of articles that had made it through the initial stage of the reviewing process. The first criterion was devised to understand whether ERP was the main research object of the article or if it was used to exemplifying or such. The second was meant to look at whether the article talked about any aspects that complement an ERP. The final criterion was made to see what type of application of ERP that the article described.

The final selection of articles, coupled with the publications for each article can be seen in the table above (Repository 1). As we can see, most of the journals are focused on SCM, operations management, information systems or enterprise systems. This diverse composition of the sample is beneficial as a foundation for our thesis. This is due to that our research question is interested not only in ERP but that we also want to have a clear connection to SCM.

Now as we had a manageable sample size of articles, we examined every article to determine whether it could be part of our final article sample. What this means is that we had a sample that

small enough, that it would allow us to go through the articles one-by-one on a deeper level. Some articles were easily discarded by looking at their abstract and headline. This could be due to that they weren't in English or didn't deal with any aspect that would be valuable to create a framework to understand and ultimately to answer the research question.

Other articles needed a more extensive review to understand if it were related to answering our research question. This more extensive review was done with an analysis framework (See below). Even though all our articles went through all of our reviewing steps, some articles were more apparent to be a part of the sample earlier in the process. Articles were furthermore excluded, as mentioned, if they were not published in English or exhibited other similar obstacles. Moreover, to avoid duplications of articles we used the version that had been published by the journal in question.

This more extensive review of articles meant analyzing them through an analysis framework. This was as mentioned the last step we put articles through before they became a part of the final sample. With this framework, we segmented our analysis into 7 different segments of analysis (Authors, Problem addressed, Research Question, Research Design, Type, Conclusion & Illustrations). These segments helped us to get a structured approach to our analysis of the literature sample. Moreover, we could focus on the aspects that we wanted to find in the articles more easily. Hence, once we had analyzed articles with this framework we could easily distinguish whether the article would be beneficial in answering our research question.

Article & Author	Problems adressed	Research questions	Research design & methodology	Type	Conclusion	Illustrations

Table 2

(Source: Own Creation)

Some articles that lacked aspects specific to the scope or frame of our research could thereby be discarded. All articles that were added at a later stage also succumbed to this process to ensure that it fitted the mold of the sample. Moreover, it made it easy to create an overview of the articles. Furthermore, we could easily group articles in groups of themes, as we got a quick and transparent overview of them. This was due to that we could see all the important aspects of certain articles. This would eventually serve as a foundation for creating connections between our articles, which ultimately ended up as the groups and framework we created. This framework thereby also served as a tool that allowed us to understand the sample better and easily see connections and patterns.

We will now describe the process of creating all the separate sections of the literature review. It will take the reader through the process of how we created all the groups and categories that became the foundation for our framework.

4.2 Emphasis groups method

With the foundation that we got from the analysis framework (see above) the next step was to review the articles in detail. Once we began to look at the articles we quickly noticed that many articles shared certain common elements. What we mean by this is that certain groups of the articles tended to have certain motivations for why an ERP should be used. We could thereby see that the motivations for using an ERP were different depending on the specific article. This lead us to, after carefully reviewing our literature, to create 4 different groups. These groups were: Efficiency, Flexibility, Collaboration & Accuracy. These specific groups were chosen as these four elements of ERP-use were the ones that were most apparent after our initial analysis, via the analysis framework we mentioned. What led us to these groups were then the analysis of the articles we had done with the analysis framework (Table 2).

Efficiency	Flexibility	Collaboration	Accuracy

Group 1

These 4 groups that we created were coined emphasis groups. We named them emphasis groups due to that these groups convey the motivations behind the use of an ERP. However, we chose the word emphasis as it better represents what these elements that we found in the articles are. This basically means that we could see a specific emphasis towards using ERP in the presentation in a certain article. In some articles, it would have been confusing to call it motivation as it wasn't anything that explicitly that would allow it to be called a motivation. All these emphasis groups have distinct features that separate them from the other groups. As mentioned, these groups were constructed based on the general emphasis' that we could see in the literature sample. These categories of emphasis allow us to get an overview of the article sample from a more general standpoint. This means that, these emphasis groups hold a more general and theoretical outlook. This is due to that, these groups are constructed from the implicit emphasis' that we deduced from articles in our sample, which means that they are general. Moreover, as the groups are drawn from articles, it conveys that the groups are theoretical and doesn't explicitly relate to practice.

What these emphasis groups allow us to do is to review the article sample and hopefully extract further insights into our problem. Hadn't we constructed any types of categories it would be hard to get any insight from the article sample, as the sample otherwise is merely an unstructured list. Classifying the article sample into different distinct groups is thereby facilitating a foundation for a literature review to yield results going forward.

Some articles might be transcendent and have more themes or aspects of themes. Therefore, some articles might be part of more than one emphasis group. This is the first stage in the deeper analysis of our literature sample. Hence, the grouping is broad in nature and will serve as a platform for us to get a solid understanding of what our literature sample can give us. When we will refer to these groups it simply be as emphasis groups. If we refer to a specific emphasis group, it will be explicitly stated.

4.3 ERP application group method:

As we mentioned, the emphasis groups are general and theoretical in nature. They are more theoretical in nature as we have defined them as the motivations for using ERPs. Therefore, the emphasis groups only provide the more theoretical aspects of ERP development. The more practical side of ERP development was thereby not covered by the emphasis groups. Hence, we needed to have another grouping to be able to cater to us solving the research question. Aside from the emphasis groups that we created from occurrences we saw in the articles, we could also notice applications of ERP. What this means is that articles also mentioned specific applications of ERPs. Not only did the articles mention specific applications but it was furthermore a part of our research purpose and mentioned explicitly in our problem statement. Hence, we looked further into what applications that were mentioned in the articles of the sample. If no specific application was mentioned, we looked at the technologies that was mentioned. From this we then could understand what application of ERP that was portrayed in the article.

We found out that the sample encompassed a lot of different applications, but also similar ones. However, due to the multitude and diversity of the applications we needed to categorize the applications in some way. As with the emphasis grouping, it would provide us with an overview that would allow us to see patterns and make way for analysis.

Due to that we have limited ourselves to specifically look at ERP applications from a SCM perspective it made sense to use categories that could convey this fact. Hence, when we came up with the categories for the applications we used the definitions for SCM that we had made within this chapter (See 4.6). This meant that we ended up with 8 different ERP application groups: Communication, Customization, Demand Estimation, Supply Chain Integration, Push-to-pull, Agility and Lean management. What we then did was to use these general themes of SCM to group the ERP applications. What this ultimately did was that we could possibly link an application to a specific process within SCM. However, it became apparent that some applications could have several uses depending on the article in question. Therefore, the same application could be within more than one group. Furthermore, in some articles ERP was

referenced as an application in general. Namely what function the application of an ERP has in general. Hence, ERP in general was also possible to place within the application groups. As the applications are the more tangible side of a ERP, this grouping connected our thesis to a more practical dimension than the emphasis groups did. Moreover, it provided a good foundation for uncovering more insights for the creation of our framework.

4.4 Method Combination of ERP Application groups and emphasis groups:

We had now created two separate groupings from our article sample. These two groups represented two different aspects of ERPs. One more theoretical (Emphasis) and one practical (ERP Applications). Even though the created insight for the creation of our framework and to answer our research question, there was still something lacking. In combining the two groups we hoped that we could connect the more practical and theoretical dimension with each other. In combining the two groups we could deduce patterns in regards to both the perspectives that the groups represented. In combining the two groups with each other each article therefore now had at least one emphasis and ERP application group tied to it. Once this had been done we were interested whether we could deduce any pattern in regards to time. Hence, we sorted the articles by their publication date. After this we could see what emphasis groups and application groups that seemed most apparent during certain years. However, doing this on a year-to-year basis made it hard to see the general trends or patterns. Hence, we sorted the articles by decades. Once we had sorted them into decades we counted how many instances of each emphasis group and ERP applications that the decade had. Once this computation had been completed we could now see the patterns more clearly.

The patterns and other insights we could make within this section of the chapter became the cornerstone of the creation of our framework. This meant that we now had sufficient data from the literature review that could work as a foundation for our framework. Moreover, this ratified the creation of our groups as we could gain concrete insights that we could use to create a framework, which was a focal point of our research question. The framework is a focal point as it serves as an incremental part in understanding the development of ERP and its applications.

4.5 Literature Review Presentation

After we had analyzed all articles with our analysis framework, we conducted another type of analysis of the article set. However, within this analysis we were explicitly focused on in what setting the articles talked about the application of ERPs. What this means is that some articles were more prone to accentuate the benefits that a certain application of ERP had on efficiency, whereas others were focusing on benefits gained in flexibility. At times articles, would transcend the groups we had constructed as benefits aren't always singular. One application of ERP can therefore provide benefits in more than one area. When these occurrences appeared we therefore wanted to justify for ourselves what the overarching point was in the article. In justifying, what the overarching point was in an article we wanted to enable us to group articles into a certain group. We did this with the conviction that even though multiple benefits of the application could be mentioned in an article, the essence of the article could still render a certain emphasis. This grouping exercise that we have conducted will allow us the ability to garner a more insightful analysis. This is due to that by classifying what we uncovered from our analysis into groups we can point specifically to what group that had e.g. a pattern. Without groups or any other type of classification, it is hard to show in an intuitive way what the findings from analysis entail.

However, before getting more in depth in regards to actual groupings, we want to define two key terms of the thesis. These two key terms are Supply Chain Management and ERP. These two terms have many different definitions. Moreover, these definitions have changed over time. Therefore, before we go into the actual groupings that we made via reviewing the article sample, we need to frame what these terms encompass in this thesis, to avoid confusion. These definitions will be done with the help of the article sample, as these articles are what makes up the theoretical foundation of this thesis. Therefore, this article sample should also serve to define these terms, to avoid any personal bias.

4.6 Supply Chains and Supply Chain Management

A supply chain, in its simplest iteration, can be understood as a set of functions that interact to move material forward through the firm (Golicic et al, 2001). A chain is formed by aligned firms with the end-goal of bringing products to markets. These firms are aligned via functions

including: raw material to manufacturing, wholesale, transport, retailers all the way to end-consumer (Ibid). However, this was only one definition of SCM we could find in our literature sample. Another definition states that a supply chain is defined as three or more organization directly linked by one or more flows of products, services, finance and information, from a products origin to its customer (Kumar, 2001; Golicic et al, 2002). There is even a broader definition of supply chains. This definition sees a supply chain as a network of firms and their associated activities that work together, usually in a sequential manner (Kumar, 2001). However, as the concept and boundaries of a firm or enterprise is increasing getting blurred, the term supply chain might not be relevant from a semantic standpoint (Overby & Min, 2001; Ekman et al, 2014). There are now so many interconnections between firms that transparency of information is a problem (Ekman et al, 2014). Moreover, the communication and collaboration within chains are now enabled via digital solutions, and not sequential but more so simultaneous (Makkonen & Mervi, 2014). Hence, the term supply chains should be better described in terms of a supply network.

As we can see there are various definitions of what the term supply chain entails. Depending on what context or level of analysis you have on might be better suited than the others. Moreover, these various definitions, aren't similar. This means that it is crucial to know which definition that is used within a thesis or other scholarly work, to avoid confusion. We therefore acknowledge that the definition of what a supply chain is, rests upon a combination of different definitions, as seen above. However, commonalities exist between the different definitions as they all focus on the different flow that a product/services is succumbed to, from production to market. We thereby acknowledge that several definitions and understandings of supply chains exist. However, we must define what our outlook of a supply chain is to avoid confusion. If we deviate from the thesis's understanding of a supply chain, this will be made explicit.

Our definition of a supply chain is that of an extended enterprise or network. We chose this definition as we want to create an understanding of ERP development and its applications, and an outline of a framework for this. As this is the purpose of our thesis we believe that we need to have a definition of a supply chain that has an enterprise or network focus. Which stems from that ERPs by its nature has this very perspective, as it focuses on integrating processes We

therefore believe that a supply chain should be understood as a network with information that travels across firm boundaries. Moreover, that the orientation of flows is process-oriented rather than function-oriented. This is due to that a function rarely spans outside of its functional boundaries, whereas a process isn't bound by organizational structures in the same regard. A process-orientation is suitable for our thesis as we, as said, see the supply chain as a network, which isn't bound by firm boundaries.

As we have now described what a supply chain can be defined as and our definition of it in this thesis, we have described the term Supply Chain Management (SCM). This is due to that this term might have different understandings and hence it is important to explain and described this term as well. Moreover, as our topic aims to be a supply chain management related thesis, a description of what the term means is helpful. By helpful we mean that the reader will get a better sense of how this thesis problem and perceived outcome relates to SCM.

As we have now described what a supply chain can be defined as and our definition of it in this thesis, we have described the term Supply Chain Management (SCM). This is due to that this term might have different understandings and hence it is important to explain and described this term as well. Moreover, as our topic aims to be a supply chain management related thesis, a description of the term is helpful. By helpful we mean that the reader will get a better sense of how this thesis problem and perceived outcome relates to SCM.

SCM is a term that is focused on the management of the flow of goods and information across supply chains. This has been defined as all activities associated with the transformation of goods from raw materials through the end user, as well as the associated information flows (Makkonen & Mervi, 2014). SCM could therefore further be defined as the integration of supply chain activities through improved supply chain relationships to achieve a competitive advantage (Ekman et al, 2014). As we have seen this term itself doesn't have one clear definition, the same is true for SCM (Kumar, 2001; Ekman et al, 2014). At its core SCM is about management of flows, as we mentioned, but as the view of what supply chains encompass changes, so does the view of what SCM encompass. At its core, SCM applies a systems approach to supply chains as it views a supply chain as a separate object of analysis, rather than firms (Makkonen & Mervi,

2014). This means that it is the activities and process within a supply chain that is the most interesting (Rahimi et al, 2015). This is in stark contrast to seeing the focal firm as the primary analysis object (Clemons et al, 1993; Montoya et al, 2010). Thus, the idea of partnerships between firms to manage the flow of goods, services and information from supplier to end customer, is extended to a multi-firm entity we call network (Montoya et al, 2010; Makkonen & Mervi, 2014). This entails that management of supply chains is a very complex issue where you have multiple aspects to consider (Siau & Tian, 2004; Addo-Tenkorang et al, 2017). This means that you need to take into account flows across the supply chains and not just your firm (Hallikas, 2008; Nurmilaakso, 2009; Ekman et al, 2014). SCM is thereby a term to described the management of all these types of separate flows in a supply chain (McLaren et al, 2002; Rahimi et al, 2015). Moreover, it has gotten increasingly complex to manage due to the federation of operations which has been enabled via e.g. ERPs (Helo et al, 2014; Makkonen & Mervi, 2014; Rahimi et al, 2015). Thereby, this particularly ERP in the supply chain, is of great interest to managers (Hallikas, 2008; Hazen et al, 2016).

4.7 ERP

As we described in the section above, ERP has a large role to play in the management of supply chains. However, as we have described both in the section above and in our problem statement, ERPs can also be damaging for firms, via e.g. increased complexity. The term ERP can have many definitions or iterations. Due to this and that this term is an integral part of our thesis, the term and our definition of it will be described.

The abbreviation ERP refers to Enterprise Resource Planning, which is an overarching term for systems that help firms to integrate and manage important processes of their business (Møller 2005; Ekman et al, 2014). The essence of ERPs is that they offer a shared structure that can integrate and accentuate processes and functions within firm and its network. The functional areas within a firm usually have separate ERP modules that cater to the specific needs of processes and functions within these specific areas (Clemons et al, 1993; Schlie & Goldhar 1995; Small, 1999; McAfee, 2002). Typical modules found in current ERP systems are: financial accounting, management accounting, order processing, manufacturing, supply chain

management, human resources, project management, customer relationship management and data services (Helo, 2004; Møller 2005). Previously these separate modules made up the entirety of an ERP (Rizzi & Zamboni, 1999). ERPs have developed since that time and as they have developed to allow for integration of more functions; the importance of an ERP has changed (Rizzi & Zamboni, 1999; Helo, 2004; Møller 2005; Dietz et al, 2013). From being a tool to improve functions it has taken a position as a facilitator for firms and even entire networks (McLaren et al, 2002; Ward & Zhou, 2006; Hallikas, 2008; Makkonen & Mervi, 2014). ERPs are thereby an enabler that provides the base for allowing firms and networks to function to extend their relationships (Ekman et al, 2014).

The first advent of the term ERP is generally attributed to the organization Gartner (Møller 2005). This stemmed from the extended the capabilities of material requirements planning (MRP), (MRP II), as well as computer-integrated manufacturing (CIM), which had enabled something that was beyond the original MRPs (Co et al, 1998; Møller 2005; Ward & Zhou, 2006). ERP came to represent a larger whole that reflected the evolution of application integration beyond manufacturing (Treleven et al, 2000; Barki & Pinsonneault, 2005). Initially, these early ERP systems focused on automating back office functions that did not directly affect end-consumers (Clemons et al, 1993; Schlie & Goldhar 1995). Customer facing functions, dealing directly with customers, such as customer relationship management became apparent first in later iterations of ERPs (Lord, 2000; Devaraj et al, 2007).

Current ERP systems are instead based around a foundational platform, then a separate module (Ekman et al, 2014; Makkonen & Mervi, 2014). This allows firms to customize the modules and only include those modules that the firm need (Ross, 2005; Nurmilaakso, 2009; Verdouw et al, 2010; Camara et al, 2014). ERP systems have thereby allowed firms to coordinate disparate functions into a standardized process, while at the same time allowing for customization (Ekman et al, 2014; Rahimi et al, 2015).

The current development streams within ERPs is now to integrate ERPs with mobile devices (Siau & Shen, 2002; Helo et al, 2014). Furthermore, ERP vendors are extending ERP to these devices, along with other business applications (Klein, 2007; Ekman et al, 2014; Helo et al,

2014). Lastly, ERPs continues to integrate and have an increasing number of applications in an increasingly federated and global system (Verdouw et al, 2010; Rahimi et al, 2015).

We have now presented the term ERP. We can see that what ERP is defined as has changed throughout time as it isn't tied to anything as it merely is a term. In this thesis, we thereby see ERP as a term that describes the overall functionalities of the system as such. ERP is thereby more so a term for a system that encompass certain characteristics. As we have described the core of an ERP system is that it integrates different processes or functions, thereby enabling federated and outsourced work. However, another aspect of ERP that will be frequent throughout the thesis is applications. With ERP applications, we refer to the different functions or processes that a ERP can be applied to. This refers to the increasing functionalities and capabilities that an ERP has taken on. The applications of an ERP were e.g. very limited in its infancy, but the application base has broadened as time has gone by. Today ERPs have a much vaster application, and this is thereby what we refer to with the word application, in this thesis.

4.8 ERP in SCM

As we have now defined the two terms (ERP & SCM) separately, we will now explain the interplays they have with each other. In general, ERPs facilitate better SCM in that it can integrate the functions and processes that make up the supply chain or network (Barki & Pinsonneault, 2005). Via integrating these separate processes and functions, you make the SCM much easier, as you get increased transparency (Frank, 2004; Gibson, 2004). This increased transparency allows firms to manage increasingly complex supply chains or networks (Hallikas, 2008). Outsourcing and global expansion would therefore have been much more cumbersome without ERPs (Clemons et al, 1993, Dietz et al, 2013). ERPs allow you to have good visibility even if you federate your operations (Subramani, 2004, Croom, 2005, Hallikas, 2008).

Thereby the development of ERPs to include more application and therefore increased integration, has allowed for better management of supply chain networks (Goutsos & Karacapilidis, 2004; Subramani, 2004). This is due to the mitigating effect that integration can have in terms of increasing transparency and visibility throughout a network or chain (Camara et al, 2014; Ekman et al, 2014).

As the chain or networks grows; an increasing number of entities, functions, and process need to be managed (Ross, 2005; Rahimi et al, 2015). Managing these complex networks is therefore much easier if you can get an overview of the entire network (Devaraj et al, 2007; Dedrick, 2008). This gives you important information that you need to conduct your tasks (Ibid). ERPs can thereby, as we mentioned, facilitate better management of federated processes and networks (Ross, 2005; Nurmilaakso, 2009). ERPs therefore serves as an incremental part of modern SCM (Verdouw et al, 2010; Ekman et al, 2014).

However, as we have seen in the problem introduction for this thesis, this has not only led to benefits but also pose new challenges for firms and their network. If the requirements upon your ERP solution isn't properly managed, implemented or articulated it can lead to the complexity mentioned above (Ward & Zhou, 2006; Makkonen & Mervi, 2014). Again, this is the purpose of our thesis, to bring an understanding to the development of ERP and its application. Via this thesis, we thereby hope that we will have established framework for how to articulate the requirements of your ERP initiatives. As we have mentioned we can possibly make an outline which can allow for firms to get the right mindset when they discuss how to proceed with their ERP investments, in terms of specifying their requirements upon said investment. This is an important business insight as we have established earlier that this is a major source of said increase in complexity. We will therefore now begin with our grouping exercise that will serve as the foundation for the creation of a framework, that we hope will alleviate this problem.

4.9 Groupings

Now we have clarified the two important terms SCM, ERP and how they relate to each other. Furthermore, we have determined what definitions these terms have in our thesis. As mentioned we deemed this to be important as these two terms are the cornerstones of our research question. We have thereby created a frame for our thesis that is supposed to mitigate any source of confusion for the reader, in regards to our terminology.

With this frame in place, we now move on with the grouping of articles into the different group types that we have described. We have described above how these were created, in terms of our method. However, we will now conduct and present that process. We will begin with the

emphasis groups as this grouping was the first one that we identified, as described above. WE will move on with the ERP applications groups. Thereafter we will have a section in which we will combine the two groups with each other, to allow for framework creation. This chapter then ultimately ends with a conclusion of the findings in the literature review. These conclusions serve both as a summary of the findings and a starting point for creation of a framework.

4.9.1 Emphasis Groups

In grouping the articles within our sample we hope, as mentioned, to understand overarching emphasis in the literature sample. This means that we focused our efforts to see, what the focal point of a specific article was. We thereby tried to uncover what emphasis for the specific article in question. This is of interest due to that we wanted to see what type of knowledge streams that underlined our literature sample. If this could be uncovered, we could potentially see in what way focal points in terms of emphasis has changed. Conducting such an exercise would help us in designing our forthcoming framework, as we are interested to see whether we can construct a framework to any development of ERP. Especially as this thesis is a literature review understanding the literature sample is a key component of the thesis. As we had already created the different emphasis groups, once we had analyzed an article, it was placed into its appropriate emphasis group. This grouping of different articles regarding their emphasis, serve as the first step in the creation of a framework to understand developments in ERP and its application.

4.9.2 Efficiency

Emphasis Group	Articles
Efficiency	(Schlie & Goldhar 1995) – MRP, CIM, CAD, CAM, CAE, FMS, CNC, Kanban, Value-focused (Co et al, 1998) – CIM, MRP, MRP II, AMT, MPC (Small, 1999) – AMT, CAD, CNC, AMHS, AITS, JIT, MRP II, FMS (McAfee, 2002) – AMT, ERP, MRP II, R/3 (Ward & Zhou, 2006) – JIT & IT Deployment, ERP (Helo, 2004) – Kanban, MRP, ERP (Rizzi & Zamboni, 1999) – WMS, ERP, DTs (Goutsos & Karacapilidis, 2004), - e-Business, XML, EDI, ERP, DTD Lord, 2000 – e-Business, CRM Romero & Rodriguez, 2010 - E-commerce, ICT, WebB2B, WebB2C

Group 2

Efficiency is a term that focuses on improving performance in terms of concrete measurements (McAfee, 2002; Romero & Rodriguez, 2010). We thereby define the efficiency emphasis group as one which articles' in one way or another is concerned with improving metrics. Essentially this entails that you emphasize improving e.g. operational performance measures like productivity (Rizzi & Zamboni, 1999; Helo, 2004). This means that in these instances the ERP and its related applications are seen as enablers that result in performance increases by improving bottom-line metrics (Small, 1999; McAfee, 2002). This could as an example relate to increased productivity, more output per input, or more optimal inventory levels (Rizzi & Zamboni, 1999).

This emphasis group thereby proposes a view of ERP and related applications as allowing the firm to stay competitive via improving these measures (Small, 1999; Lord, 2000; Helo, 2004). However, these measures don't need to be related to purely operational aspects of the firm; it can also be e.g. regarding quality or flexibility (Co et al, 1998; Helo, 2004). Even though it might seem contradicting that flexibility can be part of this emphasis group, it is due to that articles within this group, see flexibility as something that will help you to improve performance (McAfee, 2002; Helo, 2004). Hence, by improving flexibility you can increase performance and

stay competitive due to improving this capability (Small, 1999; Helo, 2004). It is therefore in the emphasis behind the use than what it is that decides placement.

Due to that the composition of this group is focused on improving performance, it also encompasses aspects such as process improvement and controlling aspects for the firm (Schlie & Goldhar, 1995). The efficiency group thereby contains aspects that are focused on improving performance and related aspects that help you achieve this end-goal (Schlie & Goldhar, 1995; McAfee, 2002). An example is organizational policies like lean management that are supposed to lead to increases in performance (Ward & Zhou, 2006). These policies like lean management have a focus on efficiency as it is concerned with reducing waste (Small, 1999). Waste means resources that aren't contributing to the value-creation of the firm (Small, 1999; McAfee, 2002). Hence, there is a focus to enhance the performance capabilities of the firm by making them more efficient and focused on allowing them to execute their core functions (Ward & Zhou, 2006; Zhao & Fan, 2007).

