Automated Risk Assessment
- Potential benefits and risks in the Swedish insurance market

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Abstract
The technological advances made in society has affected many industries, one that is affected is the insurance market. The purpose of this thesis has been to identify potential benefits and risks connected to the automation of the risk assessment process of life insurance on the Swedish insurance market. In order to enhance the understanding and further enabling the identification of the potential benefits and risks the future process, as preferred by the participants, and the current process are discussed. The thesis includes the participants by using participatory design and analyzes the findings in connection to literature within the area of e-business and strategic planning.

The result shows a number of identified benefits of automating the risk assessment process along with potential risk that should be addressed.

Keywords: Swedish insurance market, medical risk assessment, automation, e-business, strategic planning, participatory design, digitalization
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<th>Medical risk assessment</th>
<th>Process in which the risk of issuing the insurance is assessed based on medical information of the customer</th>
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<tr>
<td>Medical records</td>
<td>Medical records containing medical information about the patient created by health care provider</td>
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<tr>
<td>Risk assessor/ Underwriter</td>
<td>Employee with medical training conducting risk assessment</td>
</tr>
<tr>
<td>Health application/ Health declaration</td>
<td>Application with questions regarding the customer health that is part of the application for the insurance and is the basis for the risk assessment.</td>
</tr>
<tr>
<td>Insurance application</td>
<td>The process of applying for an insurance</td>
</tr>
<tr>
<td>Insured</td>
<td>The person who’s life is subject for the insurance</td>
</tr>
<tr>
<td>Beneficiary</td>
<td>The one according to the beneficiary clause who is entitled to the insurance amount that is paid out in an insurance claim.</td>
</tr>
<tr>
<td>Actuary</td>
<td>The one who is responsible for the insurance company’s insurance technical investigations and calculations.</td>
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<tr>
<td>ICT</td>
<td>Information and communications technology</td>
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1. Introduction

In this chapter an introduction to the research area is provided along with the research problem, previous studies related to this area and description of the purpose, limitations and the importance of this research.

1.1 The Research Problem

Today most people have come in contact with the terms insurance and insurance companies. Most people have some sort of insurance to give them aid if an unforeseen event would occur. A life insurance will give financial contribution to the surviving family if the insured would die. There are a lot of different insurance companies on the market that the customer can choose between.

When a customer applies for an insurance this process is called underwriting. This process is of great importance for an insurance company since this process is used to assess the risk associated with entering an agreement with the applicant (Lee, Mark and Chiu, 2007; Asabere, 2012; Ara, Zarrabieh and Arastoo, 2014). The company agrees to a financial risk by entering an agreement with the applicant since it accepts to bear a responsibility to uphold the terms of the insurance in regards to paying out a certain amount if the insured dies. Therefore it is very important that this process is accurate and can calculate the risk accurately (Lee, Mark and Chiu, 2007).

Risk assessment is part of the underwriting process. The health declaration or application is the beginning of the risk assessment process (Bronsema et al., 2015).

The underwriting process of a life insurance can be manual and handled by an underwriter. The underwriter will be assigned the application and together with information about the customer, such as medical information, the documents submitted in the application etc, the underwriter can determine whether the applicant is eligible for the insurance (Lee, Mark and Chiu, 2007). The underwriting process requires intricate decision-making that is usually performed by an employee trained to have the needed medical knowledge (Patterson, Bonissone and Pavese, 2005).

When the underwriting process are manual the customer will in many cases not be able to apply a life insurance online without an underwriter having to assess the application, and the customer will therefore have to wait until this is done before the insurance is fully created. The process can be very time consuming (Bronsema et al., 2015).

In other industries automated system has been implemented in order to increasing capacity, decreasing cost, minimizing cycle time and increasing traceability in the process (Patterson, Bonissone and Pavese, 2005). It is of interest to understand what advantages can be found in automating the medical risk assessment process in the insurance industry, and how this can support the insurance company.

In this thesis the use of automation of processes is used to describe the digitalization of processes with use of information system to minimize the amount of manual handling in the process.
1.2 Previous Research

Aggour et al. (2006) investigates an automated underwriting system that the insurance company Genworth Financial has implemented. They conclude that the system is a success and they focus a lot on how to implement the information system.

Lee, Mark and Chiu (2007) discuss how important the underwriting process is for insurance companies. But also states that there are weak spots in the automation solutions and that this can cause the insurance company to miss out on business opportunities. They therefore present a system to address some of this weak spots and presents how some underwriting processes may look like.

Meyer et al. (1992) examines the implementation of expert system in the insurance industry. They investigate two companies that have implemented an expert system to handle some of the applications for insurances and they discuss some of the benefits this has brought to the company.