In short, the efficiency emphasis group is primarily concerned with balancing investments and resources in a manner that improves performance (Ward & Zhou, 2006). As presented this can be done or measured in a multitude of ways (Helo, 2004; Ward & Zhou, 2006). However, one might argue that the quintessential purpose of all firms is to improve performance; hence all articles should have this emphasis (McAfee, 2002). Even though this might be true, this emphasis group is constrained by encompassing articles that are explicitly relating their problem or findings to improving, measuring, assisting or controlling some aspect relating to operational performance (Schlie & Goldhar, 1995; Small, 1999; Helo, 2004). Hence, the scope of the group is limited to only include these types of articles.

4.9.3 Flexibility

Emphasis Group	Articles
Flexibility	(Skog & Legge 2002) - SAP R/3 – Pitfalls of ERP Imp, function→process orientation (Clemons et al, 1993) -EDI-Outsourcing Siau & Shen, 2002 – m-commerce, e-commerce, wireless (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Verdouw et al, 2010), ERP, ICT, Mass-customization (Deeter-Schmelz et al, 2001) – B2B e-commerce & EDI (Treleven et al, 2000) – E-commerce, ERP (Ross, 2005), - e-technologies, e-CRM, SFA, e-Business, EMA, CSM (Hazen et al, 2016), -PPM, ERP, Circular Economy, Remanufacturing Gibson (2004), - B2B e-commerce. EDI, XML, eHubs, ERP Frank, 2004 – ERP, DBMS, ACID, e-commerce (Devaraj et al, 2007), - e-business, VMI, APS, MPS Golicic et al., 2002 – e-commerce (Jinno et al, 2017) – ERP, BI (Camara et al, 2014), - Web 2.0, Cloud, PaaS, SaaS (Addo-Tenkorang et al 2017), -CPD, IPD, ERP IoT-MPC, CE+, SaaS (Gnimpieba Z. et al, 2015), - GPRS, RFID, Cloud Computing, IoT, event-based (Zhao & Fan, 2007), -MC-ERP, IRP Dutta & Roy, 2003 - e-commerce Mavengere, 2014 - ERP Panda & Rath, 2015 - BPA, MRA Zeier et al, 2009 - RFID, DDSN Gunasekaran & Ngai, 2003 - B2B e-commerce, EDI, Virtual enterprise, ERP

Group 3

The competitive landscape of today is increasingly valuing entities that have the capabilities to attain speed and agility (Golicic et al, 2002; Verdouw et al, 2010; Gnimpieba Z. et al, 2015). Hence, this emphasis group is composed of articles from the literature sample, which focused on how you can achieve these capabilities. By flexibility we are referring to an ability to

accommodate this current environment signified by increased competition (Treleven et al, 2000; Devaraj et al, 2007; Zeier et al, 2009). This increased competition is as mentioned a function of increasing pressures to be more agile and doing it at a faster pace (Frank, 2004; Ross, 2005). Being flexible thereby means that you can allow yourself to respond in a quick manner to changing demands (Siau & Shen, 2002; Gunasekaran & Ngai, 2003 Gibson, 2004). This can be achieved in a variety of ways with ERP (Camara et al, 2014; Addo-Tenkorang et al, 2017). Functions of ERP that can allow for this is e.g. capabilities that allow your ERP to be accessed remotely via different types of devices (Ross, 2005; Helo et al, 2014). It can furthermore be functionalities in the ERP that can allow you to change production setups faster or allow for more flexible ways to sell products and services (Clemons et al, 1993; Deeter-Schmelz et al, 2001; Siau & Shen, 2002).

However, what ERP helps with in this regard is mainly to making distorted information more transparent as well as enhancing communication in the firm (Clemons et al 1993; Deeter-Schmelz et al, 2001; Panda & Rath, 2015). Having actionable information readily available and being able to communicate this in a lenient manner throughout the enterprise, can accommodate the mentioned changes in the environment thereby achieving flexibility (Ross, 2005; Helo et al, 2014).

You can furthermore distinguish between different types of flexibility (Skog & Legge, 2002; Hazen et al, 2016). One of these flexibility types is organizational flexibility, which focuses on the organizations ability to be flexible and change to demands (Zhao & Fan, 2007; Mavengere, 2014: Addo-Tenkorang et al, 2017). This type of flexibility is thereby focused on the organization as a unit and how flexible this unit is regarding changes. This can be exemplified by how rigid the structures in the organization are, the less rigid these structures are the better is the organization's ability to change them to market demands (Verdouw et al, 2010; Hazen et al, 2016). There is also a flexibility type called physical flexibility, this type refers to the more tangible side of flexibility (Dutta & Roy, 2003; Camara et al, 2014). What this means is what the technology in use limits you to do (Jinno et al, 2017). This doesn't only refer to inability of the technology but can also refer to that you might have legacy systems in place that aren't easily replaceable (Treleven et al, 2000; Camara et al, 2014). It is thereby something physical which

you cannot easily dispose of. It might therefore also be the work space of the firm as an example. Thereby these two types of flexibility can also explain aspects that limit your overall flexibility (Siau & Shen, 2002; Frank, 2004; Ross, 2005).

Furthermore, flexibility can not only allow you to respond to the market but also to allow for change within the enterprise. Changing e.g. production setups or project focus are also aspects that flexibility is concerned with (Helo et al, 2014). In conclusion, the articles that compose this group are thereby emphasizing applications of ERP that can allow a firm to accommodate change both within and outside their enterprise.

4.9.4 Collaboration

Emphasis Group	Articles
Collaboration	(Dedrick et al, 2008), - no spec tech (Makkonen & Mervi, 2014) -Supplier Eco-system (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Kumar, 2001) – ICT in ERP for SCM (Montoya et al, 2010)-ERP implementation-Trust (Vickery et al, 2003) -EDI (Capitão et al, 2012) – ICT, Web tools McLaren et al, 2002 – EDI, e-commerce, shared collaborative systems, XML, B2B, B2C (Nurmilaakso, 2009) – e-commerce, e-business, B2B e-commerce, ICT (Hallikas et al, 2008), - Collaborative Relationships – No spec tech (About ICT sector) (Deeter-Schmelz et al, 2001) – B2B e-commerce & EDI Soto-Acosta & Meroño-Cerdan, 2008 – eBusiness (Value-Creation) Croom, 2005 – e-commerce, CRM, e-business, EDI (Rahimi et al, 2015), - Global ERP, Process (Downing, 2010), - EDI, B2B, web-based (Barki & Pinsonneault, 2005), - EDI, B2B &B2C e-commerce, OI-organizational intergration, ERP Gonzálvez-Gallego et al, 2013 – ICT, e-business, ERP (Klein, 2007), - eBusiness, EDI, XML Overby & Min, 2001-I-commerce & EDI Dietz et al, 2013 – ERP Subramani, 2004 -IOS, EDI, SCMS (Camara et al, 2014), - Web 2.0, Cloud, PaaS, SaaS Møller 2005 – ERP, ERPII, e-ERP, APS, EDI, P2P, HUB, e-commerce Siau & Tian, 2004 - CORBA, JavaBeans, DCOM, HTML, XML, SOAP, .NET & Semantic web, ERP -How to integrate internet stuff for SCM w ERP Chen et al, 2014 - IoT, CRM, ERP, SaaS, ERP, Cloud, SOA, RFID, GPS

Group 4

Even though this emphasis obviously is focused on improving performance, this emphasis group is different from efficiency in that it is also about the enablement and intangible benefits of increased collaboration (Siau & Tian, 2004; Subramani, 2004; Croom, 2005; Makkonen & Mervi, 2014). Thereby, collaboration can both be tangible in terms of joint-investments or intangible aspects such as trust (Barki & Pinsonneault, 2005; Hallikas et al, 2008; Rahimi et al, 2015).

Collaboration is thereby a broad term and could mean many different things depending on context. We therefore need to state our definition of collaboration. This emphasis group defines collaboration as efforts that involve separate entities, working towards a unifying goal (Barki & Pinsonneault, 2005; Vickery et al, 2003). Thereby our definition doesn't exclude either tangible or intangible aspects of collaboration. However, articles still need to abide by the definition in that it needs to focus on the allowing different entities to achieve some type of goal. Collaboration can sometimes, as we have mentioned, result in outcomes that aren't explicitly tangible as increased collaboration might lead to increase of trust (Montoya et al, 2010; Hallikas et al, 2008; Ekman et al, 2014). Increasing trust levels can then work as a device which effect mitigates the transaction costs of the relationship (Møller 2005; Dedrick et al, 2008; Camara et al, 2014; Chen et al, 2014). Trust however doesn't allow itself to be measured in any concrete way such as production efficiency metrics (McLaren et al, 2002; Nurmilaakso, 2009; Downing, 2010). Aside from trust, collaboration can enable increased innovation in terms of more perspectives and even co-engineering a product vertically through the supply chain (Klein, 2007; Dietz et al, 2013; Gonzálvez-Gallego et al, 2013). Collaboration therefore also has a clear connection to increased performance (Overby & Min, 2001; Soto-Acosta & Meroño-Cerdan, 2008; Capitão et al, 2012).

As mentioned, collaboration efforts can also involve more tangible aspects. Increasing joint efforts in terms of co-investment is one way that can be viewed as increased levels of collaboration (Overby & Min, 2001; Subramani, 2004; Møller 2005). Furthermore, relating performance increases to such investments can put a number on the concrete value of collaboration efforts (Croom, 2005; Soto-Acosta & Meroño-Cerdan, 2008). This can further prove collaborations impact upon performance with tangible numbers as well (McLaren et al, 2002; Dedrick et al, 2008; Hallikas et al, 2008).

However, collaboration efforts have garnered more attention in regards ERP (Ekman et al, 2014; Rahimi et al, 2015). Collaboration is important for business of today for a multitude of reasons (Dedrick et al, 2008; Soto-Acosta & Meroño-Cerdan, 2008; Camara, 2014). One reason is the volatile business environment of today (Barki & Pinsonneault, 2005; Rahimi et al, 2015). Collaboration can in this setting be seen as a value in itself, due to that a fruitful relationship can create sustainable competiveness (Subramani, 2004; Hallikas et al, 2008). Successful collaboration is an incremental part in making such a relationship work well, in order to ensure that joint efforts can realize its proposed benefits (Barki & Pinsonneault, 2005; Downing et al, 2010; Makkonen & Mervi, 2014). A relationship without a working collaboration will incur transaction costs that will hamper its development of any valuable assets. Collaboration can thereby be seen as a driver for change for ERP (Kumar, 2001; Klein, 2007; Gonzálvez-Gallego et al, 2013). We can see this in the increasing focus to enable functionalities within ERP that can accentuate collaborative initiatives (McLaren et al, 2002; Makkonen & Mervi, 2014; Rahimi et al, 2015).

Collaboration can therefore be summed up to be an increasingly important aspect for business and hence for ERPs development (Hallikas et al, 2008; Montoya et al, 2010; Makkonen & Mervi, 2014). We have presented that collaboration is a diverse term. In this emphasis group we have presented that collaboration in ERP can work both as a mitigation device, facilitator and enabler (Subramani, 2004; Klein, 2007; Nurmilaakso, 2009; Camara et al, 2014). In conclusion, collaboration is an important part of ERPs and will continue to be so (Downing et al, 2010; Capitão et al, 2012; Rahimi et al, 2015.

4.9.5 Accuracy

Emphasis Group	Articles
Accuracy	(Deeter-Schmelz et al. 2001) – e-commerce, e-business, B2B e-commerce, ICT (Lee et al, 1997) - MRP, DRP (Rodriguez, 2006)- e-business, SRS (Sense & Response Systems) (Wang et al, 2005) - SCM-oriented IOISs and Internet applications (e.g., SAP's mySAP.com), SAP Advanced Planner -ERP. Golicic et al., 2002 – e-commerce (Croson & Donohue, 2006) - ERP (Helo, 2004) - Kanban, MRP, ERP Frank, 2004 – ERP, DBMS, ACID, e-commerce Dutta & Roy, 2003 - e-commerce Lin et al, 2010 - ERP, ANP, TOPSIS (Talks about how ERP can help in this and that push & pull are the dynamics) Gosain et al, 2005 - EDI, API Zeier et al, 2009 - RFID, DDSN

Group 5

Accuracy is an emphasis group that we define as the importance of estimating, forecasting or predicting in a correct way (Lee et al, 1997; Deeter-Schmelz, 2001; Dutta & Roy, 2003). Having accuracy allows a firm to take actions with degrees of certainty (Golicic et al, 2002; Dutta & Roy, 2003; Frank, 2004). Thereby accuracy can mitigate different types of risk (Golicic et al, 2002; Croson & Donohue, 2006). Articles that have an emphasis on accuracy thereby share the characteristic that they are emphasizing the benefits from achieving accuracy in the firm (Deeter-Schmelz et al. 2001; Helo, 2004).

Compared to the efficiency group, this group is not explicitly only concerned with tangible performance improvements (Rodriguez, 2006; Lin et al, 2010). The accuracy emphasis group is instead primarily emphasizing the benefits of accuracy, even though this obviously ultimately can relate to performance improvements (Croson & Donohue, 2006; Rodriguez, 2006). An example is integration of web-based solutions in the ERP, this enable a closer intimacy with the demand (Golicic et al., 2002; Wang et al, 2005; Rodriguez et al, 2006). A closer intimacy with demand

can allow you to take actions upon more accurate data, thereby affecting the performance of the company (Lee et al, 1997; Deeter-Schmelz, 2001; Lin et al, 2010). Furthermore, ERPs now have the ability to track this type of information in real-time, which improves the quality of decisions a this data is now accurate in real-time rather than being a lagging number (Gosain et al, 2005; Rodriguez et al, 2006)

However, accuracy can also be valuable in terms of monitoring operations. An example is that in performance management you may also be concerned whether initiatives or projects are performing per expectations (Deeter-Schmelz, 2001; Wang et al, 2005). In monitoring performance, you therefore want information to be accurate to see in which direction such initiatives are heading (Golicic et al, 2002; Helo, 2004). If such information is inaccurate it might mean that a firm can take the wrong actions and hence lose competitiveness (Wang et al, 2005; Croson & Donohue, 2006; Zeier et al, 2009). In this regard, this loss of competitiveness wasn't related to improving performance but rather what a lack of accuracy can result in. Also in terms of monitoring, integrating the ERP with web-based solutions provide computing power and transparency of information in real-time, improving the accuracy of the monitoring (Helo, 2004; Wang et al, 2005).

4.9.6 Conclusion from the Emphasis Groups

We have now created 4 groups from the literature sample in regards to their theoretical emphasis. From this we can conclude that it seems like certain groups have more articles. Moreover, certain groups have a composition of articles that include much more recent publication dates. Even though this can enable us to determine changes in regards to that theoretical underpinnings of why you employ ERPs have changed it is not sufficient for answering our research question. This is due to that we need to show how this relate to specific applications of ERP to provide guidance for firms. Explaining that the emphasis of theoretical concepts for understanding value of ERP has changed is a good exercise for providing a solid foundation to understand where the change adheres from. However, we need a practical dimension to show what this change has meant in terms of application of ERP. Thereby, we make the findings more transparent when you via applications of ERP can portray this change.

We therefore created a frame for putting certain applications of ERP into groups as well. However, these groups had a different focus on how they were created compared to the emphasis groups. The application groups were focused on explaining categorizing the literature sample based upon what specific applications that were used and for what reason. The emphasis groups have instead been focused on presenting the theoretical grounding of the articles, rather than the specific application that an article mentions.

4.10 ERP Application Groups

As we had established the emphasis groups we went deeper with our analysis of the articles and looked at what specific technology applications of ERP that the articles mentioned. The reason why we wanted to review the specific technology application of ERP was due to that we needed it to provide a more solid foundation for our results. It furthermore became apparent that the ERP applications themselves could also transcend the emphasis groups we created above. Hence, we needed to do a similar grouping exercise for application of ERP as well.

We thereby looked at what ERP application a certain article was focused on. As an example, this meant that once an article had been assigned to one of the four emphasis groups we had created, we then tried to distinguish what application of ERP this article was about. Hence, an efficiency focused article might be talking about using ERP applications like EDI. However, articles with a different emphasis might also cover EDI application within ERP. Hence, this grouping of the specific applications into larger subsets provided us with a foundation for the upcoming analysis section of the thesis. Listing the separate applications in isolation would not allow for a holistic perspective of how ERP applications have developed.

As mentioned we have combined specific applications of ERP into larger subsets. These groups were created based on what applications that we had in our literature sample. These were then grouped into more general application groups. However, some applications couldn’t be determined to adhere to one specific group. Hence, they aren’t mutually exclusive to any ERP application group. Therefore, the same application might very well be present in more than one group, as the emphasis of the article was what placed the article in the group to begin with.

We will now in detail describe the separate group constructs to enable an understanding for what the application groups are composed and hence how we thought about them when they were constructed. We created 8 different ERP application groups (Customization, Demand Estimation, Communication, Integration, Push-to-pull, Agility and lean management). These groups were created with the intention to touch upon aspects that are prevalent within in Supply Chain Management and hence solidify this thesis' connection between ERP and SCM. Thereby we could have constructed the groups differently but a deliberately chose to give them with the intent to convey a connection to SCM and relate it to ERP.

4.10.1 Communication

ERP Group	Article & Applications
Communication	(Makkonen & Mervi, 2014) -Supplier Eco-system (Kumar, 2001) – ICT in ERP for SCM (Skog & Legge 2002) - SAP R/3 – Pitfalls of ERP Imp, function→process orientation (Montoya et al, 2010)-ERP implementation-Trust (Vickery et al, 2003) -EDI (Deeter-Schmelz et al, 2001) – B2B e-commerce & EDI (Clemons et al, 1993) -EDI-Outsourcing (Nurmilaakso, 2009) – e-commerce, e-business, B2B e-commerce, ICT (Capitão et al, 2012) – ICT, Web tools Frank, 2004 – ERP, DBMS, ACID, e-commerce McLaren et al, 2002 – EDI, e-commerce, shared collaborative systems, XML, B2B, B2C Soto-Acosta & Meroño-Cerdan, 2008 – eBusiness (Value-Creation) (Siau & Shen, 2002) – m-commerce, e-commerce, wireless (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Gnimpieba Z. et al, 2015), - GPRS, RFID, Cloud Computing, IoT, event-based (Treleven et al, 2000) – E-commerce, ERP Møller 2005 – ERP, ERPII, e-ERP, APS, EDI, P2P, HUB, e-commerce

Group 6

Communication is an essential part of an ERP or any other type of information system (Clemons et al, 1993; Treleven et al, 2000; Møller 2005). This application group thereby were dealt articles that had a focus on aspects that affected communication in the ERP. Communication can be done in several ways within ERPs (Siau & Shen, 2002; Gnimpieba Z. et al, 2015). The general trend is that the ways in which you can communicate have expanded as has the scope of whom you communicate with (Deeter-Schmelz et al, 2001; Vickery et al, 2003; Nurmilaakso, 2009; Ekman

et al, 2014; Helo et al, 2014). As an example, communication can now be done via internet and even mobile applications (Siau & Shen, 2002; Møller 2005).

This transferring of information within firms, as well as between, has developed in conjunction with the change in technologies (Kumar, 2001; Ekaman et al, 2014; Helo et al, 2014. ERPs allows for this a platform with which a broad range of tools and applications can communicate within the firm (Treleven et al, 2000; Deeter-Schmelz et al, 2001; Nurmilaakso, 2009). ERPs can thereby allow you to integrate several functions of the firm and explicitly express the internal value chain of an enterprise (Helo et al, 2014; Makkonen & Mervi, 2014). The technological development of ERP has continued to expand even outside the firm, which has enabled the outsourcing of more and more functions (Clemons et al, 1993; Ekman et al, 2014; Makkonen & Mervi, 2014).

Modern supply chains have experienced an increasing association between companies throughout the network, thus not restricted to a single entity (Nurmilaakso, 2009; Ekman et al, 2014; Makkonen & Mervi, 2014). Investment in ERP and related applications can therefore dramatically change the cost and value equation for a supply chain (Frank, 2004). The equation can change so dramatically as ERP investment allows the firm to cope with uncertainty of demand, higher product quality, and shorter response times or cycle times (Kumar, 2001; Ekman et al, 2014 Helo et al 2014). ERPs and their applications and the communication it enables thereby have a direct effect on the bottom-line performance (Vickery et al, 2003; Makkonen & Mervi, 2014).

Skog & Legge (2002) present factors that have influenced adoption of ERPs such as globalization of business, increasing national and international regulations, focus on standardization, scalable and flexible infrastructures and collaboration among vendors. Not only does this convey that there are a multitude of factors that influence adoption of ERP but also how diverse those factors are (Treleven et al, 2000; Skog & Legge, 2002; Nurmilaakso, 2009). Furthermore, given the diversity of factors in conjunction with ERP development has spurred a move towards a process-orientation of the firm (Skog & Legge, 2002; Makkonen & Mervi, 2014). This shift in orientation has meant that there has been an increase in communication across firms (Soto-Acosta &

Meroño-Cerdan, 2008). The increase in communication is due to that processes transcends firm and functional boundaries and thereby spurs increasing communication (Møller 2005; Ekman et al, 2014).

As the use of ERP has expanded outside the firm, firms must regularly implement and manage firm-wide integrated systems and collaborative platforms (McLaren et al, 2002; Montoya et al, 2010). This development has been enabled with the help of ICT (Kumar, 2001; Nurmilaakso, 2009). The integration of ERP between firms, has led to and improvement of information communication along the supply chain, which in turn has positive benefits in multiple supply chain aspects (Montoya et al, 2010; Makkonen & Mervi, 2014). These benefits have materialized as higher flexibility, higher customer service levels and better coordination between firms (Treleven 2000, 2000; Vickery et al, 2003; Helo et al, 2014). The increase in benefits has at the same time reduced coordination and transaction costs for the supply chain (Clemons et al, 1993Deeter-Schmelz et al, 2001). Lastly, ICT tools such as available internet connection throughout the labor force, as well as standardized data exchange between trading partners, have had a positive effect on labor productivity and has contributed directly to operations and performance (Kumar, 2001; Nurmilaakso, 2009).

An example of this can be found in logistic service providers (referred to as LSP), as they seek to offer clients integrated logistics solutions where ICT play a supportive role within outsourcing processes (Jeffers et al., 2008 as described by Capitão et al, 2012). However, Capitão et. al. (2012) acknowledges that despite the benefits ICT poses for ERPs, there is a gap between manager's expectation and the increase in firm performance. This suggest that implementation is a crucial for mitigating this gap, as expectations and capabilities need to align to achieve results (Nurmilaakso, 2009; Montoya et al, 2010).

In conclusion, we can see that ERPs has become essential to the management of different types of flows (See 4.6 Supply Chains and Supply Chain Management) among supply chain partners, as it has allowed for increased integration, synchronization, visibility, and responsiveness (McLaren et al, 2002; Capitão et al, 2012; Ekman et al, 2014). Aspects relating to communication in ERPs have gained in importance, as more technologies have been incorporated into ERPs (Capitão et

al, 2012). You can thereby communicate in a variety of ways with a wide array of partners, simultaneously (Makkonen & Mervi, 2014). Examples of this are the integration of web services and mobile solutions with your ERP (Ibid). Ultimately, this has created firms that transcend towards virtual enterprises, increasingly digitizing processes and capabilities throughout their own digital eco-system, via e.g. clouds (Helo et al, 2014; Makkonen & Mervi, 2014).

4.10.2 Customization

ERP Group	Article & Applications
Customization	(Klein, 2007), - eBusiness, EDI, XML (Ross, 2005), - e-technologies, e-CRM, SFA, e-Business, EMA, CSM (Hallikas et al, 2008), - Collaborative Relationships – No spec tech (About ICT sector) Lord, 2000 – e-Business, CRM Overby & Min, 2001-I-commerce & EDI Golicic et al., 2002 – e-commerce Croom, 2005 – e-commerce, CRM, e-business, EDI (Zhao & Fan, 2007), -MC-ERP, IRP (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Hazen et al, 2016), -PPM, ERP, Circular Economy, Remanufacturing (Verdouw et al, 2010), ERP, ICT, Mass-customization (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Treleven et al, 2000). – ERP, E-commerce

Group 7

Articles in which the application was focused on creating a customized experience were grouped together in this group. Being focused on customization we defined as a firm that tries to cater to the specific needs of their customers (Croom, 2005; Ekman et al, 2014, Hazen et al 2016). Customers are increasingly demanding more customized products; ERP applications can be a way for firms to cope with this increasing demand of customization (Lord, 2000; Klein, 2007). Moreover, the articles placed in this group also shared an understanding of an extended integration. This extended integration thereby includes customers as a more integral part of the value chain (Treleven et al, 2000; Zhao & Fan, 2007; Verdouw et al, 2010; Hazen et al, 2016).

Concrete examples of this is how e-commerce allows customers to choose attributes of their products, as online order configurability enables customers to design their own products and services through special configuration (Golicic et al., 2002; Ross, 2005).

The increased integration of capabilities within ERPs have thereby resulted in an increased array of possibilities to configure to your liking (Treleven et al, 2000; Ross, 2005; Klein, 2007; Ekman et al, 2014; Helo et al, 2014). These increased levels of customization made possible, as mentioned, due to increased integration of the ERP to more functions and entities (Ross, 2005; Hallikas et al, 2008; Verdouw et al, 2010). Furthermroe, information exchange enabled by e-business have been shown to have a positive effect on the level of customization, which in turn has a positive effect on performance (Overby & Min, 2001; Klein, 2007). This means that the incorporation of web-based tools and solutions in the ERP have contributed to a large portion to the ability to customize (Klein, 2007; Ekman et al, 2014; Helo et al, 2014; Hazen et al, 2016).

Customization is thereby dependent upon several factors of the ERP and it is clear that there has been an upward trend towards higher customization of processes (Zhao & Fan, 2007; Hallikas et al, 2008; Verdouw et al, 2010; Helo et al, 2014; Hazen et al, 2016). Furthermore, in digitalizing the ERP and its applications customization seems to have increased (Verdouw et al, 2010, Ekman et al, 2014; Helo et al, 2014; Hazen et al, 2016). The increased integration has led to more collaboration which ultimately has enabled a higher level of customization (Ross, 2005; Klein, 2007; Hallikas et al, 2008; Ekman et al, 2014).

4.10.3 Standardization

ERP Group	Article & Applications
Standardization	(Nurmilaakso, 2009) - e-commerce, e-business, B2B e-commerce, ICT (Gibson, 2004) - B2B e-commerce. EDI, XML, eHubs, ERP (Lord, 2000) – e-Buiness, CRM (Downing, 2010), - EDI, B2B, web-based (Rahimi et al, 2015), - Global ERP, Process (Jinno et al, 2017) – ERP, BI

Group 8

Through the use of an ERP, companies can cope with increasing complexity, by standardizing their communication and transaction processes (Gibson, 2004; Downing, 2010; Rahimi et al, 2015). Articles that we placed within this group thereby exhibited these characteristics in terms of their ERP-application.

The ability to globalize your operations have been enabled via standardization that e.g. EDI & e-commerce have provided (Nurmilaakso, 2009; Downing, 2010; Rahimi et al, 2015). Standardization is needed for globalized operations to simplify the processes of the firm, as globalization induces complexity (Rahimi et al, 2015). An example of this is how EDI has enabled standardized automatic data exchange, thereby having a standard for transmitting data electronically between parties in a system (Lord, 2000; Nurmilaakso, 2009; Jinno et al, 2017). Moreover, when looking at the development of EDI systems in the automotive industry, Gibson (2004) found that, organizations are moving towards internet based standardized tools to achieve cost effectiveness.

At the same time, ERP systems are getting more complex, due to the integration of an increasing number of functions and processes (Gibson, 2004; Nurmilaakso, 2009; Rahimi et al, 2015; Jinno et al, 2017). In addition, global markets using e-commerce, are in themselves a force towards standardization, while at the same time allowing for a larger ability to accommodate complexity

(Gibson, 2004; Rahimi et al, 2015). Thereby the advent of e-solutions for ERPs has the possibility to standardize the workflow of the ERP and hence mitigate the complexity (Gibson, 2004; Downing, 2010; Rahimi et al, 2015). Essentially, this argues that using e-commerce allows for more customization, while at the same time standardizing this process (Gibson, 2004; Nurmilaakso, 2009; Downing, 2010). Furthermore, having a standardized e-process has also enabled BI applications in ERPs which has given insights into their operations (Downing, 2010; Jinno et al, 2017).

As we now have been through both the standardization and customization application group it is apparent that they work in conjunction. By this we mean that standardization enables customization (Gibson, 2004; Rahimi et al, 2015). At the same time, increasing customization levels will increase complexity (Nurmilaakso, 2009; Downing et al, 2010, Rahimi et al, 2015). However, standardizing your workflow, which can be done via e.g. e-solutions, have a mitigating effect which will thereby allow you to accommodate a higher degree of customization (Gibson, 2004; Nurmilaakso, 2009; Downing, 2010; Rahimi et al, 2015).

4.10.4 Lean Management

ERP Group	**Article & Applications**
Lean Management	(Schlie & Goldhar 1995) – MRP, CIM, CAD, CAM, CAE, FMS, CNC, Kanban, Value-focused (Co et al, 1998) – CIM, MRP, MRP II, AMT, MPC (Small, 1999) – AMT, CAD, CNC, AMHS, AITS, JIT, MRP II, FMS (McAfee, 2002) – AMT, ERP, MRP II, R/3 (Ward & Zhou, 2006) – JIT & IT Deployment, ERP (Deeter-Schmelz et. al. 2001) - EDI (Helo, 2004) – Kanban, MRP, ERP

Group 9

Lean management is a term refers to a concepts and strategies that focus on reducing waste operations of a firm and is something supply chain management (Ward & Zhou, 2006). This waste can be a multitude of things but essentially relates to improving efficiency of operations (Schlie & Goldhar, 1995; Small, 1999). Primarily it is applications of ERP such as MRP that has

been used for lean management execution (Co et al,1998; Small, 1999). MRPs have enabled firms to control their inventory and production requirements, keeping an optimal level of materials on stock (Schlie & Goldhar, 1995; Co et al, 1998). Even though lean management as a term preceded ERP, MRPs still provided integration albeit between a specific department rather than a whole enterprise (Small, 1999; McAfee, 2002). Integration of processes enabled firms to reduce manufacturing setup time and produce smaller batch runs, these factors in turn led to a decrease in lead time (Small, 1999; Helo, 2004). The integration of manufacturing processes via MRP, has also led to increases of firms' ability to decrease e.g. throughput times (Schlie & Goldhar 1995). Thereby once ERP was deployed, the ability to carry out lean principles became accentuated as you could carry it out throughout the enterprise and not only within a separate entity of the firm (Ward & Zhou, 2006). The increased integration of processes across the enterprise thereby meant that more waste could be reduced (Ibid).

Thereby investment in ERP lead to an increased performance for firms, in terms of reducing lead times and cycle times (Co et al, 1998; Small, 1999; McAfee, 2002). Furthermore, reducing lead times is regarded as a prime motivation for increasing integration levels (Schlie & Goldhar, 1995; Co et al., 1998; McAfee, 2002). Lead times spur integration as it the whole enterprise or even supply chain need to be integrated to facilitate reductions of lead time (McAfee, 2002, Ward & Zhou, 2006). Furthermore, as ERP enabled integration between firms as well lean and JIT practices could be implemented throughout a supply chain (Ward & Zhou, 2006). Implementation of this throughout supply chains has shown to be impacted by the level of integration (Ibid). Hence ERP has had a significant role in the evolution of lean management in SCM (Helo, 2004; Ward & Zhou, 2006).

The lean enterprise use of ERP to implement lean and JIT practices, has led to a decreased investment in inventory along the supply chain (Deeter-Schmelz, 2001). This essential means that the reduction of waste has been able to be done on an even greater scale (Small, 1999; Helo, 2004).

4.10.5 Supply Chain Integration

ERP Group	Article & Applications
Supply Chain Integration	(Devaraj et al, 2007), - e-business, VMI, APS, MPS (Clemons et al, 1993), - EDI-Outsourcing (Gibson, 2004), - B2B e-commerce. EDI, XML, eHubs, ERP (Dedrick et al, 2008), - no spec tech (Dietz et al, 2013) – ERP (Lord, 2000) – e-Business, CRM (Frank, 2004) – ERP, DBMS, ACID, e-commerce (Gonzálvez-Gallego et al, 2013) – ICT, e-business, ERP (Subramani, 2004) -IOS, EDI, SCMS (Rizzi & Zamboni, 1999) – WMS, ERP, DTs (Camara et al, 2014), - Web 2.0, Cloud, PaaS, SaaS (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Addo-Tenkorang et al 2017), -CPD, IPD, ERP IoT-MPC, CE+, SaaS (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Goutsos & Karacapilidis, 2004), - e-Business, XML, EDI, ERP, DTD (Barki & Pinsonneault, 2005), - EDI, B2B &B2C e-commerce, OI-organizational intergration, ERP (Treleven et al, 2000), - ERP, E-commerce (Siau & Tian, 2004) – CORBA, JavaBeans, DCOM, HTML, XML, SOAP, .NET & Semantic web, ERP - How to integrate internet stuff for SCM w ERP

Group 10

An ERP is at its core about integrating dispersed processes into a cohesive whole (Dedrick et al , 2008). Hence, integrating supply chain processes is an important part of ERP usage and articles which shared this focus were placed in this group. The integration of processes has been via different types of technologies over the course of time (Clemons, 1993; Siau & Tian, 2004; Devaraj et al, 2007; Camara et al, 2014; Helo et al, 2014; Addo-Tenkorang et al, 2017). In the earlier parts of our sample Supply Chain integration via EDI or by virtue of the ERP itself (Clemons et al, 1993; Rizzi & Zamboni, 1999). As internet access became commonplace it allowed for integration to be done with more entities simultaneously (Treleven et al, 2000; Siau &Tian, 2004; Barki & Pinsonneault, 2005; Helo et al, 2014).

Through the use of information systems as described earlier, firms invest in ERP with an intention to increase integration with suppliers and customers (Ekman et al, 2014; Frank, 2004). Although the direct link between supply chain integration and performance is unclear, supplier integration has shown to have a positive impact on cost, quality, flexibility and delivery performance (Lord, 2000; Goutsos & Karacapilidis, 2004; Barki & Pinsonneault, 2005). Consequently, there is a relationship between the use of ERP and firm performance, as firms that integrate suppliers and customers have shown to significantly outperform other firms (Frank, 2004; Devaraj et al, 2007; Ekman et al, 2014).

Outsourcing integration can also bear with external parties is a factor that increases risk tied to agency theory (Clemons et al, 1993; Gonzálvez-Gallego et al, 2013). Via WMS and DTs, firms have avoided this risk of integrating outsourced processes by keeping processes vertically integrated instead (Rizzi & Zamboni, 1999; Treleven, 2000; Dedrick et al, 2008). For example, manufacturers in the automotive industry were found to be able to outsource more functions to their suppliers through the use of business-to-business e-commerce (Gibson, 2004; Devaraj et al, 2007; Ekman et al, 2014). In addition to achieving higher connectivity, with e-commerce firms can avoid the inefficiencies related to limited communication experienced with integrating suppliers (Gibson, 2004; Gonzálvez-Gallego et al, 2013).

Therefore, even though integration increases complexity and enhances overall risk, ERPs can decrease the cost of coordination, without increasing the risk coupled with external integration (Treleven, 2000; Siau & Tian, 2004; Devaraj et al, 2007; Helo et al, 2014). This mitigating effect that use of ERP has for integration has lead more firms towards integrating parties in their supply chain rather than merely vertical (Clemons, 1993; Rizzi & Zamboni, 1999; Gibson, 2004; Ekman et al, 2014; Helo et al, 2014). The same is evident in the move away from market transactions, to integration of upstream and downstream parties in the supply chain (Treleven, 2000; Gibson, 2004; Devaraj et al, 2007; Dietz et al , 2013). ERP and related applications of e-solutions has enabled the integration to expand beyond processes inside the firm and thereby made way for an integrated virtual enterprise (Camara et al, 2014; Ekman et al, 2014; Helo et al, 2014).

We can thereby see that integrating processes is coupled with different challenges, in our literature sample outsourcing & agency theory issues (Clemons et al, 1993; Gonzálvez-Gallego et al, 2013; Camara et al, 2014;). We have also seen that integration has a connection to performance of the overall firm (Gibson, 2004; Dedrick et al, 2008). Moreover, that integration is complicated and poses challenges for the firm, which ERP can mitigate (Rizzi & Zamboni, 1999; Barki & Pinsonneault, 2005; Dietz et al, 2013; Ekman et al, 2014). ERPs can mitigate these risks due to that it can give a cohesive overview of all integrated processes (Lord, 200; Barki & Pinsonneault, 2005). Hence, even though the risks are still there, ERPs are supposed to make you retain some of the control that integration of horizontal processes induce (Clemons, 1993; Siau & Tan, 2004; Ekman et al, 2014). Moreover, the increased integration might lead to facilitation for creating relationship-specific assets (Subramani, 2004; Gonzálvez-Gallego et al, 2013).

4.10.6 Demand Estimation

ERP Group	**Article & Applications**
Demand Estimation	(Deeter-Schmelz et al. 2001) – e-commerce, e-business, B2B e-commerce, ICT (Lee et al, 1997) - MRP, DRP (Rodriguez, 2006)- e-business, SRS(Sense & Response Systems) (Wang et al, 2005), - SCM-oriented IOISs and Internet applications (e.g., SAP's mySAP.com), SAP Advanced Planner -ERP. (Golicic et al, 2002) – e-commerce (Croson & Donohue, 2006) - ERP (Helo, 2004) - Kanban, MRP, ERP

Group 11

An important issue in supply chain management has been to be able to estimation demand, in order to project e.g. inventory and production levels (Lee et al, 1997; Helo et al, 2004; Wang et al, 2005). Firms have historically used different technologies to achieve better estimations of demand with systems like MRP, DRP to SRS (Helo, 2004; Rodriguez, 2006). However, even though firms may develop capabilities to share information, if inaccurate information flows

through these systems, it still might lead to inefficiencies. (Lee et al, 1997; Deeter-Schmelz et al. 2001). The advent of ERP and the integration of processes that it made possible allowed for improved estimations, as you could get a holistic overview of the demand (Lee et al, 1997; Croson & Donohue, 2006).

As new applications within ERP have provided access to customers' behaviour in new manners and therefore access to information about demand has become an important competitive feature (Wang et al, 2005; Rodriguez, 2006). In structuring and understanding this information, firms can gain the ability to make better predictions and forecasts for their e.g. production and inventory, which is ultimately affecting performance (Deeter-Schmelz et al, 2001; Croson & Donohue, 2006; Rodriguez, 2006). Applications as e-commerce can thereby mitigate the uncertainty in estimating demand (Golicic et al., 2002).

An inherent problem in integrated supply chains with visibility (Deeter-Schmelz et al, 2001): Improved estimation capabilities and understanding of information can help to solve this problem which commonly referred to as the bullwhip-effect (Deeter-Schelmz et al, 2001; Rodriguez, 2006). The bullwhip-effect is caused by information distortion in the supply chain, which results in anomalies for demand forecasting (Wang et al, 2005). These anomalies in forecasts can result in e.g. excessive or depleted inventories, and as inventories pose a holding cost, this affects the bottom-line (Helo, 2004; Rodriguez, 2006).

As ERP thereby can provide more accurate information sharing across processes, they have a mitigating effect on information distortion (Wang et al, 2005; Croson & Donohue, 2006; Rodriguez, 2006). Applications such as sense and response systems may prevent or avoid negative impact from the bullwhip-effect, by allowing for better estimation of demand and faster response time (Rodriguez, 2006). Furthermore, the increased visibility of real-time data that ERP thereby allow firms to respond faster to other firms in the supply chain (Deeter-Schemlz, 2001; Helo et al, 2004; Wang et al, 2005). This increase of accuracy in information coupled with the ability to share and take action upon this information is thereby what enables firm to keep up with competition (Rodriguez, 2006). Firms that have an ERP are thereby enabling themselves to

match supply and demand more accurately, increasing visibility in the chain and increases in competitiveness (Wang et al, 2005; Rodriguez, 2006).

As we can see from our articles in this group, demand estimation hasn't been a primary driver for recent ERP development (Helo, 2004; Wang et al, 2005). However, when ERP began to be used to a greater within firms the inherent problems with this integration became apparent (Deeter-Schmelz et al, 2001). Moreover, the integration also made it possible to achieve better estimation due to the greater visibility (Rodriguez, 2006). However, it is earlier systems and applications that can be seen to have had this focus of their application. As an example, MRP has it as its main focus to control material requirements and enable planning of such issues (Lee et al, 1997). Then with the new opportunities that e-solutions could present with ERP this provided an amplification of the issues that had already been covered with MRP and ERP (Lee et al, 1997; Helo et al, 2004; Rodriguez, 2006. However, it is fair to say that the estimation focus has decreased over the years as other issues have gotten more information lately (Wang et al, 2005; Croson & Donohue, 2006).

4.10.7 From Push to Pull

ERP Group	**Article & Applications**
Push-to-Pull	(Rodriguez, 2006), - e-business, SRS(Sense & Response Systems) (Zeier et al, 2009), - RFID, DDSN (Gibson 2004), - B2B e-commerce. EDI, XML, eHubs, ERP (McLaren et al, 2002) – EDI, e-commerce, shared collaborative systems, XML, B2B, B2C (Romero & Rodrıguez, 2010) – E-commerce, ICT, WebB2B, WebB2C (Dutta & Roy, 2003) – e-commerce (Hazen et al, 2016), PPM, ERP, Circular Economy, Remanufacturing

	(Lin et al, 2011), ERP, ANP, TOPSIS (Talks about how ERP can help in this and that push & pull are the dynamics) (Verdouw et al, 2010), (Goutsos & Karacapilidis, 2004) – e-Business, XML, EDI, ERP, DTD

Group 12

This group is similar to demand estimation. However instead of focusing on how or by what proxy estimations can be conducted, this grouping refers to a more a change in how the ERP and its related technologies are applied to (Gibson 2004). In general, this grouping portrays articles that has had a focus on not only estimation of demand but what that demand is a product of. Demand can largely be said to have been viewed in two different ways (Lin et al, 2011). Either the demand can be pushed through to the end customer or pulled from said entity (Goutsos & Karacapilidis, 2004; Zeier et al, 2009; Verdouw et al, 2010; Lin et al, 2011). Before the advent of ERP, which has increased visibility in the supply chain, pulling mechanisms were hard to apply effectively (Lin et al, 2011; Hazen et al, 2016). However, as ERP began to employ more functions and get integrated with e-solutions, the ability to pull demand increased significantly (Dutta & Roy, 2003; Rodriguez, 2006).

As the ability to pull demand has increased we have seen a shift in how you portray demand has moved from a push to a pull dynamic in supply chains. As pulled demand is supposed to bring better performance by e.g. reduce inventory, cycle times due to a higher intimacy to the demand (McLaren et al, 2002; Lin et al, 2011; Hazen et al, 2016). Pull-based systems are supposed to give more accurate estimates of demand due to the higher intimacy levels, as you estimate upon demand that is derived from customers, which supposedly is supposed to enable you to have e.g. more optimal production and inventory levels (Goutsos & Karacapilidis, 2004; Gibson, 2004; Rodriguez, 2006).

However, to effectively execute a pull-strategy requires you to have a way to organize and transfer this information to the necessary parties throughout the chain, in a lenient manner (Rodriguez, 2006; Zeier et al, 2009; Romero & Rodrıguez, 2010; Lin et al, 2011). The evolution

of ERP and e-solutions has therefore been of incremental importance in shifting to a pull-based system (Gibson, 2004; Rodriguez, 2006; Lin et al, 2011). Functionalities such as SRS are furthering the development of achieving a truly pull-based system (Goutsos & Karacapilidis, 2004; Rodriguez, 2006). Not only can your ERP then allow you to employ a pull-based system but it would be able to react and change estimations in real-time, thereby achieving an even more optimal depiction of demand (Rodriguez, 2006; Verdouw et al, 2010; Hazen et al, 2016).

An example of this notion is apparent in a study of BTO in the automotive sector, meaning that cars are not set in production before the specific order has been placed (Gibson, 2004). Conducted a BTO production strategy was not really feasible before the increased information sharing, via e-commerce enabled supply chains (Rodrguez, 2006; Verdouw et al, 2010; Lin et al, 2011).

4.10.8 Achieving Agility

ERP Group	**Article & Applications**
Agility	(Kumar, 2001) – ICT in ERP (Panda & Rath, 2015), - BPA, MRA, (Gosain et. al, 2005), EDI, API (Gunasekaran & Ngai, 2003), - B2B e-commerce, EDI, Virtual enterprise, ERP (Overby & Min, 2001)-I-commerce & EDI (Dutta & Roy, 2003) - e-commerce (Mavengere, 2014), ERP (Chen et al, 2014), - IoT, CRM, ERP, SaaS, ERP, Cloud, SOA, RFID, GPS (Gnimpieba Z. et al, 2014), - GPRS, RFID, Cloud Computing, IoT, event-based (Treleven et al, 2000), - E-commerce, ERP (Siau & Tian, 2004) - CORBA, JavaBeans, DCOM, HTML, XML, SOAP, .NET & Semantic web, ERP - How to integrate internet stuff for SCM w ERP

Group 13

All previous application groups we have connoted a change in ERP as well as the environment (Treleven et al, 2000; Gunasekaran & Ngai, 2003). We can see that there has been a change in how demand is perceived, what ERPs are used for as well as increasing pressures upon the firm (Gosain et al, 2005; Chen et al, 2015). Agility is defined as the ability to cope to and perform

well in fast changing environments, so therefore the articles within this group exhibit how these abilities can be created (Panda & Rath, 2015). All these changes are happening in a rapid pace and given that ERP has enabled more efficient ways of doing business it has also thereby ramped up the speed at which you must react to stay competitive (Treleven et al, 2000; Panda & Rath, 2015). In reacting to all these changes, you need not only to have an effective application of ERP and its related functions but to be agile (Dutta & Roy, 2003; Gunasekaran & Ngai, 2003; Gnimpieba Z. et al, 2014). What this conveys is that due to the conditions described, firms need to have gain the ability to change their strategies, setups and hence also ERPs easily (Dutta & Roy, 2003; Mavengere, 2014).

Firms today face a challenge with regards to increasing their competitiveness in a connected and dynamic global market (Treleven et al, 2000; Siau & Tian, 2004; Chen et al, 2014). Organizational agility is considered as a key competence for firms to respond to these rapidly changing markets (Dove, 2001; Sambamurthy et al., 2003, as described by Panda & Rath, 2015). This is forcing firms to focus on improving their agility, which means to become flexible in order to respond to changing market requirements (Kumar, 2001; Gnimpieba Z. et al, 2014). In coping with increased uncertainty and variety in demand, the use of ERP can help to reduce response times and cycle times (Kumar, 2001; Gunasekaran & Ngai, 2003; Siau & Tan, 2004). ERP has therefore become a crucial factor for firms to stay competitive (Panda & Rath, 2015).

Although the majority of our literature sample in this grouping is conceptual or case-based, it still unanimously supports the fact that ERP enables firm agility (Overby et al., 2006, as described by Panda & Rath 2015). The use of ERPs allows firms to broaden the reach and abundance of knowledge in operations, which in turn enhance the overall agility of the firm (Treleven et al, 2000; Siau & Tian, 2004; Chen et al, 2014). Explicit examples are that modular design of interrelated business activities and connectivity between structure data has a positive effect on supply chain flexibility (Overby & Min, 2001; Gosain et al, 2005). Other studies show how firm are seeking to achieve this agility through a decentralized model, where they outsource their value adding activities and develop a virtual enterprise (Kumar, 2001; Gunasekaran & Ngai, 2003).

However, ineffective use of ERP resulting from negligent management of such activities may actually limit agility (Gnimpieba Z. et al, 2014). This can happen via e.g. sharing a broad range of information with your supply chain, which can lead to information overflow and limits the supply chains flexibility (Siau &Tan, 2004; Chen et al, 2014; Panda & Rath, 2015).

Leveraging ERP-capabilities can serve as an enabler for firm agility. However, if investments in ERPs are not are not properly managed and translated into superior capabilities, large investments in ERP will hinder the overall agility of the firm (Panda & Rath 2015). As the need for agility is created from external environmental factors, firms must focus on developing resources are required to leverage the proposed capabilities of an ERP (Siau & Tan, 2004). This will in turn enable superior agility without succumbing to the common pitfall of over-investment in ERP and its capabilities (Siau & Tan, 2004; Panda & Rath, 2015).