Crable, Brodzinski and Frolick (2008) presents briefly a system to handle the underwriting process automatically for an insurance company. They touch upon a few benefits of the system and addresses issues with previous versions of the system. They have also included the use of electronic application as a mean to retrieve information from the customer.

Iyer and Bonissone (2007) present a classification technique that can be used in automation of insurance underwriting and what this technique looks like. They also discuss how to detect outliers in the underwriting process and discuss how inconsistency in manual underwriting may affect fairness and transparency of the assessment of the applicant.

Glasgow et al. (1998) has reviewed an application making it possible to extract information from free-form text in life insurance applications. This application has made it possible for the company that implemented this solution to automatically assess applications based on the information given by the customer in the application.

Royce (2007) examines a system that has integrated a rule engine enabling the system to conduct the risk assessment for a portion of the insurance applications and routing the more complex applications to an underwriter. The system is able to for the less complex application either issue the insurance or decline the customer and provide the customer with an explanation.

Ara, Zarrabieh and Arastoo (2014) discusses how electronic expert system can be used in the underwriting process of life insurance. The proposed solution does not perform the risk assessment but is a way to collect the necessary information from the customer which the underwriter needs to assess manually.

Asabree (2012) proposes an underwriting expert system that will help a more novice underwriter assess the application, but the system is not able to make the assessment instead of the underwriter, but rather guide the underwriting in their assessment.
Bonissone, Subbu and Aggour (2002) discusses the area of automated risk assessment by investigating how to handle the tuning of the automated underwriting process of insurances, and how a fuzzy decision-making system can be used in order to determine the risk of the application. They emphasize the need for this process to be reliable. They compare different methods and evaluate the fuzzy decision-making system.

Patterson, Bonissone and Pavese (2005) have investigated the area of performance measurement in automated decision system. They have discussed how this can be done by discussing applying this on a development process of an automated decision making system for an insurance underwriting process. They discuss the need for having a strategy for ensuring a high quality of the system during the entire lifespan.

Garven (2002) discusses how e-commerce affects the insurance market in many ways. The author discusses some ways this can affect the insurance companies and their business processes, and that this can also have an effect on the product structure and pricing.

1.3 Deficiencies in Previous Research

The studies presented in previous section show that the underwriting process and the risk assessment are of great importance for insurance companies, and that automating the process can be beneficial. None of the studies are performed on the Swedish market, and they do address problems related to how to implement the automation solutions. Some of the listed previous studies touch upon some risks associated with automation, but they address a specific issue not the solution in whole.

Patterson, Bonissone and Pavese (2005) discusses the how to maintain performance of a decision engine in the insurance industry, but they don’t touch upon benefits that are associated with this engine. Also the article is more than 10 years old and a lot can have happened in the technological context since that article was published, other article as Meyer et al. (1992) and Glasgow et al. (1998) are also published many years ago. Crable, Brodzinski and Frolick (2008), Meyer et al. (1992), Royce (2007) and Glasgow et al. (1998) discusses cases of automating the risk assessment implemented at specific insurance companies but they fail to address some very important aspects to fully assess the system that they have investigated. Such as what criteria they are assessing the applicant on and if the system can handle assessing medical records which is a requirement on the Swedish market.

1.4 The Significance of this Research

There are several arguments to why an insurance company should implement automated risk assessment. A manual risk assessment process requires manual handling which will be based to some extent on personal knowledge, and what conclusions the underwriter draws based on the information provided by the customer. Which may result in difference in assessment depending on the underwriter assigned to the application. There may be a risk that the customers are assessed differently and therefore that the risk which the insurance company is being exposed to may differ. This also affects time required for applying for an insurance. All
customers may not be able to get the insurance immediately when applying for it online.

The technological advances made in the insurance industry changes the competitive landscape and also the nature of which products and services that the companies can offer. This will have impact on the strategy of the companies to ensure their survival. Improving the way the insurance company conduct the underwriting can be part of a future strategy and improve the way customers can apply online.

This research investigates which other potential benefits from the company’s point of view can be found by having automated the risk assessment process besides just assessing the application for a new life insurance. The research investigates in which way this can support the business and business strategy. Which other business opportunities that can be found from using such solution, or other processes that can be supported by the automated process. In the same way what potential risks surrounding this solution can be found, which would be important to address, is investigated. Such as if there’s any risk associated with excluding the underwriters from the assessing the application that the automated process will be able to handle. If this can potentially have a negative impact on other work tasks they perform that might have to be addressed and handled. This research would also contribute to filling the gap in the previous research I have identified during the initial phase. As some of the most relevant previous studies regarding the nature of the solution they have examined was written many years ago and technology in society has come a long way since then, this research would give more up-to-date results. Also this research would examine the benefits and risks more focused and from the view of the internal stakeholders in the company, who are the experts in this context.