4.10.9 Conclusions from the ERP Application Groups

ERP Group	**Article & Applications**
Communication	(Makkonen & Mervi, 2014) -Supplier Eco-system (Kumar, 2001) – ICT in ERP for SCM (Skog & Legge 2002) - SAP R/3 – Pitfalls of ERP Imp, function→process orientation (Montoya et al, 2010)-ERP implementation-Trust (Vickery et al, 2003) -EDI (Deeter-Schmelz et al, 2001) – B2B e-commerce & EDI (Clemons et al, 1993) -EDI-Outsourcing (Nurmilaakso, 2009) – e-commerce, e-business, B2B e-commerce, ICT (Capitão et al, 2012) – ICT, Web tools Frank, 2004 – ERP, DBMS, ACID, e-commerce McLaren et al, 2002 – EDI, e-commerce, shared collaborative systems, XML, B2B, B2C Soto-Acosta & Meroño-Cerdan, 2008 – eBusiness (Value-Creation) (Siau & Shen, 2002) – m-commerce, e-commerce, wireless (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Gnimpieba Z. et al, 2015), - GPRS, RFID, Cloud Computing, IoT, event-based

	(Treleven et al, 2000) – E-commerce, ERP Møller 2005 – ERP, ERPII, e-ERP, APS, EDI, P2P, HUB, e-commerce
Customization	(Klein, 2007), - eBusiness, EDI, XML (Ross, 2005), - e-technologies, e-CRM, SFA, e-Business, EMA, CSM (Hallikas et al, 2008), - Collaborative Relationships – No spec tech (About ICT sector) Lord, 2000 – e-Business, CRM Overby & Min, 2001-I-commerce & EDI Golicic et al., 2002 – e-commerce Croom, 2005 – e-commerce, CRM, e-business, EDI (Zhao & Fan, 2007), -MC-ERP, IRP (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Hazen et al, 2016), -PPM, ERP, Circular Economy, Remanufacturing (Verdouw et al, 2010), ERP, ICT, Mass-customization (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Treleven et al, 2000). – ERP, E-commerce
Standardization	(Nurmilaakso, 2009) - e-commerce, e-business, B2B e-commerce, ICT (Gibson, 2004) - B2B e-commerce. EDI, XML, eHubs, ERP (Lord, 2000) – e-Buiness, CRM (Downing, 2010), - EDI, B2B, web-based (Rahimi et al, 2015), - Global ERP, Process (Jinno et al, 2017) – ERP, BI
Lean Management	(Schlie & Goldhar 1995) – MRP, CIM, CAD, CAM, CAE, FMS, CNC, Kanban, Value-focused (Co et al, 1998) – CIM, MRP, MRP II, AMT, MPC (Small, 1999) – AMT, CAD, CNC, AMHS, AITS, JIT, MRP II, FMS (McAfee, 2002) – AMT, ERP, MRP II, R/3 (Ward & Zhou, 2006) – JIT & IT Deployment, ERP (Deeter-Schmelz et. al. 2001) - EDI (Helo, 2004) – Kanban, MRP, ERP
Supply Chain Integration	(Devaraj et al, 2007), - e-business, VMI, APS, MPS (Clemons et al, 1993), - EDI-Outsourcing (Gibson, 2004), - B2B e-commerce. EDI, XML, eHubs, ERP (Dedrick et al, 2008), - no spec tech (Dietz et al, 2013) – ERP (Lord, 2000) – e-Business, CRM (Frank, 2004) – ERP, DBMS, ACID, e-commerce (Gonzálvez-Gallego et al, 2013) – ICT, e-business, ERP

	(Subramani, 2004) -IOS, EDI, SCMS (Rizzi & Zamboni, 1999) – WMS, ERP, DTs (Camara et al, 2014), - Web 2.0, Cloud, PaaS, SaaS (Ekman et al, 2014), Extended-ERP (Focused on customer oriented processes), Market-as-Network, (ERP, ERPII), e-Commerce (Addo-Tenkorang et al 2017), -CPD, IPD, ERP IoT-MPC, CE+, SaaS (Helo et al, 2014), - Cloud manufacturing, ERP, Virtual enterprise, (Goutsos & Karacapilidis, 2004), - e-Business, XML, EDI, ERP, DTD (Barki & Pinsonneault, 2005), - EDI, B2B &B2C e-commerce, OI-organizational intergration, ERP (Treleven et al, 2000), - ERP, E-commerce (Siau & Tian, 2004) – CORBA, JavaBeans, DCOM, HTML, XML, SOAP, .NET & Semantic web, ERP -How to integrate internet stuff for SCM w ERP
Demand Estimation	(Deeter-Schmelz et al. 2001) – e-commerce, e-business, B2B e-commerce, ICT (Lee et al, 1997) - MRP, DRP (Rodriguez, 2006)- e-business, SRS(Sense & Response Systems) (Wang et al, 2005), - SCM-oriented IOISs and Internet applications (e.g., SAP's mySAP.com), SAP Advanced Planner -ERP. (Golicic et al, 2002) – e-commerce (Croson & Donohue, 2006) - ERP (Helo, 2004) - Kanban, MRP, ERP
Push-to-Pull	(Rodriguez, 2006), - e-business, SRS(Sense & Response Systems) (Zeier et al, 2009), - RFID, DDSN (Gibson 2004), - B2B e-commerce. EDI, XML, eHubs, ERP (McLaren et al, 2002) – EDI, e-commerce, shared collaborative systems, XML, B2B, B2C (Romero & Rodrıguez, 2010) – E-commerce, ICT, WebB2B, WebB2C (Dutta & Roy, 2003) – e-commerce (Hazen et al, 2016), PPM, ERP, Circular Economy, Remanufacturing (Lin et al, 2011), ERP, ANP, TOPSIS (Talks about how ERP can help in this and that push & pull are the dynamics) (Verdouw et al, 2010), (Goutsos & Karacapilidis, 2004) – e-Business, XML, EDI, ERP, DTD

Agility	(Kumar, 2001) – ICT in ERP (Panda & Rath, 2015), - BPA, MRA, (Gosain et. al, 2005), EDI, API (Gunasekaran & Ngai, 2003), - B2B e-commerce, EDI, Virtual enterprise, ERP (Overby & Min, 2001)-I-commerce & EDI (Dutta & Roy, 2003) - e-commerce (Mavengere, 2014), ERP (Chen et al, 2014), - IoT, CRM, ERP, SaaS, ERP, Cloud, SOA, RFID, GPS (Gnimpieba Z. et al, 2014), - GPRS, RFID, Cloud Computing, IoT, event-based (Treleven et al, 2000), - E-commerce, ERP (Siau & Tian, 2004) - CORBA, JavaBeans, DCOM, HTML, XML, SOAP, .NET & Semantic web, ERP -How to integrate internet stuff for SCM w ERP

Repository 2

We have now created a cohesive framework in which we have grouped applications under several groups focused on what focus the application had. However, many applications transcend groups and hence aren't exclusively tied to a specific application group. There is however things to take notice of in the groups within this table (Repository 2). Firstly, most of the articles in our sample are about Integration, Communication & Customization applications of ERP. Furthermore, we can see that the majority of articles within these 3 groups have more recent publication dates. Moreover, other groups like Lean Management and Demand Estimation have their articles centered on a more condensed timeframe. In addition, this timeframe isn't recent. This mean that only a few of the articles in these 2 groups have a publication that later than 2005. Therefore, it seems like this grouping of applications in ERP for SCM express some change in what the applications are used for. Furthermore, the sheer number of applications used in ERPs has also experienced a significant increase. Moreover, these new applications for ERP are primarily within Communication, Customization & Integration ERP groups.

4.10.10 Synthesizing the Results from Emphasis & ERP Application Groups

We have now conducted two grouping exercises, one focused on applications and one concerned with the articles' emphasis. However, as the purpose of our thesis is to create some type of framework for ERP development and also to confirm notions we have gained throughout the grouping processes, we needed to try group these two groupings together. We wanted to try and

align the two groupings with each other to see whether there were any patterns or relations between certain applications and emphasis. Furthermore, we also wanted to see whether this could show of any evolution over time in regards to emphasis or applications. By evolution over time we mean if we any emphasis or application group could be said to have increased/decreased in importance. This would thereby provide a foundation from which we could create a framework and in what way. If we couldn't find a pattern that could be said to be apparent over time as an example, then our framework would need to be constructed without regards to time.

We started by grouping the separate groupings together. In grouping them together we tried to think which application groups that adhered to which emphasis group. In doing this we went back to the groups' review sections and tried to look for similarities. By similarities mean that the application groups shared or primarily was driven by the emphasis group is was placed in. Again, as some articles are in more than one application group, one article might be in more than one emphasis group as well. However, as most articles only was part of one application group, it is still a distinction between them. Moreover, this exercise is more about connecting the overarching themes in the application groups and relates them back to more general concepts, which are what the emphasis groups represent. Thereby this new grouping connects a more theoretical side (Emphasis groups) with a more practical one (ERP Application groups), as this grouping is focused on uncovering and sorting specific application; albeit from academia.

Article	Emphasis	Application Group
Ekman et al, 2014	Collaboration	Communication, Customization, Supply Chain Integration
Hazen et al, 2016	Flexibility	Customization, Push-to-pull
Kumar, 2001	Collaboration	Communication, Agility
Downing et al, 2010	Collaboration	Standardization
Verdouw et al, 2010;	Flexibility	Customization, Push-to-pull
Helo et al, 2014	Flexibility	Communication, Customization, Supply Chain Integration
Ward & Zhou, 2006	Efficiency	Lean Management

Gonzálvez-Gallego et al, 2013	Collaboration	Supply Chain Integration
Addo-Tenkorang et al, 2017	Flexibility	Supply Chain Integration
Gunasekaran & Ngai, 2003	Flexibility	Agility
Nurmilaakso, 2009	Collaboration	Communication, Standardization
Mavengere, 2014	Flexibility	Agility
Lin et al, 2010	Accuracy	Push-to-pull
Small, 1999	Efficiency	Lean Management
Frank, 2004	Flexibility, Accuracy	Communication, Supply Chain Integration
Makkonen & Mervi, 2014	Collaboration	Communication
Jinno et al, 2017	Flexibility	Standardization
Ross, 2005	Flexibility	Customization
Dutta & Roy, 2003	Accuracy, Flexibility	Push-to-pull, Agility
Zhao & Fan, 2007	Flexibility	Customization
Helo, 2004	Efficiency, Accuracy	Lean Management, Demand Estimation
Croom, 2005	Collaboration	Customization
Croson & Donohue, 2006	Accuracy	Demand Estimation
Co et al., 1998	Efficiency	Lean Management
García-Peñalvo et al, 2011	Collaboration	
Rahimi et al, 2015	Collaboration	Standardization
Dietz et al, 2013	Collaboration	Supply Chain Integration
Camara et al, 2014	Collaboration, Flexibility	Supply Chain Integration
Golicic et al., 2002	Flexibility, Accuracy	Customization, Demand Estimation
Goutsos & Karacapilidis, 2004	Efficiency	Supply Chain Integration, Push-to-pull
Hallikas et al, 2008	Collaboration	Customization
Soto-Acosta & Meroño-Cerdan, 2008	Collaboration	Communication
McLaren et al, 2002	Collaboration	Communication, Push-to-pull
Romero & Rodriguez, 2010	Efficiency	Push-to-pull
Overby & Min, 2001	Collaboration	Customization, Agility
Zeier et al, 2009	Accuracy, Flexibility	Push-to-pull
Schlie & Goldhar 1995	Efficiency	Lean Management
Lord, 2000	Efficiency	Customization, Standardization, Supply Chain Integration
Siau & Tian, 2004	Collaboration	Supply Chain Integration, Agility

Gibson, 2004	Flexibility	Standardization, Supply Chain Integration, Push-to-pull
Møller 2005	Collaboration	Communication
Panda & Rath, 2015	Flexibility	Agility
Siau & Shen, 2002	Flexibility	Communication
Rodriguez, 2006	Accuracy	Demand Estimation, Push-to-pull
Clemons et al, 1993	Flexibility	Communication, Supply Chain Integration
Gosain et al, 2005	Accuracy	Agility
Montoya et al, 2010	Collaboration	Communication
Devaraj et al, 2007	Flexibility	Supply Chain Integration
Klein, 2007	Collaboration	Customization
Vickery et al, 2003	Collaboration	Communication
Deeter-Schmelz et al, 2001	Collaboration, Flexibility, Accuracy	Communication, Lean Management, Demand Estimation
Skog & Legge, 2002	Flexibility	Communication
Dedrick et al, 2008	Collaboration	Supply Chain Integration
Rizzi & Zamboni, 1999	Efficiency	Supply Chain Integration
Treleven et al, 2000	Flexibility	Communication, Customization, Supply Chain Integration, Agility
Subramani, 2004	Collaboration	Supply Chain Integration
Barki & Pinsonneault, 2005	Collaboration	Supply Chain Integration
Capitão et al, 2012	Collaboration	Communication
McAfee, 2002	Efficiency	Lean Management
Wang et al, 2005	Accuracy	Demand Estimation
Chen et al, 2014	Collaboration	Agility
Gnimpieba Z et al, 2015	Flexibility	Communication, Agility
Lee et al, 1997	Accuracy	Demand Estimation

Repository 3

We have now created an overview that encompass the articles in the literature sample, with their respective emphasis and application groups. However, simply creating this overview can't provide the basis for the type of framework for understanding ERP and its application, that we want to create in this thesis. Moreover, it is cumbersome to deduce patterns from only looking at an overview. We therefore need to work with the data and combine it with other aspects that can provide us with insight if patterns or other correlations exist in the data. Thereby, the creation of

the overview serves as the first step for allowing us to get the full picture of how ERP has changed and in what regard.

As all articles now had an application and group tied to them we started to sort them in order of publication year. We did this to see whether our groupings could be useful and whether any patterns existed within this chronology. Moreover, we had already via the grouping exercise above, seen that there seemed to be certain patterns that could be deduced merely from the groupings themselves. Hence, we wanted to confirm whether these notions could be considered accurate, from a theoretical standpoint.

Year	Emphasis	Application Group
1993	Flexibility: I	Communication: I Supply Chain Integration: I
1995	Efficiency: I	Lean Management: I
1997	Accuracy: I	Demand Estimation: I
1998	Efficiency: I	Lean Management: I
1999	Efficiency: II	Lean Management: I Supply Chain Integration: I
2000	Efficiency: I Flexibility: I	Agility: I Communication: I Customization: II Standardization: I Supply Chain Integration: II
2001	Collaboration: I	Agility: I Communication: I
2002	Accuracy: I Collaboration: I Efficiency: I Flexibility: III	Communication: IIII Demand Estimation: I Lean Management: I Push-to-pull: I
2003	Accuracy: I Collaboration: I Flexibility: II	Agility: II Communication: I Push-to-pull: I
2004	Accuracy: II Collaboration: II Efficiency: II Flexibility: II	Agility: I Communication: I Customization Demand Estimation: I Lean Management: I

		Push-to-pull: II Standardization: I Supply Chain Integration: IIIII
2005	Accuracy: II Collaboration: III Flexibility: I	Agility: I Communication: I Customization: II Demand Estimation: I Supply Chain Integration: I
2006	Accuracy: II Efficiency: I	Demand Estimation: II Lean Management: I Push-to-pull: I
2007	Collaboration: I Flexibility: II	Customization: II Supply Chain Integration: I
2008	Collaboration: III	Communication: I Customization: I Supply Chain Integration: I
2009	Accuracy: I Collaboration: I Flexibility: I	Customization: I Push-to-pull: I Standardization: I
2010	Accuracy: I Collaboration: II Efficiency: I Flexibility: I	Communication: I Customization: I Push-to-pull: III Standardization: I
2011	Collaboration: I	Agility Communication Customization Demand Estimation Lean Management Push-to-pull Standardization Supply Chain Integration
2012	Collaboration: I	Communication: I
2013	Collaboration: II	Supply Chain Integration: II
2014	Accuracy: Collaboration: IIII Efficiency: Flexibility: III	Agility: II Communication: III Customization: II Supply Chain Integration: III
2015	Collaboration: I Flexibility: II	Agility: II Communication: I Standardization: I
2016	Flexibility: I	Customization: I Push-to-pull: I

2017	Flexibility: II	Standardization: I Supply Chain Integration: I

Repository 4

Once we had sorted all the articles by publication date a pattern in relation to time emerged. This pattern was related to the emphasis and ERP application groups we had created. Articles that had been thought to emphasize efficiency benefits from ERP tended to be more prevalent in the older articles. However, the more current the publication date of the article was, other emphasis groups started to become more apparent. Thereby, there seems to be a pattern of change in terms of emphasis and that this pattern can be attributed to time. This means that the reason for using ERP has changed with the passing of time. Specifically benefits from using ERP in terms efficiency isn't the definitive reason for business of today. There are thereby other emphasis groups that have gained traction with the passing of time. However, the change in emphasis is only one side of the pattern we have uncovered. This pattern was uncovered when we sorted the articles by publication date.

Regarding the ERP application groups, we were also here able to see a pattern of change. It seemed like application groups such as lean management and demand estimation had a clear connection to the efficiency emphasis group. As the number of efficiency emphasis articles decreased, so did the number of articles from the two mentioned application groups. There also seem like the increasing emphasis put on collaboration has led to changes regarding the composition of the application groups. As collaboration started to be the emphasis for using ERP, the application groups started to get more diverse. This meant that the ERP application was broader than before and thereby encompassed more aspects. Moreover, we could also see that the overall composition of application groups changed, e.g. from mostly lean management to communication. Therefore, it seems like there is a connection between the two groups in terms of how they have changed in composition over time.

Year-Span	Emphasis	ERP Application
1990-2000	Accuracy: 1 Efficiency: 5 Flexibility: 2	Agility: 1 Communication: 2 Customization: 2 Demand Estimation: 1 Lean Management: 3 Standardization: 1 Supply Chain Integration: 4
2001-2010	Accuracy: 10 Collaboration: 15 Efficiency: 5 Flexibility: 11	Agility: 5 Communication: 10 Customization: 7 Demand Estimation: 4 Lean Management: 3 Push-to-pull: 9 Standardization: 3 Supply Chain Integration: 8
2011-2017	Collaboration: 8 Flexibility: 8	Agility: 4 Communication: 5 Customization: 3 Push-to-pull: 1 Standardization: 2 Supply Chain Integration: 6

Repository 5

To get a clearer picture of the broader changes over time we grouped together the articles in decades of publication dates. This allowed us to focus on how many of each emphasis and application group that existed within a certain distinct time-frame. Hence, we could thereby see the patterns we had already suspected more clearly. Moreover, you could see the decades had very distinct characteristics. This means that the earliest decade was emphasizing efficiency for using an ERP and the applications they used were thereby mainly focused on achieving benefits in terms of efficiency. The middle-decade seems to be a transcending period as it shares characteristics of both the earliest as well as the last decade. This means that it still has a sizeable number of articles with efficiency emphasis, albeit that it is relatively small, and at the same time the first decade with collaboration emphasis. The last decade the emphasis has clearly shifted and now only encompass the flexibility and collaboration emphasis groups.

In terms of the ERP application groups there isn't as much of a clear pattern between the three decades. However, if we would harken back to the ERP application groups we created (Repository 2), it is possible to understand why this might be the case. The earlier decade has a more limited pallet of technologies that they use for the application of ERPs, examples of these

are MRP, AMT, CAD, CNC, AMHS, AITS, JIT or EDI. When we then look at later decades what becomes apparent is firstly that we have there is a much more diverse set of applications. Moreover, you have the advent of internet which has enabled a whole suite of e-solutions for the ERP applications, like e-commerce, supplier-ecosystems, SaaS, PaaS, Web 2.0 and Cloud-Manufacturing. Thereby, even though there isn't a clear trajectory for a pattern or development over time for the application groups, it has also changed albeit in a different manner. Thereby you could say that the ERP application groups has gotten more diverse to accustom the change that we have seen in the emphasis groups. What we mean by this is even though you can't deduce a clear pattern in the ERP application groups in regards to composition, there is a pattern of how the groups themselves have changed. We believe that the expansion of the groups, in terms of diversity in numbers and in capabilities adhere from that the change in emphasis has spurred such a development. We can thereby determine, through our literature review, that there is a relationship between emphasis and application groups of ERP. This relationship is furthermore signified by that the emphasis that is in primacy spurs the development of ERP applications.

Therefore, we believe that the needs that the firm has in regards to their ERP is primarily driven by what emphasis it has. This is due to that we have seen this pattern develop through time in the tables we have created in this section of the literature review. Thereby with this foundation, we propose that when the emphasis change so does the applications, to fit with the emphasis. This means that as we have seen the composition of ERP applications might not have changed but the applications themselves have changed and we see this to be connected to that we have a pattern of change in regards to the emphasis groups.

As we now have proposed that there is a pattern that can be deduced from our literature review the next question becomes what has caused this swift. This question is multi-facetted and there isn't therefore any one correct answer. Moreover, it is not within the scope of our thesis to provide an explanation for this. However, we have found evidence within the literature we have reviewed of some possible factors that has played a part in the development of the pattern. These factors will be presented in the conclusions from the literature review, as it relates more to the entire literature review than the specific table we created in this section.

5 Conclusions from the literature review

We have now gathered a literature sample via a rigid gathering and search process. Furthermore, we have worked with this literature sample to see what it could tell us. We began with grouping together articles in regards to their core meaning, which became the emphasis groups. This was done to gain an overview of what aspects that our sample was emphasizing and if there was anything useful that could be used from that process, for our research question. We could see that there were some differences between the groups' composition of articles both in terms of publication dates and number. After gaining this insight we created the ERP application groups, as the emphasis groups only represented a theoretical perspective of ERPs. This grouping was more thorough and detailed than the emphasis groups, as it was focused on specific applications. The value of the ERP application groups for our thesis was thereby the focus on uncovering if there also seemed to be any insights from in regards to the more practical nature of the applications. Moreover, we were interested if this process would yield any insights and if they would be similar to those from the emphasis grouping process. After searching through the articles for the specific ERP applications, we created the ERP application groups to get an overview of what types of applications we had in our sample. As with the emphasis groups we could see that there seemed to be some differences in the composition of the articles, both in terms of the number and publication dates. However, it was unclear if this pattern could be related to or was as strong as the one we found in the emphasis groups.

To find out if this was the case we combined the ERP application and emphasis groups. However, simply combining the two groups couldn't help us with this. We therefore needed to add aspects like time to get a sense of whether we could see the pattern or not. Once we added the time-component we could see that a pattern existed within the emphasis groups. However for the ERP application groups this wasn't as apparent. However, when we looked back at the tables within the ERP application section, we could see patterns. This pattern however was connected to that the number of applications had increased and that the sheer set of applications was thereby more diverse and had increased capabilities for the enterprise. Thereby there is a pattern regarding the ERP application groups, however it is not the same as the one in the emphasis group. This means that we cannot see that there has been a shift from a particular group towards

another, over time. However, the increase in the diversity and number of applications, in the ERP application groups, is a pattern and we still could see that this pattern has a connection to the pattern in the emphasis groups.

This entails that not only do you simply have more applications at your disposal, but perhaps also that they have a different focus in their execution. The cause of these two changes, which has become apparent from the two previous grouping exercises, is not something that is clear in isolation. Hence, we need to combine the application groups with the emphasis groups we created. In combining these two groups we would be able to point towards were this changes and adheres from or at least get hint of such. This would then point us in a direction as to how to construct our framework. Moreover, combining the two groups would enable us to have support for the notions which we developed during the separate grouping processes.

In terms of emphasis it seems like with time there has been a move towards agility and collaboration. This doesn't mean that the other emphasis groups aren't apparent today; rather it is related to the expansion of the capabilities of ERPs which has enabled such a change in the emphasis in application. As an example, EDI has been prevalent since the start of the time-horizon of the articles. However, the emphasis of why this application is used has changed over time. From our grouping, we could see that the application of EDI was sometimes seen merely as a mean towards conducting e.g. inventory management. Whereas in other articles, EDI was an enabler for achieving e.g. benefits from greater communication.

As we have mentioned, ERPs have experienced an expansion in terms of the number of applications at their disposal. This expansion of applications as we seen, haven't been with an efficiency emphasis, primarily. Instead most new applications have emphasized flexibility or collaborative aspects. ERP has been a facilitator for this movement as it as its core has expanded enterprises and integrated processes rather than functions. Hence, as we have previously discussed that integration increases complexity, it has spurred development of applications with a collaborative emphasis.

Furthermore, given that ERP have given way for an extended enterprise, firms have achieved a closer intimacy. However, this increase in the intimacy with demand has also increased the

demands for agility. These agility demands are derived by an increased demand for more customized products, as the closer intimacy has made this possible. Moreover, as enterprise continue to extend and make their operations faster and more efficient, overall competition increase as well. Thereby the new applications of ERP have exposed firms to increased competition. This competition thereby further accentuates that firms need to provide a range customizations as well as the agility to be able to change with demand. This development thereby shows that applications of today and in the future, will emphasize flexibility. Flexibility is the primary emphasis in the new applications due to their focus on providing customized products, which puts pressure on achieving agility in operations.

Lastly, all the developments we have presented induce complexity. We thereby can see that there is an interrelationship between all these developments that has ultimately led to increased complexity for firms. As an example, we have seen increasing demand on customization, which has forced companies to add processes for this in their operations. In adding more processes the entire operation becomes more complex, even though that we have seen that ERP can mitigate complexity, the very notion that you need to integrate more processes make it more complex. Another example is that, we have seen that as ERP has developed it has garnered capabilities that have allowed it to integrate more parts of an enterprise. Even though increased integration is supposed to make the enterprise's operations flow better, the simple fact that you try to integrate more will induce complexity. Hence, it is crucial to fit the needs of your company with the capabilities of the ERP. If you add capabilities that you do not need, given the emphasis of your firm, you take on unneeded complexity. Taking on complexity has a negative effect on performance and thereby you do not get the benefits from an ERP. An ERP is supposed to mitigate complexity but it can as we see then actually have the opposite effect, if it is not aligned with the needs of the enterprise.

6. Interviews

6.1 Introduction

We have now gathered a lot of valuable insights which will aid in the development of our understanding. However, this literature review used a historical approach to uncover how ERP and its application has developed. Furthermore, the literature will always have some lagging effect in its findings as these are based on already published articles. Therefore, we wanted to conduct interviews to try to get an even more current version of ERP and its application. The interviews' purpose is thereby to ratify the trends and patterns of the development of ERP and its application, which we have seen in the literature review. Moreover, we want to determine if the emphasis and application groups are relevant, by using them in the analysis of these interviews.

The upcoming section will start by describing how the interviews were conducted. This has already been described in more general terms in the methods chapter. However, in this section we will focus on how the interview was structured in even greater detail. What we mean by this is that we will describe e.g. length of the interviews, setting or other elements that could have affected the interview result. This is important due to that our sample size is small and hence it is of even greater importance to make all elements that could affect the ultimate result explicit.

We will then proceed with our different interview subjects, which we will describe briefly. This will serve to frame the presentation so that the reader can get a sense of what type of subjects that we included in these interviews. This is of crucial importance as the type of companies that we use will greatly affect the result of the interviews. Especially as we have a relatively small sample size for these interviews, it is even more important to know what type of companies that we have interviewed. This is due to that the result of each interview subject, accounts for greater importance than it would have had if we had a larger sample size.

Once we have presented the interview subjects we will go through how we achieved the output of the interviews. To begin with we want to make it explicit how we analysed the interview data, which ultimately has a large effect on the output. Another aspect of the analysis is how and why we chose the specific analysis method we used. Even though we have described what type of

analysis we will conduct, in the methods chapter, we haven't presented what or how we came up with our coding as an example. In presenting the rationale behind the coding, we want to provide transparency and clarity for the results from the interviews. Moreover, we will describe the structure of the coding process and how it was carried out. We will conclude with how we analysed it to yield the insight and findings we found and why.

Once we have presented all the different parts of the interviews, we will do a summary of this presentation. In this summary, we will try to synthesize between all the different interview parts. This will then lead us to a conclusion section about the interview data we have analyzed, in which we will display the key findings of the interview data. We will also discuss the impact of these findings briefly. This will then serve as a foundation for synthesizing the interview data and the literature review data, in the upcoming chapter.

6.2 Interview Execution

As we have previously mentioned, our interviews are semi-structured. Which means that we have a structured line of questions. However, the order of when these questions are asked isn't set and follow-up questions might be asked if the interviewee would mention something interesting. This mean that if an interviewee would mention something that could be useful for the thesis, we will not hesitate to ask follow-ups. However, we still have a frame in place, due to that we have questions which we want answered. This is therefore of help both for the interviewee and interviewer, to stay the course and not stray away too much from the overarching topic. This furthermore helps in keeping the duration of the interviews in check, as there is a structure in place.

We have in total conducted 5 interviews. These interviews have been conducted via face-to-face, skype or by telephone. This is due to that many of our interviewees weren't close by and hence we needed to use all these tools we had at our disposal. Even though one could argue that this has affected the results of interviews, we still believe that the interviews via skype or by phone closely resemble a face-to-face interview. This is due to that we have used camera devices, when available, to create a similar setting to that of a physical interview. Moreover, one could argue that this type of interview might be better as we do not influence the interviewee as much, would

we have conducted a face-to-face interview. Hence, the lack of physical interviews might not be that great of a concern from this perspective.

Furthermore, these interview subjects which we could summon were primarily chosen base on availability. This was necessary primarily due to our limited time-frame. Therefore, to get a finished product done in time, we needed to utilize our personal networks for finding our interview subjects. However, due to the nature of our thesis it is not a primary concern what position, company or industry that the interview subject has. This is due to that we believe that our research topic is at a fundamental stage. We are thereby more interested in creating an understanding, a portrayal or foundation for future research to use. Hence, it is more interesting to understanding the general aspects, at this stage of the research. We however, acknowledge that our selection of interview subjects might ultimately have effects upon our findings.

The interview questionnaire had 6 questions. These questions were concentrated on understanding the context, ERP use and its application. The first 2 questions were concerned with the interview subject, what position it had at what company and for how many years. The following questions were interested in understanding what the subject used ERP for and what it deemed to be the primary motivation for its use. This is due to that we want to uncover what we call emphasis in the literature review. Lastly, the 2 last questions were focused on what applications ERP had for the subject and whether this had changed during their time at the company. All our questions were constructed with considerations to our research question and our literature review. The questions we want answered are concerned with why ERP is used and if its application has changed. Hence, the interview questions need to be constructed in a way that can reflect that. We believe that our questions have been constructed in such a way, which have been described above (Appendix 2 & 3).

After the interviews, have been conducted we will code them to allow for the analysis. Before we move to the coding however we transcribed our interviews. These transcriptions were made from recordings that we had of all the interviews. In coding the results of our interviews, we used the groupings that we had created in the literature review. This means that for the questions concerned with ERP and motivations for its use reflected our emphasis groups. Hence, when we

coded this sections of the interviews we used the ERP emphasis groups as codes. For the questions concerned with the application of ERP, we instead used the ERP application groups as codes. Each emphasis group and application group was given their own color. Hence, we have color-coded the interviews. This helps us to code the interview data more easily and will be explained in greater detail in a section below (6.5 Coding).

The color-coding helps us to analyse said data and clearly see the patterns apparent in the interview data. We chose these codes as the ultimate purpose of the interviews is to ratify or confirm the groups and trends we have seen in the literature review. Hence, using the groups we created in the literature review is therefore suitable. It will therefore allow us to see if the groups have any explanatory power. Moreover, we will see if the same trends we saw in theory are apparent in the interviews as well. This would provide us with cache to say that our groups also hold true in practice. Furthermore, we could see whether inconsistencies in the data might could be due to other aspects rather than our groups being simply theoretical.

6.3 Interview Data Presentation

Interview # /Sections	1	2	3	4	5
Position	Junior Consultant	Commodity Buyer	CEO	Director & Majority Owner	Supply Chain Planner
Company Type	ERP-Consultancy	Truck Company	Software Company	Startup-Intelligent Lighting	FMCG
Company Size	Small	Big	Small	Small	Big

Interview Table 1

As seen in the table above (Interview Table 1), our interview subjects represent a diverse set of contexts. We have both small and large companies as well as companies from vastly different industries. Moreover, our interview subjects have varying hierarchical positions. Given that our interview subjects embody such diversity, the data from the interviews will allow us to get an overview of the supply chain. This means that as we do not have subjects from one specific positions or level of a company, we can recognize if there exists any difference in terms of our research question in this regard. Given that our research question is focused on establishing an overview to allow companies to gain an understanding of ERP and its applications by what has driven its development, it is highly beneficial with such a diverse set of interview subjects. It is beneficial as you will gain a more holistic overview the more diverse your interview subjects are. Had we used a more homogenous set of interview subjects we might have had a very narrow perspective, ill-suited for establishing general understandings of a subject.

Regarding company-size we have made broad distinctions if the company is big or small. This stems from that there is a large discrepancy between our interview subjects. We do not really have any medium sized companies as those we have interviewed either have less than 50 employees or several thousands. Hence, this distinction basically conveys whether the company has thousands of employees or if it is rather small.

All our subjects were asked the same questions from our template (Appendix 2 & 3-Interviews). When we needed clarification our wanted to explore any aspects further, follow-up questions were asked. Furthermore, we have already touched upon that these interview subjects were chosen out of convenience. Lastly, we chose only 5 to have enough time to go through all interviews in detail, due to our limited time-frame.

6.5 Coding

As we mentioned the codes for the coding the transcribed interviews were derived from the groupings that we created in the literature review. The rationale is as mentioned that the interview purpose is to ratify the existence or patterns of these groups. The interviews themselves were as mentioned transcribed from audio recordings, to assure that we didn’t miss anything crucial. We proceeded with reading through these transcriptions and code the date. Coding the data means

that we, while reading, mark certain words or phrases. You mark this to allow you be have a basis upon which you can analyze and deduce patterns from the interviews. This otherwise cumbersome due to that we deal with text, which by itself doesn't tell us anything. Through the coding however the data become more transparent in its message. The codes which essentially are the groupings, from the literature review, were also given a specific color (See below, Coding Template 1).

Color-coding was especially useful as we have so many different groups. Moreover, we do not have any specific word or phrases tied to the groups, as they are understood via their definitions. Hence, a frequency based coding system would have been too complex to execute in a valuable way. Color is thereby an easy way for us to distinguish our respective groups as well as to mark more than words. Furthermore, while conducting the coding we uncovered aspects that didn't fit into the groups, but they were still given a lot of importance in the interviews. To be able to capture these aspects as well we added a new factor color code as well. Before entering the coding we constructed a coding template in which we pre-defined all colors and definitions of the overall groups, to make the coding process coherent (See Coding Template 1).

Coding Template

Emphasis Groups

Refers to the general motivation behind using the ERP, the purpose for its use, a more theoretical or top-level view.

Accuracy	**Collaboration**	**Efficiency**	**Flexibility**
Color	Color	Color	Color

Application Groups

Refers to the specific applications of the ERP what it is used for. More operational viewpoint

Standardization	**Lean Management**	**Supply Chain Integration**	**Demand Estimation**
Color	Color	Color	Color
Push-to-pull	**Agility**	**Communication**	**Customization**
Color	Color	Color	Color

For new factors the finding is coded with red font color

Coding Template 1

As mentioned, we read through paragraphs and we marked words, sentences and paragraphs with the color we deemed to fit with. To give an example, if an interviewee mentioned that they had ERP which they used interact with suppliers, it was marked with gold (See Appendix 3-Interview Truck Company). This means that we thought this mentioning of interaction conveyed a communication application of ERP. Even though, this is a subjective exercise and you could argue that this fitted with another color-code, we have used our template (Coding Template 1), and definitions of the separate groupings for these decisions. This allows for transparency in how we actually have conducted the coding, it also gives us an objective reference point for choosing the fitting color-codes.

As we continued with this coding process, the transcribed interviews began to fill up with different colors. This pallet of different colors is then what helped us in analyzing and ultimately to extract value from the interviews. To give an example, if a certain color was very apparent

within in one interview we concluded that this emphasis and application was used a lot in this firm. Once all the firm had been color-coded we compared and looked at if the representation of colors were similar or not. If they weren't similar. then we went deeper and looked more closely as to why there was nonconformity. Regardless if the colors showed conformity or not the patterns that emerged were compared with those that we had found in the literature review. This entire analysis thereby helps us to ratify the patterns we have found in theory with support from practice.

6.4 Analysis of the Interview Data

We have described above how we conducted the actual coding and analysis process. Therefore, we will reveal what the results the analysis of the interviews yielded.

One of the first things that jumped out of the data, was that the separate interviews were very different in regards to what the coding conveyed. It therefore seems that aside from our groupings, other factors are important in establishing an understanding of ERP and its application. However, we could still see the overall patterns which had lead us to our groupings as well. Albeit that this wasn't the case for all our interviews. This notion was what lead us to search deeper as to why there was a discrepancy, in that we could see the patterns from in some companies but not in others. We will however firstly present whether our groupings seemed to be ratified and why. Thereafter we will present the new factors that affect ERP emphasis and application. These factors are those that aren't capture by our groupings but that still hold importance, from analyzing the color-coded data.

In general, the pattern which we saw in the literature review, with more emphasis towards collaboration was apparent. All companies except one mentioned that one of the main reasons why they used an ERP was to collaborate, in various ways. Moreover, most of the companies had experienced an increasing variety in the number of applications for ERP. As in our problem statement this had led to increased capabilities but had also put them under increasing complexity pressures. Even the smaller software company with a brick and mortar ERP mentioned that the system had gotten increasingly complex over the years. He mentioned that this was due to the increasing number of applications that was needed of an ERP of today.

However, as we mentioned context plays a huge part even in this instance. It might therefore be due to that it is a small software company, which has put the under this pressure. A company in another industry might therefore not have these pressures. The consulting company as an example is also relatively small but didn't have the same requirements from its environment and hence not the same emphasis.

Furthermore, we mentioned that it became apparent that other factors besides the groupings from the interviews affected ERP and its applications. This instances we grouped together and labeled contextual factors. This labeling was appropriate as we saw in the paragraph above, that although a company was similar aspects from their contexts such as size or industry affected their ERP use and application. We ultimately found 5 of these contextual factors in the interview data when we analyzed the color-coded data. These factors were job- role, size, industry, structure and global operations. As mentioned, these contextual factors were apparent to influence why an ERP was used and its application, in all interviewed companies. We will now discuss these contextual factors and in what manner we could see the influence in regards to ERP use and application.

The companies size seemed to be a factor that affected how many different applications that their ERP had. Companies like the FMCG and the Truck Company had a vast variety of use for their applications. The smaller companies mainly focused their application into a few specific areas. Another factor that held importance was the company structure. By company structure in this sense we mean how dispersed the operations of the company was. This was regardless of size, all companies that had a federated supplier base, retailer base or organization showed the same patterns. These patterns were both in terms of emphasis and application.

Furthermore, the more federated structure of these companies induced complexity and hence led them emphasize collaboration and flexibility more. Regarding applications due to the focus on these emphasis groups, applications of ERP like communication and integration where more apparent in the data. Even the small software company experienced that due to the structure of the company, they too needed their integration and communication from the application of ERP. The same holds true for the big industrial group which had a federated organization, suppliers and customer demand. For the bigger companies this pattern is accentuated due to the increased

federation of processes and organization. In relation to this the companies that had federated structures spanning borders also experienced the same pattern.

It therefore seems like a smaller company in general needs ERP for efficiency concerns. Smaller companies yield less benefits from investing in a large ERP system which could facilitate more collaborative uses. The consulting company mentioned that as the company was so small and all processes where done in-house, there wasn't really any need for workspace solutions in their ERP. Therefore, they saw the large investment this would entail as unnecessary.

Furthermore, the sector that the company operate in is also a factor that affects both the emphasis and application. The software company as an example, articulated that what they use their ERP for and what applications it has, is governed by their environment. In this case the software company mentioned that the software business as such had low margins was forcing them to use an ERP in the first place. The sector and therefore competition a company experience will affect why they want to use an ERP and the applications this requires.

Another factor of importance seemed to be the position that the interviewee had in the company. The interview subjects that were in higher echelons of the company emphasized collaboration or accuracy to gain an overview for their decision making. The more operational the interviewee the less importance did collaboration aspects hold. The consultant was merely using it as a tool for efficiently communicating their e.g. time spent. Whereas interviewees like the CEOs were more interested in gaining an overview of the operations, by integrating their federated processes. Thereby as different positions in a company have different purposes it affects why they use ERP and what applications it has. Even the buyer had different needs stemming from their position. The buyer needed to interact with a multitude of stakeholders which affected emphasis of using ERP and the application.

6.5 Conclusions from the Interviews

After analyzing our interviews, it has become apparent that, even though the basis of our groupings is still valid, more factors are needed to understand how ERP has developed. The frame to understand ERP and its applications, that we have created with the groupings, is thereby

validated from what we have uncovered in the analysis of the interview data. This frame however, has been shown to only show parts of how ERP have developed and its application. General trends as that companies today seem to emphasize using ERP for collaborative or flexibility reasons, have thereby been proven. Furthermore, the fact that the companies use a multitude of different applications, regardless has also been apparent in the interviewed data. However, the interview data has given us a more nuanced picture of why companies use ERP today and what applications they have for it. The interviews have thereby provided what we hoped as we have been able to ratify our framework from literature review. Moreover, aside from this we have found other factors that affect companies in practice. These factors thereby stem from a more practical sphere as they adhere from our interviews. Thereby the factors are more specific than the frame the groupings from the literature provided. These factors are thereby some type of forces that affect these patterns that make up the groupings. These factors are thereby something that influences the patterns or development of ERP and its application, for a firm. Therefore, the factors have an important role in why ERP is used and what application it uses it for.

7. Summary of the Interviews & Literature Review

This chapter will serve as a synthesis between the literature review and the interviews. This means that will present a concise summary of the most important findings we have found in this thesis. Creating a concise summary will allow the reader to have the findings fresh in mind before embarking on the results.

What we have found in the literature review is that we can see two main levels of analysis. These are the emphasis- and application-level. The emphasis level of analysis conveys what the entities that use ERP motivates their use with. This motivation is simply put what the firm emphasize as their underlying motivation for using an ERP. The other level of analysis is more practical and is focused on what type of applications that the ERP has. The difference between these two is that the emphasis level serve more as a theoretical underpinning or justification for using a ERP. Looking at the application level it conveys the more direct uses or applications of the ERP. Essentially the application level shows by what means firms are trying to achieve their emphasis.

Furthermore, the literature review showed of a shift in terms of emphasis and ratified the concerns about increased complexity from an increased application portfolio. The shift in showed us that firms today seem to, per academia, be more focused on using ERPs to increase collaboration or flexibility. This is interesting due to that in its infancy ERPs were primarily used for driving efficiency. However, today gaining efficiency via ERPs isn't a differentiator anymore, other emphasis is thought to be more important to stay competitive. As we described in the introduction of our thesis, we mentioned that the business environment experienced increased complexity. This complexity was stated to be due to an increased application portfolio for ERPs. An increased application portfolio is something that became apparent after our literature review as well. Hence, we can assume that the source of increased complexity is due to the increased application portfolio. However, the groups we created for the application couldn't show of any pattern in regards to what applications that seemed to be most prominent today.

The most important takeaways from the literature review is thereby the shift in emphasis and that an increased application portfolio has caused this complexity surge. This means that in terms of the emphasis groups there has been a pattern over time in terms of a shift in emphasis. In regards to the application groups, the pattern isn't tied to a shift but an increase in the number of applications of ERP.

Moreover, from the interview data we garnered new insight into ERP use and application. In the interviews, it became apparent that there were some factors outside of the emphasis and application groups. We labeled these contextual factors as they were recurring factors throughout the interviews and stemmed from the respective subjects' context. This signifies that ERP initiatives is something that is very much affected by context. This means that even though we can see that there has been an overall pattern in regards to ERPs in general, from over literature review, context commands importance. It therefore seems suitable that the trends which we have found via our literature review should therefore only be consider as general trends. This means that they more so work as something that showcase a development pattern, in relation to the groups we created in the literature review.

Firms wanting to pursue ERP initiatives should therefore look to their context to see what environment they operate in. As we have seen in the interviews there were some trends in regards to these factors and the emphasis and application groups. Hence, the contextual factors might be good indicators of what direction would be suitable for the firm in question's ERP initiatives. The factors and ERP groups thereby serve different purposes. The ERP groups that we have created seem to provide a good framework for classification and directing your ERP initiatives. The contextual factors on the other hand is what determines which direction that is suitable for the specific firm in question. Albeit that this is not the complete truth, as our research is limited. This still provides a good foundation for discussing more concrete solutions to the problem which we have described in our problem statement.

We have now provided a summary of the findings from both the literature review and the interviews. These findings have been discussed separately and in conjunction with each other. This has provided a concise presentation of the thesis and its progression thus far. We are now in a good position to discuss what the results of this presentation entail. Furthermore, we will elaborate and show a proposed outline of a framework, which we will provide a consolidation of this understanding we promised to deliver. This framework is however as mentioned only an outline and is based on the findings which we have presented above. It is therefore only meant to serve as a visual representation of our findings and to be the starting point for developing concrete tools for dealing with the complexity problem.

8 Results

8.1 Introduction to Results

Have now entered the results chapter of this thesis and will hence described the finidngs this thesis has yielded. Our findings are based on our through literature review and the interviews, which complemented and ratified what we found in the literature review. Furthermore, these the interview and literature review findings have then been summarized separately and in unison. Through these two exercises, we are now able to present the results of the findings from the literature review, interviews and their synthesis. We will thereby present the key findings of this thesis and how they can be used to solve to answer our research questions. Ultimately, this chapter will thereby provide the reader with what we have deemed the foundations for understanding ERP its application and development.

Moreover, we will end the results section with a framework outline. This framework outline will serve as a visual representation of all the findings. It thereby serves as some sort visual summary of the entire thesis. We believed that this would be a suitable way to express the findings in a condensed way. We thought that this was a suitable way to end the results chapter, as a large part of our thesis has been very theoretical in nature. Hence, the findings might be hard to digest and a framework outline that is presented visually might help with the intuitive understanding of what we have uncovered.

This is especially important due to that our thesis has had a theoretical approach, albeit with empirical elements. However, as we have stated previously, this outline is more so to get an understanding of the issues at hand in this thesis. This understanding will then hopefully allow for practice to get a direction of how to tackle the complexity issues we have raised in regards to ERP and its applications, however this will be elaborated on in the managerial implications and conclusions chapters.

Lastly, in making the results presentation visual we hope that the results will transcend better to practitioners. We believe a visual framework will transcend better to practice as it gives a tangible overview in a concise manner of the findings. It is therefore an easier digest of the most important insights that this thesis provides. Constructing a visual framework of our insights will

thereby allow, not only academics to interpret and find value from the results but for practitioners as well.

8.2 Reasoning Behind the Framework Outline

As presented in our introduction the purpose of this thesis was to provide an understanding of ERP and its applications. Specifically, in order to be able to understand why complexity has become a major concern and provide insight into resolving this issue. Moreover, we have seen in both the literature review and interviews, that we have found certain "rules" that could allow us to frame an understanding of ERP and its applications. We have been able to uncover that we have two set of groupings (Emphasis & ERP Application Groups) that provide parts of these governing rules for the understanding we wanted to build. The emphasis groups conveyed the reason that motivated a certain use of ERP in general whereas the ERP application groups depicted the more practical applications of the ERP.

Moving on, by conducting our interviews and analyzing the data from them, we gained a practical perspective for the two groupings (Emphasis & ERP Application Groups). This means that we could point to specific instances where e.g. a certain firm had a efficiency emphasis and certain ERP applications. In addition to providing this practical perspective, the interviews also provided us with the contextual factors. These worked as mediators that influenced both what application groups that were used and the reason for using ERP (emphasis). This meant that we could see some divergences in the interview data regarding the overarching patterns which we had found in the literature review. However, although there were instances where the patterns from the literature review didn't work, in general they could be ratified. It was rather due to the contextual factors than anything else that could explain the divergence. Thereby, the general pattern of a shift in emphasis from efficiency to collaboration/flexibility was ratified. The pattern regarding ERP applications, an increasing number and diversity of applications, was also proven to be accurate.

Ultimately, we synchronized all the findings from the literature review and interviews. When we cross-examined the findings in this way it became apparent that all these three aspects of our understanding (Emphasis Groups, ERP Application Groups and Contextual Factors) had

interrelationships with each other. Meaning that we could see that they had influence upon each other. We could see that emphasis influenced what applications that were used and likewise that the contextual factors directly influenced the applications of ERP as well. The contextual factors relationship with the emphasis couldn't be proved directly within this thesis as it would only have been speculation as we had no data to back such a relationship.

However, as we have mentioned all these concepts and relationships which we have described are highly theoretical and hard to grasp. Therefore, the construction of a visual framework outline for this understanding can work as a mediator for presenting our results in a more intuitive way. The mediation that the framework is supposed to provide is between the massive amounts of written text in this thesis, and its audience. This framework is however only an outline, due to the limited amount of time and resources that we have had at our disposal for this thesis. What this means is that this framework outline is only a visual representation of the findings within this thesis. We thereby don't want to convey that this framework would be a tool or model that can be directly applied to the problem described in this thesis.

Even though this framework is only an outline, it allows for a concise overview of the what aspects that affect the complexity problem we have described. It can therefore possible give firms a better understanding of what things to consider to avoid the complexity problem. You could potentially view this something that provides firms with a mindset. This mindset is represented by an increased understanding of what fundamentally affects ERPs and its application. With this framework outline we can at least provide the seed for future research to provide a more thorough framework or tool to provide explicit guidance for tackling complexity within ERP and its applications. This framework outline ultimately brings the separate parts of our thesis together in a condensed visual manner.

8.3 Presentation of Our Findings

In this thesis, we have been interested in developing a fundamental understanding of ERP and its applications, by focusing on how ERP has developed throughout time. We have used both a literature review and interviews to understand this and answer our research questions and thereby

provide insights into the overarching problems with the lack of strategies for tackling the increased complexity with ERPs. When we started this thesis with our literature review we identified two overarching themes within the literature that framed the structure of our thesis. These two themes were the Emphasis and Application groups which adhered to that we could see that articles tended to focus on either the motivations behind a certain application of ERP or the specific application itself.

These two major themes thereby became what we used to frame the entire thesis. In terms of the literature review specifically we used these themes to search for patterns. As we have showed in previous sections, we could show of some pattern developments over time within these themes. In term of emphasis this pattern was represented by a clear shift within this theme. A clear focus shift was visible, from efficiency to emphasis themes which focused more on collaboration and flexibility as main motivations behind using ERPs. Regarding applications, the pattern was more so related to an increased expansion of the portfolio of applications, rather than a shift. This furthermore ratified the description of causes for the complexity increase, in our problem introduction. Already in our literature review we were thereby able to garner valuable insights.

As mentioned the themes we had discovered in the literature review became the guiding star for the rest of the thesis. Hence when we progressed to our interviews these themes were what guided the construction of our interview questions. Even our interviews confirmed these patterns which we had seen in the literature review, thereby ratifying that the current environment also reflects the same patterns. However, with the interviews other aspects aide from our themes proved to be important for ERPs and its applications. We tried to survey the interview data and find commonalities in the factors across the interview subjects. This was to see which of these factors that could be said to be general factors that affected the issue at hand. We found a set of factors which were all interview subjects had mentioned as something that affected ERP use and application.

A major insight was however that these factors weren't related to the same sphere as the ERP emphasis or application groups. These factors were also apparent to be things that were related to the specific contexts or subject in question. Hence these factors were contextual and couldn't be segmented like the groups from the literature review. Instead the contextual factors work more as

relative parameters. This means that the factors are always relative to their context and specific company in question. The factors are therefore not as absolute as the groups from the literature review. The factors are more about positioning your firm relative to your context in regards to these factors. These factors therefore work as some sort of mediator. What is meant by this is that the contextual factors can affect otherwise general trends. Therefore, we believe that the contextual factors are at least part of the explanation as to why we could find irregularities even among our small sample.

We were thereby now in a position where we had three components which we deemed to govern what our understanding of what an ERP and its applications are. Now we progress with putting the governing rules of understanding ERP and its application in a visual framework outline. This outline is thereby a representation of what this understanding that we have been searching for is composed of, it also showcases the relationships we have found between these rules. It thereby provide what we set out to find, namely an understanding and that this then can serve to partly explain the complexity we have seen in our problem statement. This framework is regardless a starting point for taking this research for devising the actual strategies to tackle the complexity to the next level.

8.3 Framework Outline

Visualizing our findings via this framework outline present a cohesive way to understand the results of the thesis. Furthermore, as the thesis has been done in fragmented parts a visualization, like a framework outline, serves a vessel by which an integrated whole of the thesis can emerge.

We will now show how we constructed the synthesis between the findings into the framework outline and described how it should be interpreted (Figure 1). Moreover, these three specific entities that we have described above in our results, share a relation with each other. These relations that they share with each other is also captured in this model, via the blue arrows (Figure 1). Furthermore, we have placed the entities in regards to how we believe that they are connected. What we mean by this is that as e.g. the contextual factors are present in the context we show them as floating around the ERP. The ERP is therefore represented by the application and emphasis bubbles (Figure 1). What we want to convey by this is that these two are directly

connected with each other and are something that we believe what composes an ERP. There might obviously be more granularity to this but this understanding is based upon what we have uncovered in this thesis.

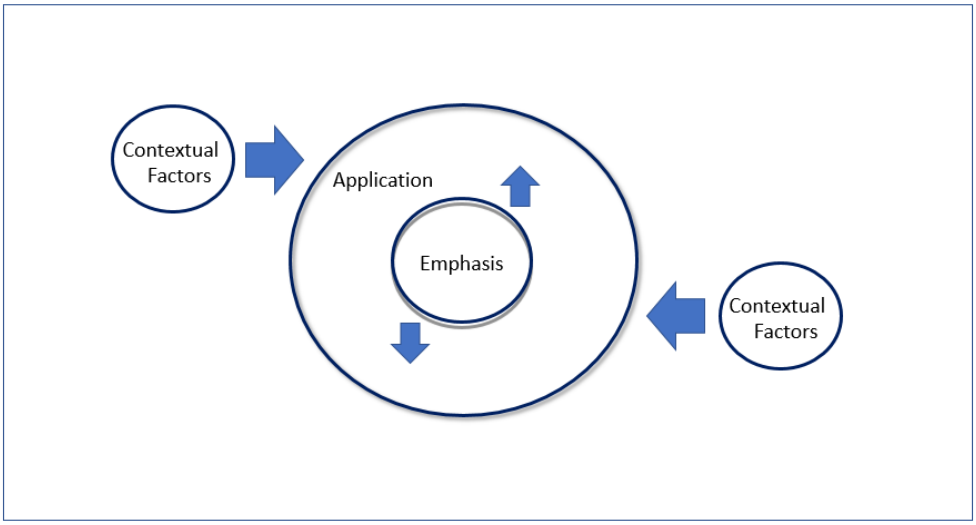


Figure 1

The relation that the different entities shared became apparent when we synthesized our findings from the literature review and the interviews. This framework outline is thereby based upon these insights. The first insight was that a pattern existed in terms of time. It was in the emphasis groups that we could see a pattern over time. We could here see that the motivations behind using an ERP had changed. It has changed in that the more current the publication date of the article the more apparent it became that flexibility and collaboration were the main emphasis. This was further ratified via the interviews as most subjects conveyed this patterns development.

However, not all interview subjects could be said to convey this fact. Therefore, there must be other factors that influences the emphasis behind using ERP. In the interviews, we could find factors that didn't fit into the framework of application and emphasis groups that we had created in the literature review. As these factors often referred to factors such as company size or market we called these contextual factors. We therefore view these contextual factors as a sphere outside of our original framework. The contextual factors are albeit affecting the components of our original framework, as described in our interviews.

What this entails for our framework outline is that even though we can portray a general trend in regards to emphasis and ERP application, context still matters. Therefore, we in this outline of a framework reinstate that context plays a large part in what motivates ERP use (emphasis) and what applications you want. As an example, the consultant company in our interviews used ERPs mostly for efficiency concerns and hence for fewer applications. However, the small software company used ERPs for different emphasis, which was more in line with the general emphasis trend that we found in the literature review. Albeit due to the more junior role the interview person at the consultancy had, we acknowledged that role was a factor that also affected ERP application and emphasis. Another observation which implies the importance of context was that the interviews subjects that worked for larger companies, tended to use more applications in general.

As we have clarified that context plays a big part we will now turn our attention to the other big finding that our framework outline presents. Even though we couldn't tie a trend to a specific application there were still trends in regards to the application groups. The literature review had already ratified that the problem description of increased complexity due to increased application. We therefore have a pattern in regards to the application groups as well. This pattern towards more complexity from increased numbers of applications could be tied partly to emphasis. As collaboration and flexibility concerns for using ERP increase, the more applications are needed. The interview data further enlightened us in regards to the increased number of applications. Interview subjects that conveyed emphasis like collaboration or flexibility, tended to use more applications. The interview subjects that portrayed that they ERP emphasis related more to efficiency concerns used far less applications. Therefore, another insight for this framework outline is that the application of ERP is affected by the emphasis.

The application of ERP is thereby affected by two different entities. On the one hand, we have emphasis which primarily influences the number of applications, per our findings. The other force that effects application of ERP is related to the contextual factors. These insights can thereby work as a guidance for companies. The guidance that this framework outline is supposed to provide is thereby to get an understanding of what it is that affects the application of ERP. In understanding, what it is that effects the application of ERP companies can get a mindset of how

to think about their IT initiatives. When a firm lacks guidance in how to deal with the increased complexity we have seen that complexity and thereby ultimately performance is affected.

In providing a framework outline that at least can guide firms in assessing the requirements upon their IT-initiatives is very useful. By using a framework like the one we have outlined the firm can take an inward approach and thereby understand what it is that affects their ERP application needs. Firms thereby get a standardized starting point in assessing what the requirements for their ERP initiatives should be. A more developed outline could thereby have a good effect on success with ERP initiatives. This is due to this loss of direction we mentioned in the problem statement. Knowing what areas to survey if you lack direction to what you want to achieve with you ERP initiative, will therefore mitigate complexity levels. This mitigative effect comes from the sheer fact that getting the direction to what the ERP initiative should do and what that requires will not allow you to add as many unnecessary applications. This is due to that firms achieve a better position from which they can articulate the requirements they have upon their ERP initiatives. What enables this position is the ability to get a direction as to why they want an ERP solution to begin with.

As we have described above complexity arises due to an expansion of the application portfolio. With this thesis, we have provided more nuanced explanations as to why the application portfolio has expanded. These explanations have built a foundational understanding and a framework from which you build on, to devise strategies to tackle the arising complexity. Even though we only have an outline which is to be seen more as a visual mind-map than a tool, we believe that it provides some grounding for firms which are at a loss in regards to their ERP initiatives. Therefore, a major result from this thesis is that we have built a foundation for understanding how ERP has developed. This has been done via a literature reviews in which we have created a classification scheme which serves as the basis of the framework outline. The groupings are thereby a good contribution as it provides a way for directing or classifying your ERP initiatives. This is then both in regards to emphasis and application. The interviews have deepened the understanding as to what forces that affect ERP initiatives.

In summary, the result of this thesis is a classification scheme which distinguishes between what emphasis an initiative has and what means (applications) you use. Furthermore, we have factors

outside of these groupings which adhere to the context of every firm. These factors influence the applications you use as well. Together these findings have enabled us to create a framework for understanding ERPs and furthermore how you can use this understanding to get direction in regards to your ERP initiatives. Ultimately, this is supposed to mitigate the problem of increasing complexity from an increased application portfolio. The mitigative effect is supposed to come from a greater understanding of ERP and, with the help of the framework, get a direction as to what applications that fits your firm. Thereby, you can choose those applications that fits your firm and hopefully not end up with excessive applications, lading to less complexity.

As we have stressed throughout the thesis this is supposed to be the foundation for a more concrete tool. We thereby do not perceive this framework to provide full guidance as to what a firm should do explicitly. Even the direction the framework outline might provide could be vague. However, despite of these facts it still serves as a foundation for inducing the mindset of how you could think to at least mitigate the problem of increasing complexity, somewhat. The main purpose of the framework outline in this thesis is however more so to provide transparency, even though it could have the mentioned applications.

9 Conclusions

This thesis has presented the development of ERP emphasis and application, to understand how provide insight in how to tackle the increased complexity in this space. Via understanding how ERPs have developed we have created a classification scheme by which you can categorize ERPs. As we have seen in our literature review, the understanding of why ERPs are used has changed over the course of time. This understanding is what we have labeled emphasis. Moreover, ultimately determined that there has been a shift in emphasis, towards using ERPs for mainly collaboration and flexibility reasons. Earlier iterations of ERPs were focused on and mainly used for efficiency concerns but now both the applications of ERPs have increased along with the change in emphasis we mentioned. Regarding the application groups, we could not deduce any shift as we did in the emphasis groups. The pattern that was apparent in the application groups were instead regarding the number of application of ERP. As the emphasis shifted we could thereby also see that more applications were deployed. Essentially this entails

that emphasis groups such as efficiency doesn't need as many applications to fulfill its needs. Emphasis groups that are more prevalent now, collaboration and flexibility, are thereby in need of a more diverse set of applications to meet its needs. Applications of ERP has thereby seen a pattern of increased numbers and diversity. ERP have thereby increased its application pallet and harnessed an increased scope of application.

Drawing from the patterns of our respective groups, the development in terms of ERP applications, has enabled firms to do things that were previously unthinkable or cumbersome. Applications such as e-solutions have enabled integration to previous unseen levels. Moreover, external factors as globalization have drastically changed the context firms operate in. Firms are now dealing with increasing pressure in regards to customization, variety and availability.

These changes have as we have seen resulted in a change in the direct application of ERP in business. Meaning that whereas ERP was previously applied to achieve efficiency gains, this driver has been downplayed in favor of collaborative or flexibility emphasis. We can thereby see that emphasis has driven the applications of ERP. When it had a focus towards efficiency the applications were less in overall number and concerned with a limited scope of the business. Once the emphasis changed towards collaboration or flexibility, it consequently required a change for the applications of ERP as well. Emphasizing e.g. collaboration or flexibility therefore has a direct impact, not only on the development of ERP applications but also for a specific firm. This is due to that you as a firm that has these types of emphasis require more applications of ERP to succeed with your overall business. A miss-match regarding emphasis and application has as we pointed out caused a rampant surge in complexity, which firms do not know how to tackle. Hence, it is incremental that a firm understands whether it is a firm that should have a larger and diverse set of applications, which would entail an emphasis on flexibility or collaboration. As we have seen that complexity is a big problem in this environment, firms would with this framework outline we have provided, be in a better position to understand what they require from their ERP. Firms can therefore instead focus on using applications they need to achieve their business goals. Thereby avoiding to incur more complexity, via using unnecessary applications that doesn't align with the business needs i.e. the emphasis. Even though this might make intuitive sense and seem

like something we portrayed in the research purpose, the frame for a more granular understanding hasn't been in place.

Moreover, from the interview data we analyzed we uncovered that there were factors outside of the classification scheme we developed in the literature review. When we analyzed the data in the interviews we began to see patterns in regards to some factors that seemed to affect the ERP use and application. Factors such as size of the company or the role of the interviewee, was deemed to be integral factors for developing a thorough understanding of the problem we wanted to solve. The common theme of these factors was thereby that they didn't fit in our groups from the literature review, however they all stemmed from context and was hence labeled contextual factors. These contextual factors are something to consider as they seem to play a large part in why firms apply certain applications or have a specific emphasis. Many reasons why e.g. the truck company used a more collaborative emphasis could be traced back to the contextual factors. The interviewee in that interview e.g. had a role that involved a lot of collaboration and the company was large and with a global footprint. Furthermore, these factors were a big reason as to why some of our interview subjects had deviations compared with the general trend we found in the literature review. The consultant that we interviewed specifically mentioned that due to the size of the company and his role, they used their ERP with mostly what we have called an efficiency emphasis.

This ultimately connotes that ERPs is contextual and therefore needs holistic approaches in regards to integration, application and research. Solving the problem that we set out to solve is thereby no easy task. We are suggesting that there is a high possibility that more contextual factors exist. However, the foundational work that this thesis represents for this research space is however a stepping stone into better understand ERPs and develop tools to tackle the inherent complexity. With the emphasis groups, application groups and contextual factors we do believe that we have created what we set out to do in this thesis. We thereby believe that the classification we developed via our literature review, coupled with the contextual factors; has provided a framework outline that can allow us to better understand ERP and its applications. However, we acknowledge that our thesis has been limited in scope and that it only provides a limited amount of guidance as to how to concretely tackle complexity. The overarching goal has

been achieved regardless as we have an understanding with a solid foundation, with insight as to which direction you need to go to tackle the problem.

10. Managerial Implications

As mentioned managers tend to have problems when they want to embrace ERP. The framework outline for understanding ERPs and its application that we have presented in this thesis, will help managers and executives to align the needs with the ERP applications on the market. From the literature review, we found that ERPs amount to complex concept that has evolved a lot throughout time. This is one reason we could find in our literature review, as to why it is hard for firms to align the emphasis of the firm with the applications of ERP. As we have mentioned previously, the development of ERP has led to increased complexity, due to the increased number of applications. We thereby have seen that the firms take on an excess of applications that induce complexity, especially if most of these applications do not align with their emphasis.

This framework that we have created will give managers a good foundation for coupling their thinking patterns when pondering actions involving ERPs. Understanding the interplay between emphasis and applications that we have described, will allow managers to get a better sense of what applications they require. In understanding the emphasis their firm has behind using ERP, decision-makers will find it easier to see what applications this requires. This mitigates the risk of taking on excess applications. In understanding what applications, you require to fulfill the goal of the investment, you are in a better position to have a beneficial outcome of your ERP investment. Hence by understanding the interplay, your investment will be optimized as you are minimizing the risk for the induced complexity from ERPs, which we have described. In realizing the complex nature of ERPs managers will therefore have a more solid foundation to make decisions from in regards to ERP-related decisions.

Our framework will thereby work as a guide for managers to get an overview of applications, and what applications that suits them, given their emphasis. Furthermore, it might also enable managers to analyze their ERP setup and determine what applications they should invest in, to fit their emphasis. Furthermore, getting this perspective on ERPs will provide managers with a more thorough understanding of the interplays apparent between ERPs and what factors can influence

it. This can then, as we mentioned, help the firms to position themselves in the framework and hence understand what applications they should require.

In summary, managers face a complex set of problems in dealing with ERPs. These issues in ERP aren't a firm issue anymore but have rather transcended to become a more integral part of the overarching network. ERPs are now such an integrated part of operations that managers must take ownership of this. Efficiency has been proven to hold less importance for ERPs today. Our findings therefore have an impact on managers, as they need to ponder a whole set of factors in terms of how to apply ERP in their own firms. ERP isn't a one-dimensional issue and therefore ERP initiatives need to acknowledge the interplay between emphasis, applications and complexity. This is therefore the most important managerial implications of this thesis, the acknowledgement by decision-makers of the interplays that ultimately affect the fit.

11. Future Research

This thesis has focused on developing a fundamental understanding of ERPs and their applications. As we have mentioned, this is needed to be able to develop more comprehensive tools or frameworks for firms to deal with the complexity of the ERP environment. One such tool could be an ERP roadmap for firms. This roadmap could have the application and emphasis groups presented in this paper as its foundation. These groups have already been developed and defined within this thesis and would therefore provide a classification structure for the roadmap.

An ERP roadmap could assist firms to devise a development path for their ERP setup. In having such a roadmap, you could identify potential pitfalls and risks even before they occur. Thereby you would have enough time to allocate resources and develop plans on how to deal with these potential risks. Moreover, you would be able to get a strategic perspective regarding your ERP setup. This would enable you to see in what direction you would need to take your ERP setup to stay competitive. What would be needed to develop a roadmap like this is to do a literature review with a focus on technologies. This is due to that you need to get a sense of what technologies that have been developed and what they can be used for. In this thesis, we have focused on how ERP has developed. However, it was focused on what already has been developed and not on how discovering forward looking trends. Moreover, interviews could be

conducted and they should be focused on uncovering the demands that firms think they will require in the future, regarding their ERPs.

Another tool that would be of interest for future research to develop, is one which can assist in the process of matching the emphasis groups with the specific applications. This would help companies in in terms of reducing complexity in their ERP environments, as you would know what applications a certain emphasis usually needs. This research could take the form of a case study of specific industry, with the aim to develop a model that can primarily be used for more firms within the industry. Alternatively, studies can be focused on a broader scope, to try and develop models that are generalizable across firms and industries. We suggest that a broader literature review can be used for such purpose, building on the proposed application and emphasis groups from this paper.

In this study, we couldn't see any trend or pattern in relation to a specific ERP application, although we had already see a general trend regarding the applications. It would therefore be of interest if future research could tie find if there exist any trends or patterns regarding any specific application of ERP. This could be done by isolating each of the application proposed in this paper, and considering how they relate to the patterns we found in the emphasis groups. We suggest that a method using interviews could be used. The interview questions would be created in such a way as to be digging into a specific application, and uncover if the specific application in isolation show evidence of the same pattern as the emphasis groups did or if any other could be found.

Moreover, as our data collection was limited, the generalizability of our results is limited. Therefore, we suggest that future research could apply a broader data collection to find support for our proposed groupings, and possibly contribute to developing the emphasis and applications groups further. This could be done by following a similar interview based method across firms and industries. We suggest that in-depths interviews with senior members of an organization can be used to grasp the main emphasis of using ERP in an organization. This is suitable as they hold a more high-level view of the function of their respective ERP setups. To look into the particular applications of ERP in an organization, we suggest that in depth interviews with employees with a more functional role in the organization. An alternative method would be to use a survey. A

survey with similar questions as those in our interviews could be distributed within an organization. This would be done to try to uncover the specific emphasis and application groups used within an organization. This would allow for researchers to get a detailed view of a particular organization in terms of emphasis and application in their ERP setup. Even though a survey might provide less robust answers, focusing on only one organization can yield a holistic picture of one specific entity. In addition, such research could possibly contribute to additional contextual factors that might exist within this particular firm.

Speaking of contextual factors, we have pointed out that factors such as the size of a firm might be an important variable to consider, besides the emphasis and application groups. It would therefore be interesting if future research could confirm the impact of these contextual factors. In addition, further research can help uncover more contextual factors, and specify what they impact specifically. What mean here This could be done by surveying firms with different sizes across industries according to a pre-defined criterion of size, such as for example the number of employees. It is of importance as size could be defined by revenue instead if number of employees, and these two aspects might have very different impact. Thereby, it would be interesting to see if the contextual factors could be looked at a more granular level.

The emphasis and application groups could furthermore also be used as grounds for a cross-organizational and cross- industry study. This could contribute to the generalizability of our findings. Building on the framework we have presented in this paper, it would be interesting to see if the same patterns can be found across industries. This could be done by done in a literature study by grouping literature according to industries, to see if emphasis and application groups differ from one industry to another. Alternatively, a survey method could be leverage across several companies to draw on empirical evidence to determine how the findings from this study varies across industries.

Building on contextual factors, we suggest that future research could look more into geographical aspects. How you view ERP might vary from one country to another. It could very well be true that the pattern we have found in this thesis is a western phenomenon. Other geographical areas might have different needs and context that affect ERP application. It would thus be of interest to understand if there might be contextual factors that relate to a specific geographic region and

why. Furthermore, it would be interesting to see how geographic region impact what we found in the regarding the emphasis and application group. Moreover, it you could also look into if the ERP patterns we have found in this thesis are universal.

Lastly, it is of importance to mention the aspect of technological innovation within ERPs, and how that might affect or impact development. Modern application of cloud based ERP systems could potentially be tied to a change in emphasis and/or application groups presented in this paper. We therefore suggest that future research could be needed to determine the interplay between technology, emphasis and application of ERP. This could be done by performing a literature review over a similar period such as this paper, where technologies are grouped according to distinctive characteristics. These groupings can then be to be compared with the of application and emphasis groupings in this paper. This essentially means that you could expanded upon the foundational framework of application and emphasis groups we have already created. By putting specific technologies in such a framework, you would be in a good position to develop predictive tools. These predictive tools could thereby help to foresee the requirements of ERPs in the future.

12. Reference List

12.1 Academic Articles

Addo-Tenkorang, R., Helo, P. T. & Kantola, J., (2017) Concurrent enterprise: a conceptual framework for enterprise supply-chain network activities, *Enterprise Information Systems*, 11 (4), pp. 474-511.

Barki, H. & Pinsonneault, A., (2005) A Model of Organizational Integration, Implementation Effort, and Performance. *Organization Science*, 16 (2), pp. 165-179.

Cámara, S. B., Moyano Fuentes, J. & Maqueira Marín, J. M., (2015) "Cloud computing, Web 2.0, and operational performance: The mediating role of supply chain integration", *The International Journal of Logistics Management*, 26 (3), pp. 426-458.

Capitão, S., Almeida, A. M. P. & Vieira, R. M. (2012) Connecting Families and Schools of Students with Deafness: Describing the ICT and Internet use in Education., *Procedia Computer Science*, 14 (1), pp. 163-172.

Chen, S-L., Chen, Y-Y. & Hsiu, C., (2014), A New Approach to Integrate Internet-of-Things and Software-as-a-Service Model for Logistic Systems: A Case Study., *Sensors*, 14 (1), pp. 6145-6163.

Clemons, E. K., Row, M. C. & Reddi, S. P., (1993), The impact of information technology on the organization of economic activity: the "Move to the middle" hypothesis., *Journal of Management Information Systems - Special section: Strategic and competitive information systems*, 10 (2), pp. 9-35.

Co, H., Patuwo, E., & Hu, M., (1998), The human factor in advanced manufacturing technology adoption: An empirical analysis., *International Journal of Operations and Production Management*, 18 (1), pp. 87–106.

Croom, S. R., (2005), The impact of e-business on supply chain management: An empirical study of key developments, *International Journal of Operations & Production Management*, 25 (1), pp. 55-73.

Deeter- Schmelz, D. R., Bizzari, A., Graham, R. & Howdyshel, C., (2001), Business-to-business online purchasing: Suppliers's impact on buyers' adoption and usage intent. *The Journal of Supply Chain Management*, 37 (1), pp. 4-10.

Devaraj, S., Krajewski, L. J. & Wei, J. C. (2007), Impact of eBusiness technologies on operational performance: The role of production information integration in the supply chain., *Journal of Operations Management*, 25 (6), pp. 1199-1216.

Downing, C. E., (2010), Is Web-Based Supply Chain Integration Right for Your Company? *Communications of the ACM*, 53 (5), pp. 134-137.

Dietz, J. L. G., Hoogervorst, J. A. P., Albani, A., Aveiro, D., Babkin, E., Barjis, J., Caetano, A., Huysmans, P., Iijima, J., van Kervel, S .J. H., Mulder, H., Op 't Land, M., Proper, H. A., Sanz, J., Terlouw, L., Tribolet, J., Verelst, J. & Winter, R. (2013), *The discipline of enterprise engineering, International Journal of Organisational Design and Engineering*, 3 (1), pp.86–114.

Dutta, A. & Roy, R. (2003). The physics of e-commerce supply chains. *Information Systems and e-Business Management*, 1 (2), pp. 175-188.

Ekman, P., Thilenius, P. & Windahl, T., (2014) Extending the ERP system: considering the business relationship portfolio, *Business Process Management Journal*, 20 (3), pp.480-501.

Frank, L., (2004), Architecture for integration of distributed ERP systems and e-commerce systems, *Industrial Management & Data Systems*, 104 (5), pp. 418-429.

Fielder, K. D., Grover, V., Teng, J. T. C. (1996). An Empirically Derived Taxonomy of Information Technology Structure and Its Relationship to Organizational Structure. *Journal of Management Information Systems*, 13 (l), pp. 9-34.

Garcia-Peñalvo, F. J., Zangrando, V., Seoane Pardo, A. M., Garcia-Holgado, A. & Ovide, E., (2011), Learning European history and geography in a multicultural and ICT-perspective., *International Journal of Technology Enhanced Learning*, 3 (4), pp. 343-354.

Gibson, P. R. & Edwards, J., (2004), The strategic importance of e-commerce in modern supply chains., *Journal of Electronic Commerce in Organizations*, 2 (3), pp. 59-76.

Gonzálvez-Gallego, N., Molina-Castillo, F-J., Soto-Acosta, P., Varajao, J. & Trigo, A., (2015). Using integrated information systems in supply chain management., *Enterprise Information Systems*, 9 (2), pp. 210-232.

Golicic, S. L., Davis, D. F., McCarthy, T. M. & Mentzer, J. T., (2002). The impact of e-commerce on supply chain relationships., *International Journal of Physical Dsitribution & Logistics Management*, 32 (10), pp. 851-871.

Gosain, S., Malhotra, A. & El Sawy, O. A., (2005), Coordinating for Flexibility in e-Business Supply Chains., *Journal of Management Information Systems*, 21 (3), pp. 7-45.

Goutsos, S. & Karacapilidis, N., (2004), Enhanced Supply Chain Management for e-business transactions., *International Journal of Production Economics*, 89 (1), pp. 141-152.

Gnimpieba Z, D. R., Nait-Sidi-Moh, A., Durand, D. & Fortin, J., (2015), Using Internet of Things Technologies for a collaborative supply chain: Application to tracking of pallets and containers., *Procedia Computer Science*, 56 (1), pp. 550-557.

Gunasekran, A. & Ngai, E. W. T. (2004), Information systems in supply chain integration and management., *European Journal of Operations Research*, 159 (2), pp. 269-295.

Hallikas, J., Varis, J., Sissonen, H., & Viorlainen, V-M. (2008). The evolution of the network structure in the ICT sector. *International Journal of Production Economics*, 155 (2), pp. 296-304.

Hazen, B. T., Mollenkopf, D. A. & Wang, Y., (2016), Remanufacturing for the circular economy: An examination of consumer switching behavior., *Business Strategy and the Environment*, 26 (1), pp. 451-464.

Helo, P., Suorsa, M., Hao, Y. & Anussornnitisarn, P., (2014), Toward a cloud-based manufacturing execution system for distributed manufacturing., *Computers in Industry*, 65 (1), pp. 646-656.

Helo, P., (2004), Managing Agility and Productivity in the Electronics Industry., *Industrial Management and Data Systems*, 104 (7), pp. 567-577.

Jinno, H., Abe, H. & Iizuka, K., (2017), Consideration of ERP Effectiveness: From the Perspective of ERP Implementation Policy and Operational Effectiveness., *Information*, 8 (14), pp. 1-11.

Klein, R., (2007), Customization and real time information access in integrated eBusiness supply chain relationships., *Journal of Operations Management*, 25, pp. 1366-1381.

Kostoff, R. N., Boylan, B. & Simmons, G. R., (2003) Disruptive technology roadmaps., *Technological Forecasting and Social Change*, 71 (1), pp. 141-159

Kumar, K., (2001). Technology for supporting supply chain management: introduction. *Communications of the ACM*, 44 (6), pp.58-61.

Kvale, S., (2006), Dominance Through Interviews and Dialogues., *Qualitative Inquiry*, 12 (3), pp. 480-500

Lee, H. L., Padmanabhan, V. & Whang, S., (1997), The Bullwhip Effect in Supply Chains., *Sloan Management Review*, 38 (3), pp. 93-103.

Leong, L. (2008). Value Chain Management in Online Reverse Auctions: Towards Strategic & Operational Excellence, *Journal of Management Information and Decision Sciences*, 11 (1), pp. 13-28.

Lin, C-T., Chen, C-B. & Ting, Y-C., (2011), An ERP Model for Supplier Selection in Electronic Industry., *Expert Systems with Applications*, 38 (1), pp. 1760-1765.

Lord, C. (2000) The Practicalities of Developing a Successful e-Business Strategy, *Journal of Business Strategy*, 21 (2), pp. 40-43.

Makkonen, H. & Mervi, V. (2014). The role of information technology in strategic buyer–supplier relationships. *Industrial Marketing Management*, 43 (6), pp. 1053-1062.

Mavengere, N. B., (2014), Role of Information Systems for Strategic Agility in Supply Chain Setting: Telecommunication Industry Study., *The Electronic Journal Information Systems Evaluation*, 17 (1), pp. 100-112.

McAfee, A. (2002). The impact of enterprise information technology adoption on operational performance: An empirical investigation., *Production and Operations Management*, 11 (1), pp. 33–53.

McLaren, T., Head, M. & Yuan, Y., (2002), Supply chain collaboration alternatives: understanding the expected costs and benefits. *Internet Research*, 12 (6), pp. 348-364.

Montoya, M. M., Massey, A. P. & Khatri, V., (2010), Connecting IT Service Operations to Service Marketing Practices., *Journal of Management Information Systems*, 26 (4), pp. 65-85.

Møller, C., (2005), ERP II: a conceptual framework for next-generation enterprise systems?, *Journal of Enterprise Information Management*, Vol. 18 Issue: 4, pp.483-497

Nurmilaakso, J-M. (2009), ICT solutions and labor productivity: evidence from firm-level data. *Electronic Commerce Research*, 9 (3), pp. 173–181.

Overby, J. W. & Min, S., (2001), International supply chain management in an Internet environment: A network-oriented approach to internationalization, *International Marketing Review*, 18 (4), pp. 392-420.

Panda, S. & Rath, S. K., (2016), Investigating the structural linkage between IT capability and organizational agility: A study on Indian financial enterprises, *Journal of Enterprise Information Management*, 29 (5), pp. 751-773.

Quine, W. V. O., (1951), Two Dogmas of Empiricism., *The Philosophical Review*, 60 (1), pp. 20–43.

Rahimi, F., Møller, C. & Hvam, L., (2016), Success in Process Standardization: Explaining the fit with international management strategy., *Business Process Management Journal*, 22 (6), pp. 1212-1246.

Rizzi, A. & Zamboni, R., (1999), Efficiency Improvement in manual warehouses through ERP Systems implementation and redesign of the logistics processes., *Logistics Information Management*, 12 (5), pp. 367-377.

Rodriguez, W., (2006), E-Business Operations Shift: From Supply Chain Management to Sense-and-Response Systems., *Journal of Internet Commerce*, 5(4), pp.73-87.

Romero, C. Q. & Rodriguez, D., (2010), E-commerce and efficiency at the firm level, *International Journal of Production Economics*, 126 (2), pp. 299-305

Ross, D. F., (2006), E-CRM from A Supply Chain Management Perspective., *Information Systems Management*, 22 (1), pp. 37-44.

Schlie, T. W. & Goldhar, J. D., (1995), Advanced manufacturing and new directions for competitive strategy., *Journal of Business Research*, 33(2), pp. 103-114.

Siau, K. & Tian, Y., (2004), Supply Chain Integration: Architecture and Enabling Technologies, *Journal of Computer Information Systems*, 44 (3), pp. 67-72.

Siau, K. & Shen, Z., (2002), Mobile Commerce Applications in Supply Chain Management., *Journal of Internet Commerce*, 1 (3), pp. 3-14.

Skog, W. & Legge, M., (2002), Evaluating Enterprise Resource Planning (ERP) Systems using an interpretive approach, *Knowledge and Process Management*, 9(2), pp. 72-82.

Small, M., (1999), Assessing manufacturing performance: An advanced manufacturing technology portfolio perspective. *Industrial Management and Data Systems*, 99 (6), pp. 256–267.

Soto-Acosta, P. & Meroño-Cerdan, A. L., (2008), Analyzing e-business value creation from a resource-based perspective., *International Journal of Information Management*, 28 (1), pp. 49-60.

Subramani, M., (2004), How do suppliers benefit from information technology use in supply chain relationships?, *MIS Quarterly*, 28 (1), pp. 45-73.

Treleven, M. D., Watts, C. A. & Hogan, P. T., (2000), Communicating along the Supply Chain: A Survey of Manufacturers' Investment and Usage Plans for Information Technologies., *American Journal of Business*, 15 (2), pp. 53-62.

Verdouw, C. N., Beulens, A. J. M., Trienekens, J. H. & Verwaart, T., (2010), Towards dynamic reference information models: Readiness for ICT mass custimisation., *Computers in Industry*, 61 (1), pp. 833-844.

Vickery, S.K., Jayaram, J., Droge, C. & Calantone, R., (2003). The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships. *Journal of Operations Management*, 21 (1), pp. 523–539.

Wang, J., Jia, J. & Takahashi, K., (2005) A study on the impact of uncertain factors on information distortion in supply chains., *Production Planning & Control*, 16 (1), pp. 2-11.

Ward, P. & Zhou, H., (2006), Impact of Information Technology Integration and Lean/Just-In-Time Practices on Lead-Time Performance., *Decision Sciences*, 37 (2), pp. 177-203.

Zhao, Y. & Fan, Y. S., (2007) Implementation Approach of ERP with mass customization., *International Journal of Computer Integrated Manufacturing*, 20 (2-3), pp. 160-168.

Zeier, A., Hofmann, P., Krüger, J. & Schapranow, M-P., (2009), Integration of RFID Technology Is a Key Enabler for Demand-Driven Supply Network, *IUP Journal of Supply Chain Management*, 6 (3-4), pp. 57-74.

13.2 Books

Dove, R., (2001), *Response Ability – The Language, Structure, and Culture of the Agile Enterprise*., 1st. Edition. New York, 'NY: Wiley

Eriksson, L. T. & Wiedersheim-Paul, F., (1997), *Att utreda, forska och rapportera*, 5th. Edition. Malmö: Liber Ekonomi.

Fejes, A. & Thornberg, R. (2009), *Handbok till kvalitativ analys*. 1st. Edition., Stockholm: Liber

Justesen, L. & Mik-Meyer, N., (2011), *Kvalitativa Metoder – Från vetenskapsteori till praktik*. 1st. Edition, Lund: Studentlitteratur.

Ridley, D., (2012), *The Literature Review. A step by step guide for students*. 2nd. Edition., London: Sage Publications Ltd.

12.3 Electronic Resources

Accenture Tech Trends (2017) Technology Vision 2017., https://www.accenture.com/us-en/insight-disruptive-technology-trends-2017 [2017-09-09]

Gartner (2016) Gartner Says Through 2018, 90 Percent of Organizations Will Lack a Postmodern Application Integration Strategy., http://www.gartner.com/newsroom/id/3233217 [2017-09-09]

Vetenskapsrådet (2002) Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning [rapport och rekommendationer] http://www.codex.vr.se/texts/HSFR.pdf [2017-05-12]

Appendicies

Appendix 1: Analysis model

Article & Author	Problems addressed	Research questions	Research design & method-logy	Type (Structure, Relationship…)	Conclusions	Illustrations

Appendix 2: Interview Transcripts

Interviews with Commodity Buyer

Q: We will now begin this interview. I've explained the interview framework and gone through the questions with the interviewee beforehand. So let's start with the first question: could you describe the company that you work for?

Yes, the company I work for is XX AB. It is the parent company for XX trucks and different cars.

Q: Basically you work within truck company, specifically but it's a large conglomerate.

Yes, and what we do in Volvo Trucks is that we buy, for me I'm a buyer, so I buy for investments team. We buy buildings construction equipment, and machinery, and different line production.

Q: Basically things that cost a lot of money? But you are specifically involved in indirect purchasing so it's not directly related with production?

Yes, so IPS. I had different experiences in Volvo Powertrain so I have long experience in Volvo as a buyer.

Q: Let's continue with the next question, could you describe what you use ERP for in your role?

I use it as a communication tool where I can find and extract data from different databases, where I can also find supply management reports, where I can find the spend of each supplier, for example each site and so on, which buyer is responsible for each segment.

Q: Would you say that this communication is more to collaborate with stakeholders?

Yes, so I work with Volvo services, and we collaborate with different stakeholders with XX AB, so what this means is that we buy different kinds of projects for XX AB. So for example, we have a project now with Volvo Penta and we have the main responsibility to buy the buildings for Volvo Penta.

Q: So stakeholders can be within and outside the company?

Yes

Q: That's a collaboration exercise.

Yes

Q: So you would think that the reason for the using the system within the company as a whole is for collaboration, as a workspace for different entities?

Yes, since we don't have an ERP system as whole, we only use specific applications, we have different applications within XX purchasing, for example EBD – when we want to make an order with a supplier we do it there. And we have different information extraction applications like e-procurement.

Q: All these systems are specially engineered for XX AB? I would assume they're customized from an SAP base because most of these applications run from an SAP core.

I would say because we don't do the extractions ourselves. We have a company in India that does that for us. So we have outsourced our IT in this way, so what we get is reports from India, for example our monthly reports. So we don't do the extractions.

Q: Many of the reports from your side… It's hard to know how automated it is as the reports that you get are already extracted and presented by someone else.

Yes, this is to simplify for the buyers and make it more efficient.

Q: Would you say that when you use tools like Pure that you mentioned, would you say that that is you extracting data personally?

Yes, because you have some different parameters you can set in, for example if I want to go look into what purchases I made 10 years ago, and I am able to extract that kind of data, and that is the most beneficial thing with APR.

Q: And now we've talked about a bit, the applications that you use within your role. What would you say are the areas that you use them in, what type of applications? Geared toward estimating demand, lean management?

It's more focused on previous purchases within the company, and then we can also do a measurement on what we did before and how good are we doing now. It's a performancement measurement where you can see, for example maybe I did not work in one specific segment last year that I'm more involved with today that another colleague has been working for. I can contact that colleague and ask, what did you think what was the cases for you. And maybe if there were complications I could also speak to that person.

For us it's more about seeing the history and this will also lead us to be more efficient.

Q: I understand it's more to get an overview and make decisions based on accurate data rather than being efficient even within your role. Moving on from there, on a company scale, what are the main drivers to use ERP within the company as a whole? Is it different or the same as your role?

I would say it's very alike. As a buyer, you are in this spider web and always have to grab a new person. And the IT systems we have it makes it much easier and efficient to see who is buying what and who is responsible for what segment. It makes it much easier to work since XX AB is a huge company and we it's quite hard because you can't just go to Asia. It's much easier to do it on your computer and you can see which person and pick up the phone and call. So it's much more of a time management issue we are facing in XX AB and we always try to make it more efficient.

Q: So for the company as a whole it's about integrating the whole supply chain and integrating stakeholders into your decision making and standardizing this process on a company scale?

Yes, you can say it's similar to lean management where we have the same equal parameters we are measuring as lean management, and the main driver here is costs. The cost of time – it takes too much time and consumes too much energy to not do these processes.

Q: Would you say the main focus is integration, more in your role and the company scale? Keeping in mind that it is such a large company and apps are de-coupled, maybe the applications are targeted towards connecting the links in the chain…

Yes, but another problem we have as the VP said, they are de-coupled and maybe we should have some integrated ERP systems, but for now it was a choice that has been made that it would be easier for us as buyers to have this outsourced and have someone else do the extraction of data because that helps us and offers a more standardized formatting. So in Volvo AB, we don't use different kinds of extractions

Q: So therefore applications going forward , would be to standardize this process via an integrated system that would integrate the chain

Yes, for example SAP, they work in other processes, but we try to make it more simplified in Volvo AB and that's why we don't have the same working culture.

Q: So it's about finding the right vendor that would work within the processes of Volvo AB and the challenges you face.

Yes.

Q: Would you also say that you have customization? Is this a driver on the company level or in your role that ERP could help with?

For me, yes a lot of customization. For example, I have more LS2 roles within my buyer role. I have to choose which supplier to choose and make different orders, and that's two different processes. It becomes quite hard for me to be able to do those extractions in one application, so that's why we have 2.So you optimize the applications towards one or two queries.

Q: So talking about customization, do you find that stakeholders demand more customized support from you? Or those stakeholders want customizable service from you as a buyer.

Yes it depends because different stakeholders have different demand on information. For example buying the truck is not the same as buying a boat, the components of what goes in are very different. All the components also reflect the different machine area. And for us you don't

always know the technical aspects or requirements so ERP makes that easier. And we have an application that has different kinds of drawings on the different components, and different machinery. So we also buy tools for the machines, and there you have to know how many mm you need and things like that. So there's so many things to have in one joint application so it would be too hard if it was all spread out.

Q: So basically you can see demands for customization both in your role and for stakeholders you deal with? And there's a lot of things to keep track of that should be customizable? But you would need a standardized process to address this which isn't quite in place yet. ..

Yes, for example we always have new products coming in so we always have to shift old products to the new, which is also very time-consuming. It wouldn't be possible to do this with pen and paper or to just call people around Volvo AB because it's too much time and not efficient.

Q: Do you see that you seem to collaborate with a lot of different stakeholders in decision making? Do you have tools in ERP that would help you to gather business intelligence for the decision process.

For now, I would say no, I think this is still coming in the future.

Q: You say you have reports which are somewhat BI.

Yes we have it sort of but in the future we need a lot more, because our applications aren't Volvo standardized from that high of a degree, so I think there's more potential for standardization.

Q: OK I think that concludes the interview, thank you for your time.

Interview with ERP Consultant

This is my interview with my friend whom I have explained all the questions to. So I will refer to the questions in the numbers they have been given in the questionnaire and also explain what we need to get out of the interview questions.

Q: So if you would start with the first question and describe your company / employer..

My company is an ERP consulting company. We are oriented towards ERP, unit for business world. That is in ERP which is mainly focused on service organizations, government services and so on.

Q: What would you say that your role is within this company?

My role is working as an ERP application consultant, which means that I am the one that does the configuration and setting up in the system. Usually a more senior consultant does the designing and analysis of needs for the customer and after that, my part begins where I do the configuration and translation of those needs into the system.

Q: So your role is more operational than strategic?

Yes.

Q: Would you say that you use ERP on a daily basis even within your work, even though you sell ERP integration services?

Yes. I also take the role of an end-user, so to speak, on a day-to-day basis.

Q: Can you describe the main focus that you have when using the ERP systems within your role, as a whole?

My role is not that intertwined with ERP as an end-user. What I do mainly, is report my time and look at balances, apply for LOA, and so on in ERP.

Q: So if I would put that in a framework regarding uses for flexibility, accuracy, or efficiency. What would you say the main focus for your company's use of ERP?

I would say for me it's about efficiency.

Q: What would you say are the main drivers for your company as a whole for using ERP systems?

It's about efficiency and reporting.

Q: Would you say that that is due to your company specifically or would you maybe see that there is also use for collaboration concerns?

Collaboration across companies you mean?

Q: Both within your company, and possibly across other companies as well.

For my organization, not so much since we're a very small company. We don't have the need to leverage the system for collaboration since we're so few. Once we become more employees / a larger company, sure…

Q: When you use it between companies, would you say then it's mainly used for collaboration, or is it used to make communication efficiency, or simply to communicate more easily?

Well that really depends on what you define as collaboration and communication. If you mean working together in projects, I would say not so much. ERP is an excellent link to the end customer for voice control and so on, but as a tool for driving projects as the actual workspace not so much… more tracking and reporting and so on.

Q: What we mean when we say efficiency, then we think more of traditional manufacturing companies for an example that might use ERP or more primitive version by using the system to govern the process chain as a whole. Would you say that describes what you do? Or is it more than that, within ERP, that connects the entire organization, and in that way collaborates.

Well it's a pretty complicated question… one step at time. For my company, it's a little different than a manufacturing company, in the end it's about resource allocation tracking. That resource allocation for me and where I work a lot, to track how we spend our time… from the time spent and so on. That's up to a huge increase in efficiency, due to ERP which would be hard to obtain without a centralized database. For manufacturing oriented companies, it's still a lot about tracking. Where do we put our resources and what do we have to gain from it? And that is a huge job to do manually. If you had the same database, then it's a lot easier to check reports, and do comparables that you don't really think you need. But it would take a long time to get otherwise.

Q: Would you say that for your company, it is not explicitly about efficiency. It's also about accuracy, making sure that the invoice amounts and time spent are correct?

Of course, yes.

Appendix 3-Color Coded Interviews

Interview 1 – ERP Consultant

This is my interview with my friend whom I have explained all the questions to. So I will refer to the questions in the numbers they have been given in the questionnaire and also explain what we need to get out of the interview questions.

Q: So if you would start with the first question and describe your company / employer..

My company is an ERP consulting company. We are oriented towards ERP, unit for business world. That is in ERP which is mainly focused on service organizations, government services and so on.

Q: What would you say that your role is within this company?

My role is working as an ERP application consultant, which means that I am the one that does the configuration and setting up in the system. Usually a more senior consultant does the designing and analysis of needs for the customer and after that, my part begins where I do the configuration and translation of those needs into the system.

Q: So your role is more operational than strategic?

Yes.

Q: Would you say that you use ERP on a daily basis even within your work, even though you sell ERP integration services?

Yes. I also take the role of an end-user, so to speak, on a day-to-day basis.

Q: Can you describe the main focus that you have when using the ERP systems within your role, as a whole?

My role is not that intertwined with ERP as an end-user. What I do mainly, is report my time and look at balances, apply for LOA, and so on in ERP.

Q: So if I would put that in a framework regarding uses for flexibility, accuracy, or efficiency. What would you say the main focus for your company's use of ERP?

I would say for me it's about efficiency.

Q: What would you say are the main drivers for your company as a whole for using ERP systems?

It's about efficiency and reporting.

Q: Would you say that that is due to your company specifically or would you maybe see that there is also use for collaboration concerns?

Collaboration across companies you mean?

Q: Both within your company, and possibly across other companies as well.

For my organization, not so much since we're a very small company. We don't have the need to leverage the system for collaboration since we're so few. Once we become more employees / a larger company, sure…

Q: When you use it between companies, would you say then it's mainly used for collaboration, or is it used to make communication efficiency, or simply to communicate more easily?

Well that really depends on what you define as collaboration and communication. If you mean working together in projects, I would say not so much. ERP is an excellent link to the end customer for voice control and so on, but as a tool for driving projects as the actual workspace not so much… more tracking and reporting and so on.

Q: What we mean when we say efficiency, then we think more of traditional manufacturing companies for an example that might use ERP or more primitive version by using the system to govern the process chain as a whole. Would you say that describes what you do? Or is it more than that, within ERP, that connects the entire organization, and in that way collaborates.

Well it's a pretty complicated question… one step at time. For my company, it's a little different than a manufacturing company, in the end it's about resource allocation tracking. That resource allocation for me and where I work a lot, to track how we spend our time… from the time spent and so on. That's up to a huge increase in efficiency, due to ERP which would be hard to obtain without a centralized database. For manufacturing oriented companies, it's still a lot about

tracking. Where do we put our resources and what do we have to gain from it? And that is a huge job to do manually. If you had the same database, then it's a lot easier to check reports, and do comparables that you don't really think you need. But it would take a long time to get otherwise.

Q: Would you say that for your company, it is not explicitly about efficiency. It's also about accuracy, making sure that the invoice amounts and time spent are correct?

Of course, yes.

Q: But again, as you said, due to the size of the company, the leverage for using it more as a collaborative workspace is limited.

Yes.

Q: Moving on from this, I was hoping that you could describe some ERP applications that you use in your role specifically.

Yes, well coming back to question 3… it would be mainly reporting my time, submitting my timesheets, applying for leave of absence and so on.

Q: So it's basically reporting applications, keeping track of things and making sure the data is accurate?

Yes, it's mere reporting on how I spend my time.

Q: Would you say that that emulates a lean enterprise in some sort of way? Do you think that this application that you use is used more on an overall level to track how resources are spent and such? Not so much individually for a manager or employee?

Yes. That's a huge part of why they want me to report my time.

Q: But then coming back to the previous questions of using ERP as a whole, what you say as to why you use these specific ERP applications… as we've defined communication – as a means for communicating knowledge between entities of the firm – using that as a definition, would you consider communication as a driver for using ERP as a whole within your company?

By that definition, sure, absolutely.

Q: The last question: could you elaborate on the purpose for using these specific ERP applications, for you specifically. I mean you as an employee in your role?

Well, since I'm mainly a sourcer for information, the purpose is rather narrow. It's about providing project managers with the information they need to effectively do reporting, follow-ups, strategic planning and so on. Though, for me, as a user, the purpose would be to provide information.

Q: Would you say that would be to integrate the firm, supplying information?

Yes, define integrate.

Q: Well in this space we've defined one type of ERP application to be supply chain integration and in this case we think that supply chain integration, when integrating via information, so that it can leverage this information – you've pointed out one area, resource allocation but also inventory stock levels and so on – if you were to be a production company that has stock…

The way you describe it, I think you mean you integrate the flow of information to other parts of the company.

Q: Yes, as an integrative data center…

Then yes, absolutely.

Q: There are also examples… as you've described previously, where all employees have the same process?

Yes.

Q: Is it customizable in any way?

Should you have the need to… yes.

Q: If I were to ask specifically about your thoughts of how the applications are used not in your role, but taking to the next level of analysis of the company as a whole? Would you see that you have the same motivations for using ERP there as well, or is the purpose different from that point of view.

For me it's about inputting data, and the whole point of an ERP system, I believe, is to get that out of the system. So no I wouldn't say it's the same in that regard, but regarding what we talked about earlier – integration, information and knowledge sharing … then yea.

Q: So if I want to distinguish – for you it's more of a standardized process, easy for you … and at a company level It's more about integrating data and communicating and creating a cohesive whole, overview.

Yes, that's a good way to put it.

Q: Another thing we wanted to discuss, it seems like customization for using ERP, would you say that that is apparent in your organization at a company level? Or is it due to the fact that you're quite small and cannot leverage those capabilities…

Yes, for my company the ERP and customization of our service offering are not that intertwined.

Q: What we're talking about, say service applications of ERP that would include CRM or e-business technologies, that would allow for greater customization for the customer… but as you said, maybe that is due to the company?

Yes. For us, it's not really an application we're looking for in our ERP, but on a larger scale, the more information you have, sure.

Q: I'm just trying to understand the context of your company. If you think that that plays a large part in how you use the ERP. Would you say that your company, meaning the structure and size, is an important factor of how you use ERP and why?

Yes, our use of ERP is very much decided by the size of our company and our needs.

Q: Would you say that that is true for the sector of businesses as well or would you think it's primarily due to the size.

Well, yea. For me – I work with customers in the different business, and the different verticals. Where it's more about the size and how much experience they have with ERPs and what is their legacy.

Q: So from your point of view does it seem to matter that the company using ERP is a production vs. service company? Does that determine how ERP is used or is it more about size?

I'd say definitely whether or not you're a manufacturing company plays a part, because then you have the whole supply chain factor and that narrows the amount of available ERPs, what you need from the ERP becomes a whole new story.

Q: Do you think it's possible to divide up a chain for a company, so the semantics are different?

No, not really. Since knowledge intense organizations where you're working more on projects than manufacturing processes, so there isn't really a supply chain. More about allocating resources, and that changes depends on what projects you have going on.

Q: But given again that you work a lot in projects, from how I understand, doesn't it seem like workspace solutions, more customizable and more integrative collaborative uses would be beneficial in the long run?

Sure but if you reach the point where manual collaboration becomes too costly and difficult to keep track of then yes, you need to expand your use of ERP, but our use of ERP would take more time.

Q: So for your company at this stage, it's more of a cost-benefit analysis, need-based solutions over expanding for the sake of expanding.

I mean if you put this way, we haven't yet encountered the pain of not keeping track of our processes. I can just speak to project managers, they're in the same room as me. But if I were to collaborate with someone in a different city, country, department or building… then yes, we would need a more sophisticated and efficient method. The project management question is far more efficient. And since I don't do the resource planning, and I'm not sure where the shoe is fitting tightly, so to speak.

Q: So you see it from a globalization and distance pattern as well?

Well yea, in the long run.

Q: Again it's due to the structure and organization of the company.

Yes.

Q: Ok I think that does it, thank you for your time.

Of course, thank you!

FMCG-Interview

This is price rounded for Denmark P: : first of all what happened, we put it our forecast. So this is demand forecast which on our colleges put in our system. On SAP this is APO.we instanned it here, ..so we don't have very much forecast left. So this is our demand forecast which one of our colleagues. So this comes from sp&I ?

This is what beens produced in the factory. Currently We have 20 min In stock. The can look at this , and say w e have too much planned, too litllle planned. So this here works like this. If we go to Poland, which is where its produced, you see a perfect picture. Non of this, we don't need any of this. It works in a push model, so when its produced, it pushes it. This is 48 millions arriving in a warehouse, Which was produced in November, so its very difficult for this..So its produceded to the end market locations. So its very difficult from this if you have a problem. So you do not need to prduce this, but you do need to produce.

Its serveral coordinates several departments and elements to essentially coordinate demand estimation with production. ?

Exatcly, and another thing is tells you is where we are. So this is a factory in turkey. So this is what the production planners do in south Hampton. They get their demand, they look at their capacity on this line. And plan where to produce, and when they cant produce something, they need to speak to the factory. And say what do we do if we cant produce something, its means we need to put in overtime.. So if you can see here, they are working working at 24/7.

So builds your capacity plans based on a demand that is put in.

TO make this work, the capacitites. The problem with this is that everyone has their own agenda, so the capacity. So that is a dilemma.

Because the bonus for the factories is based on they achieving their OE. So if your machine is not performing well, you are going to loose money. So there is an incentive here, so commit to lower capacities than you actually have.

2nd problem, all the markets ,because we work in FMG marker, and we are a public listed company

There is an incentive in the company for people not to put in their true number.

So every year, we get one capacities we get one demand signal by the end of the year it's a different one.

Its often higher, because everyone is trying to hold back on what they are commuted too. So that makes it quite difficult to

So they commit to too much, they want get a bonus. So the operation side becomes very difficult.

So when I was working in Turkey, at the Start of the year we are discussing how many people to lay off, at the end of the year we are trying to hire a million more more people. So every machine was running 24 7 , all the holidays , cuz everyone had pulled down their numbers so much . so we want from being a 30 billions factory, to a 42 million factory . so we grew by 12 million in a year. So it was

So this system allows you to uncover or align such incentives.

Not at all.

In uk we are working .

Its very hard to do an actual plan. So we have to do two plans. One in the system, and then the real system which would be volume added basically.

So this is how we do.

This is the capacity in Turkey, so in the factory in turkey you can also see it moving from planned production, to being on stock. So you always know exactly what happens in the customer.

So it like we called earlier, its about coordination as we talked about earlier. Between several departments in the company. So being able to match capacity with estimated demand.

So another thing it does, not necessarily is it allows the DRM team to . Denmark is easy, Turkey they have 17 warehouses. When the goods are produced, where do you ship it too ?so they have to decide . they have . its called a TOB planner, so It ives you a suggestion on how to build your truck, to move send the best quantity to, which location. So it gives all of this, it gives complete visabillity. Its helping people to do their jobs.

Essentially its also then about creating efficiency?

IT should optimize the supply chain, so 1 it gives you complete overview, 2 you can optimize the supply chain. 3 rd thing it allows people to do a jobs from a central location,. So the fact that the erp planner is sat in south Hampton, and the production plans are set in south Hampton. This allows for coversations on felx sourcing, so in western Europe. You can take a king regular squared,. All our products are kind of similar in terms of. So the thing that matters for operations, is what format the packs are in. IF you got a product like this, which can be made in different machines. And Poland run out of capacity. You can quickly check, so Poland has run out of capacity, does Romania have capacity ? If it does, you can move a product to Romania, and produce from there. So it allows you to optimize capacity. So whithout the erp system it would be very difficult to close down a factory for example. Because you wouldn't know what other people go, or committed to. Cause is tall mauf like you told . The factory is just toled, you are now going to produce this. And its moved over. So just how it works.

So essentially its about coordination of multiple moving parts, and communication between departments. And creating a cental overview which allows to omptimize prod schedules etc.

So just because I'm pretty sure the first recording didn't go though.

Can you just briefly just briefly desrbie the company you are employed in and your role within the company ?

I work for an FMCG company , and I am the supply chain manager for the northers Europe cluster.

We have been though the main focus and reason for using ERP systems. We have talked about the speisfic application, and the purpuses behind.

There is no criticism.'

I wouldn't say I know it well enough to criticize it. But the one thing you seem to be telling me is that the whole system seems to be reliant on the data that people actually put in the system. Say then if under and overestimated data are put into the system. This creates a problem, which keeps getting spread though departments and the organization.

Exactly.

One person makes a mistake. It's not good.

S; Not just a mistake. But also adverse incentives to not put forward accurate estimate.

P :Yeah, exactly.

So that may be a cenralI think that is it.

If there is anything in terms of specific application you guys use particular applications.

I can show you this.

Another advantage when you look at this, you can plan production with some kind of logic.

So here, you see. This is thee rothman blue for turkey. Ehh.

And it can plan it in the weekply.

They plan stuff together, they don't have to worry about cash flow in turkey. Its all very cheap. Sp their bult stock for a long time here.

2 weeks here

Then nothing

And they'll do this. So

The problem is that , which is very diff to do.

Optimizer will make this plan. And it make. Just cuz the system made it, doenst means its correct. It will never be optimal. You have to change it to make it optimal. So unless you get all the master data setup, 100% and even then. Sometimes is doensnt work. You get the right picture

In turkey, they are all 16 crews and they cant all work in the same machines. So the guys working at the sauchi machines, cant work anything else. So you may got a the right number of machines running, but you don't got the right crew machines, you have a problem. So you have to try and work out which crews to put on each mahcines. Demand and all this, capacity complient, but you may not got to produce it. So it gives you visability, but you still need experience about how to think about stuff and about your own.

So its allows to coordinate all these moving parts.

In terms of then integration, and say factories and thiugout the supply chain. This is then also something that allows you to be a step closer, say then to actual demand

. If you look at where we are now for snus. We know that wiiningtons cap. Even though we are not dealing with them on excel. We are dealing then on excel. And that's manageable, cause that is two lines say . for FNL, it almost too complicated to use with excel. But same logic, they use in fnl is the same logic used here in the SAP system.

So it maps how a supply hain, this is setup on how it should work. Ompitmally.

It esseisitially complexity. Allows you to handle complexity and show you how thing should

So that is when esperience comes in to adjust.

SO to reharsh,this allows you coordinate, better overiver, com. With factories

So you mentioned that all your system are centralized in one sytem, which runs on different modules.'

Most of our systems run on SOP.

SO that's it .

Ambianti

First question:

Get right into it, just to rehash, the interview subject is Georgios Metaxas, company ambianity. And t

Can you briefly describe the compnay where you are employed?

G: yes, ambianti is a small innovation company, that works with intelligent lighting and distributive systems.

S: what is then your role in this company?

G: I am major shareholder and director

S: Moving the 3rd questions, can you describe the main focus in using ERP sysems within your role. And as I refer to ERP systems, I am referring to the overall integration of processes within a common IT system.

G. Is is supervision of the overall process. As a director is helps to keep control over what is going on.

S. What would you say is your main driver for using ERP sysemts:

G. I would say it is keeping control, and keeping thins neat. So, to be able to track the processes and the combination with suppliers and customers, this is the main thing. Because otherwise you don't even know where you are in the process.

S: So the differences in say doin this manually, vs using a ERP system, what would you say are the main benefits you derive from using an ERP system.

G. The expected benefit is that you can manage much easier processes when they relate to multiple suppliers and customers.

S: would you say this is a matter of efficiency, being able to do this in a more efficient matter ?

G: absolutely! Efficiency here is an under run thing. Effectiveness and efficiency is usual, but efficiency is here is very important.

S: Can I ask you to describe a bit more in terms of the specific application you use, what do they do exactly?

G. Home developed, so we are very good with software, so we are using our own system. So you would know, we don't use ready made, because it is a philosophy that every company outh to have its own ERP system. Especially in the IT sector. I find it very discarecefull that IT companies rent licenses for SAP for example.

S: so it becomes a thing of honour to use a home made system.

G: I think it means that you are a waste as an IT company. Hehhe, if you cannot do you own ERP. Because it is not the most complex system to develop. So if you are an IT company, I thinkthe minimum you should be able to do is your own IT system. Heheh. So if you are not in it IT, I understand you might not use you own, but if you are in IT..

S: so as you are in IT company, you are able to leverage your own recourses to develop ERP

G: yeah.

S: In terms of describing the specific home made applications. Do you have a lot of them, do you have one central ?

G: We try to keep in central. We try to do more things on one system.

S: So you spoke abit about having multiple suppliers, and the coordination of them. Could you elaborate abit more about how you leverage ERP system could help you in terms in dealing with this.

G: yeah, definitely. So, one thing is the coordination of suppliers, the other thing is how you coordinate orders and process. So do one order and then you wait for the next order,so without the ERP system you would not know when the right time is to do the next order and things like that.

S: So now that we have talked about the specific ERP application and the main drivers in that, I want to move on to the last question and ask to you elaborate on the main purpose of using such ERP application. We talked abit about how this could be a way to increase efficiency, could you elaborate abit in terms of the overall purpose of using such ERP systems.

G: tidy I would say. You keep things tidy, so at a given moment you are ready to figure out whats going on.

S: when you say tidy, does it mean that things go automatically, that its easy to do or ?

G: I woulnt just say automatically, I would say its more about having a clear view of what is happening at any given moment. So account balances, invoices, stuff like that.

S: So if I understand correctly then, purpuses of accounting are a main driver for you.

G: Among others,

S. when you say the others:

Truck Company - Interview

Q: We will now begin this interview. I've explained the interview framework and gone through the questions with the interviewee beforehand. So let's start with the first question: could you describe the company that you work for?

Yes, the company I work for is Truck Company AB. It is the parent company for Truck Company trucks and different cars.

Q: Basically you work within truck company, specifically but it's a large conglomerate.

Yes, and what we do in Truck Company Trucks is that we buy, for me I'm a buyer, so I buy for investments team. We buy buildings construction equipment, and machinery, and different line production.

Q: Basically things that cost a lot of money? But you are specifically involved in indirect purchasing so it's not directly related with production?

Yes, so IPS. I had different experiences in Truck Company Powertrain so I have long experience in Truck Company as a buyer.

Q: Let's continue with the next question, could you describe what you use ERP for in your role?

I use it as a communication tool where I can find and extract data from different databases, where I can also find supply management reports, where I can find the spend of each supplier, for example each site and so on, which buyer is responsible for each segment.

Q: Would you say that this communication is more to collaborate with stakeholders?

Yes, so I work with Truck Company services, and we collaborate with different stakeholders with Truck Company AB, so what this means is that we buy different kinds of projects for Truck Company AB. So for example, we have a project now with Truck Company Penta and we have the main responsibility to buy the buildings for Truck Company Penta.

Q: So stakeholders can be within and outside the company?

Yes

Q: That's a collaboration exercise.

Yes

Q: So you would think that the reason for the using the system within the company as a whole is for collaboration, as a workspace for different entities?

Yes, since we don't have an ERP system as whole, we only use specific applications, we have different applications within Truck Company purchasing, for example EBD – when we want to make an order with a supplier we do it there. And we have different information extraction applications like eprocurement.

Q: All these systems are specially engineered for Truck Company? I would assume they're customized from an SAP base because most of these applications run from an SAP core.

I would say because we don't do the extractions ourselves. We have a company in India that does that for us. So we have outsourced our IT in this way, so what we get is reports from India, for example our monthly reports. So we don't do the extractions.

Q: Many of the reports from your side… It's hard to know how automated it is as the reports that you get are already extracted and presented by someone else.

Yes, this is to simplify for the buyers and make it more efficient.

Q: Would you say that when you use tools like Pure that you mentioned, would you say that that is you extracting data personally?

Yes, because you have some different parameters you can set in, for example if I want to go look into what purchases I made 10 years ago, and I am able to extract that kind of data, and that is the most beneficial thing with APR.

Q: And now we've talked about a bit, the applications that you use within your role. What would you say are the areas that you use them in, what type of applications? Geared toward estimating demand, lean management?

It's more focused on previous purchases within the company, and then we can also do a measurement on what we did before and how good are we doing now. It's a performancement measurement where you can see, for example maybe I did not work in one specific segment last

year that I'm more involved with today that another colleague has been working for. I can contact that colleague and ask, what did you think what was the cases for you. And maybe if there were complications I could also speak to that person.

For us it's more about seeing the history and this will also lead us to be more efficient.

Q: I understand it's more to get an overview and make decisions based on accurate data rather than being efficient even within your role. Moving on from there, on a company scale, what are the main drivers to use ERP within the company as a whole? Is it different or the same as your role?

I would say it's very alike. As a buyer, you are in this spider web and always have to grab a new person. And the IT systems we have it makes it much easier and efficient to see who is buying what and who is responsible for what segment. It makes it much easier to work since Truck Company AB is a huge company and we it's quite hard because you can't just go to Asia. It's much easier to do it on your computer and you can see which person and pick up the phone and call. So it's much more of a time management issue we are facing in Truck Company AB and we always try to make it more efficient.

Q: So for the company as a whole it's about integrating the whole supply chain and integrating stakeholders into your decision making and standardizing this process on a company scale?

Yes, you can say it's similar to lean management where we have the same equal parameters we are measuring as lean management, and the main driver here is costs. The cost of time – it takes too much time and consumes too much energy to not do these processes.

Q: Would you say the main focus is integration, more in your role and the company scale? Keeping in mind that it is such a large company and apps are de-coupled, maybe the applications are targeted towards connecting the links in the chain…

Yes, but another problem we have as the VP said, they are de-coupled and maybe we should have some integrated ERP systems, but for now it was a choice that has been made that it would be easier for us as buyers to have this outsourced and have someone else do the extraction of data

because that helps us and offers a more standardized formatting. So in Truck Company AB, we don't use different kinds of extractions

Q: So therefore applications going forward , would be to standardize this process via an integrated system that would integrate the chain

Yes, for example SAP, they work in other processes, but we try to make it more simplified in Truck Company AB and that's why we don't have the same working culture.

Q: So it's about finding the right vendor that would work within the processes of Truck Company AB and the challenges you face.

Yes.

Q: Would you also say that you have customization? Is this a driver on the company level or in your role that ERP could help with?

For me, yes a lot of customization. For example, I have more LS2 roles within my buyer role. I have to choose which supplier to choose and make different orders, and that's two different processes. It becomes quite hard for me to be able to do those extractions in one application, so that's why we have 2.So you optimize the applications towards one or two queries.

Q: So talking about customization, do you find that stakeholders demand more customized support from you? Or those stakeholders want customizable service from you as a buyer.

Yes it depends because different stakeholders have different demand on information. For example buying the truck is not the same as buying a boat, the components of what goes in are very different. All the components also reflect the different machine area. And for us you don't always know the technical aspects or requirements so ERP makes that easier. And we have an application that has different kinds of drawings on the different components, and different machinery. So we also buy tools for the machines, and there you have to know how many mm you need and things like that. So there's so many things to have in one joint application so it would be too hard if it was all spread out.

Q: So basically you can see demands for customization both in your role and for stakeholders you deal with? And there's a lot of things to keep track of that should be customizable? But you would need a standardized process to address this which isn't quite in place yet. ..

Yes, for example we always have new products coming in so we always have to shift old products to the new, which is also very time-consuming. It wouldn't be possible to do this with pen and paper or to just call people around Truck Company AB because it's too much time and not efficient.

Q: Do you see that you seem to collaborate with a lot of different stakeholders in decision making? Do you have tools in ERP that would help you to gather business intelligence for the decision process.

For now, I would say no, I think this is still coming in the future.

Q: You say you have reports which are somewhat BI.

Yes we have it sort of but in the future we need a lot more, because our applications aren't Truck Company standardized from that high of a degree, so I think there's more potential for standardization.

Q: OK I think that concludes the interview, thank you for your time.

Interview with RUNET software

Our interview subject is Dr. Constatinos Georgiadis

Right on to the first questions if that is ok with you MR.

First question is then as follows: Can you describe the company where you are employed?

G: Im not employed, I am the CEO of the company.

The company is called Runet, software and expert systems. The company is a software company, and international software company.

IT is specialized on engineering software, this means with software dealing with Eurocodes, structural software, for building.

IT is based on the Eurocodes, based on unified code of Europe. And the Europe hits for all the European market.

So basically, what the company does, the comp. develops software and sells it in all the countries in EU, and other countries, like Australia, which have Eurocodes.

The company is not big, its small, it's a company with about 5-6 people, not big.

But also has distributors around the world, in Italy, turkey, Bulgaria, chechia, all around the world

So, without these distributors, the main company, which develops the software, is consistent. Is a very small company about 5-6 people.

S: That is great!

You briefly touched upon in the first questions, but can you briefly describe you own role in the company?

I am the CEO, and basically, I am also the main developer of the software. Basically, all the software is of my own development over the years. Starter in 1980, up to now. So, it's a long process.

So, I am the main developer of the software, and also the director of the company. So, I am giving the main direction to all the people that work in the company.

S. Further questions I would like to get more into the ERP systems.

ERP referring the to overall integration of …

Can you describe the main focus in using these ERP systems.

G: the company as I said is developing software and selling software throughout Europe. So these means we develop different programs for structural engineering programs. This means we have about 8-10 different products, ok.

No, these products are developed for the EU market, so every country in Europe uses the basic Eurocodes, but also has so national codes, which the program has to be adopted to. So, these programs have to be adapted. Also, they have to be in a different language, in English, Turkish, Greek, Bulgarian, Norwegian.. So if you put all of these together, the 10 original products, they come out to be 10 times. They come out to be 500 different programs. So they are different versions. So we have to have a system so handle all this. To be able to handle all these different programs, according to the country, the language, and the personal things the engineers have to have in each country.

So we have developed an automatic system to create the different parts of the software for specific application in the specific countries. That is one. Another part is that every program as to be locked. Because the biggest problem in software is how you protect your software. So we have another system to keep tracing the locking and the people who have the programs and the way they implement them in their machines. So all these systems.. and off course we have the logistics. All these systems which you can call ERP, are developed in house. Is this clear ? It can be a little bit complex.

S: So would it be correct to say that in your first point you are referring to an ERP system that allows you to handle the complexity that comes from dealing with multiple nations, and in the second point you made it about protecting your software, so referring to all this systems that protect and lock your systems.

G: Exactly! It is very, very tricky. The ERP systems takes care of the locking, you have to find the particular behaviour of customers in each country. So different countries behave differently,

according to the license of the software. There are country, which respect the license, which means one license for each computer. There are other counties, where are very more reluctant in the way they view the license. They try to put it in different machines. They buy 1 copy and put it in say 4-5 different computers, or give it to their friends.

So we have a software system, which traces where they put it, and activates automatically the license. So this software has built in the differences in behaviour between people in. and this is very tricky, and very difficulty to develop.

So from one point it tries to protect our software, and on the other side it tries not to offend our users. So for example a user might format his machine, and puts another software, we cannot tell him that he cannot put another software in.

It's a delicate line to develop a system, to trace this automatically.

S: So essentially, it's a system that allows for the differences between countires in protecting the software.

G. Exactly, and there is a lot of difference! Not just in Europe, but worldwide!

S: A lot of the same, if we look at the main drives for using such as ERP system….

G: We can see two different systems. One system to developed the software and another to protect the software. And then a third one for logistics. Another system.

All this are developed in house, and keep adjusting to the market, and what we learn continuously from the market. And also, we need the system, because as I said in the beginning, the software is something which, internationally, the prices are low.

So we cannot handle this with having a lot of people doing the job. We are talking about a market which has a very low profit, because the sale prices are very low, and also the money we miss from the illegal use of the software, is quite big. So basically, is you put these two together, the money we get from the prices, and the illegal use of the software, it is two factors which makes the profit very low.

If the profit is very low, we cannot have to many employees in the company, because employees means money. This means we have to develop software systems to keep tracing such things. On the other side, because its very very customized, all these things, we have to develop our selves all these systems.

S: In term of main focus, would it be correct it say that the ERP systems that you are developing in House, the in house ERP systems that allows to deal with the complexities in an atomized way.

G: YES:

S: So the automation of complex processes, in order to be cost efficient.

G: Exactly, in order to be cost efficient, in order to survive. And off course these ERP systems have to be created in such a way so all this to automatic though the internet. So somebody has to go to the internet, get an order, get a program automatically from the server, and check all this locking and everything, get an activation from the program. And on top of everything, the system we have from the behaviour of the customer, builds a profile for every customer, which gives him the right to for example get upgrades automatically for the program. Because there are upgrades which cost money, and upgrades which are free. And the system here also has to recognize automatically, because everything is done automatically, if the customer is allowed to have an upgrade, if he has to pay, and how much he has to pay.. and all these things. it's a complicated system.

G: basically it's a system that is hard to handle with people,

S: in regards to?

G: in regards to all the complexity, you have people to dedicated and learn from every customer, and learn the behaviour.

S: So the ERP system allows you to automatize this very labour intensive process?

G: exactly!

G: There has to be an ERP system that continuously learns from the behaviour.

It has to be adjusted continuously. So we started with a very primitive ERP system back in 90s, we can say 90 to 95 or something, and this system learns by itself and gets corrected continuously, to adjust into the behaviour of the customer, the market, and also the development of the European structural codes which continuously change.

S: the system has learned and is self-adaptive.

G: exactly!

S: So in terms of the 5th questions then, ERP applications that you use. We talked a lot about the first one, essentially. you also mentioned briefly something about a logistic system. ERP system that handles the logistics

G: Yeah, I can talk a bit on that. This is a logistic, how much a customer will have to pay every time buys. So if it's a good customer, he might get a special offer.

And what happens is that different counties in Europe, have different ability to buy the software. Say an engineer in Germany, earns more money than an engineer in Italy, or in Greece, or in Bulgaria. So this means that we have to have a different price and different behaviour for the accounting of the different countries, and also we have to. We have a system, which according to how many programs he / or she has, or how many versions the customer has, we evaluate the customer how many % he can have in reductions he can have when he for example gets an upgrade, or maybe he gets an upgrade for free. Or all these details. So the accounting & logistics system is developing this part. To take care of all the differences in countries. All though the prices are the same, they have to be adjusted to the different countries and also have to evaluate the customers, because. We have a lot of products, so customers start with one program, then they go to the next and the next and the next. So means that the more products they buy, the better picture. So the more a customer buys, the better prices he can get. And also, the upgrades. the Eurocodes continuously changes, and the programs continuously change. The upgrades, about every 6 months we have a new version of the program. Which means that sometimes the customers pay for it, and sometimes he doesn't pay. Gets it for free. So we try make a system to

have a logic accounting, a logic accounting system . so we don't over change the customers, and for the customer to be satisfied with the product they get, according to the prices they get.

S: So is it correct to say that a ERP system is some part of establishing a relationship with a particular customer, and giving him the prices and the services .

G: yes

S: so when you mention customer, do you also refer to the retailers / distributors.

G: well yes, we have retailers. Basically we handle all the job, and the retailers get it ready from us. And also we handle the customers in our own data base. So we give them direction on what to do.

S: So in regards to talking with the different customers, and staying in touch with the different retailers.

G: yes, so before the ERP. So we have an agreement with the retailers that they take direction from us, how they are going to talk to the customers, and what price they are going to use to the customers, and how to behave to each customers. Off course they have some freedom, but we try to implement our policies so we don't over price and we don't have customers who are dis satisfied from the products and the pricing.

G: Supposed example, is if we do a mistake…immidiatly, we give some benefits to the customers, or give something for free. We don't want to have a face to the customer that would be, say that we are running after his money.

S: So the idea is to leverage these ERP systems in such a say that you create trust between you and the customers?

G: exactly!

S: and also, further to coordinating with your retailers to ensure your policies

G. exactly! And this is necessary for a small company to survive! Because say we are small company and competing with products from big companies, which have a lot of people inside and have a lot of money, which they can put in commercial in internet advertisement, which we don't have.

So basically, our way of competing, is the way we behave towards the customers. So we are not faceless.

G. Always, we have an ERP system to correct, but we are not faceless to the customer.

S: Can you elaborate on the purpose of using ERP?

G: the point is that without this ERP system, we cannot survive, basically.

We cannot survive as a small company, you have to develop a very advanced ERP system to have always in order to survive. Very advanced, very automatic. There is no other way to survive in the software market.

S: this self-built ERP application, are a central component of your survival, via the automation that comes from reducing labour cost.

G: exactly!

S: so just to rehash as we are going towards the end here. These ERP systems help you in the sense of dealing with complexity that comes from being present in several international markets, and by automating such a process of adapting each these products to this end markets. And then its about the locking and the protection of the software, and third you also talked about the relationship you have with the retailers and customers. And how to adapt to a price and behaviour towards a customer thought the use of ERP systems

G: exactly, you said it right! These are the 3 basic points. And they are very basic, I say it again for a small company to survive. Otherwise there is no way to make it in the market. Otherwise we

would have to have a lot of money, to cover up with commercials, and your mistakes. There is no way.

You have to develop a very advanced system, in order to survive.

S: so again, all these systems are in house developed.

G: Exactly!

S: So with that we conclude the interview. Thank you for your participation Mr. Georgiadis

G. Thank you!