1.5 The Aim and Research Question

The aim of this research is to investigate the possible benefits and risk associated with adopting an automated risk assessment solution for the underwriting process of life insurances in the Swedish market. This analysis will be made from the perspective of the company.

To investigate the aim the following research question is asked:

*What are the possible benefits and risk associated with adopting automated risk assessment in the underwriting process of life insurance seen from the company’s perspective?*

This will be performed on the Swedish market and limited to life insurance in order to limit the scope.

In this thesis I investigate how the automated risk assessment can support the business from the perspective of strategic planning of information system, for example which other business opportunities can be found. The other perspective I use is e-business, the implemented automated process will alter a key business process and which additional benefits and risks can be obtained from the change.
This research will contribute scientifically by bringing aspects as benefits and risk associated with automated risk assessment into light, which will give an insight into how a business critical process in the insurance market can be analyzed based on the perspectives of strategic planning and e-business. It will also expand the sparse scientific studies that have been made in the area of automated risk assessment in the Swedish insurance market. This will also give both the insurance companies and the development company insight into which aspects can support their business, the potential benefits, and which aspects should be handled, the potential risk, in order to mitigate risks for the business.

1.6 Delimitations

In order to limit the scope for this research, this thesis will aim at investigating the automation of risk assessment for life insurances on the Swedish market. The life insurance is a risk insurance that can be combined with a range of conditions that the applicant has to fulfill in order to eligible for the insurance, such as conditions regarding health. The companies that doesn’t have automated risk assessment needs to employ underwriter that has knowledge in assessing application for life insurances. The risk assessment is also of great importance for this type of insurance since it is very important for the insurance company to make sure that they do not enter an agreement with a risk level that is too high with different customer. If the company would not be able to assess the risk in a good way, they risk getting into a financial crisis when they cannot cover all the financials responsibilities they have accepted. The incorrect assessment can hurt the rest of the customers (Browne and Kamiya, 2012).

A second delimitation made during this research is that the legal aspects will not be assessed, meaning that whether a proposed change in the process would be legally possible or not will not be examined in this thesis. These aspects will be presented as they come up in the research, but not further analyzed.

1.7 Structure of this Thesis

The rest of the thesis is structure as follows: the second chapter includes basic information regarding the insurance market, underwriting and the technological advances made to give a further understanding of the research context. Chapter three presents the research strategy and methods chosen for the research as well as the empirical setting, ethical considerations and aspects related to the quality of the research. Chapter four presents the empirical findings. The fifth chapter gives a presentation of the analysis of the findings and discusses the research. In chapter six the conclusions and the suggestions for future research is presented.
2. Theoretical Framework

In this chapter I will present some basic information about insurances to enhance the understanding of this area and important elements. I will also present relevant information regarding underwriting, the insurance market, the technological advances made and important information regarding the digital framework.

For this research it is relevant to have a basic understanding of the underwriting process in insurance companies and why this process is of such great importance when later reviewing the analysis of this research. Also it is of relevance to get an insight in the advances made in the technological side of the industry and how this can affect what the companies have to relate to. This has a connection to the theory of e-commerce and digital capabilities which is reviewed later. In order to get a good foundation for the research I have mainly scanned the following areas; digital capabilities, automated risk assessment, medical risk assessment, expert system, e-business and strategic planning.

2.1 Insurance Market

In order to give a brief understanding of the insurance system it is important to understand a few basic elements of the insurance market.

An insurance is a protection for a certain event, if this event occurs a financial compensation will be given. There’s a cost for having an insurance in the form of a risk premium. The foundation for the insurance is there’s a large amount people sharing the risk by each paying a smaller amount of money to get a larger amount if the event occurs. Another foundation is that the statistical probability of the event can be calculated (Randquist, 2005).

There are both insurance for insuring property or insurance of the person. The life insurance is for insuring the life of the insured, if the insured dies the surviving family of the insured will receive a financial compensation (Randquist, 2005). This compensation can be very important for the surviving family for them to be able to have the required economy to stay in the house they are living in.

There’s both private and public insurances, this thesis will focus on the private side because life insurance belong to private insurance. A private insurance can either be individual or collective. The individual is an agreement between the insurance company and the policyholder. Collective insurance is signed with the insurance company and a group, this can for example be with an employer or a union (Falkman, 2006).

Meyer et al. (1992, p.554) defines risk as “Risk is the possibility of loss or injury and is an element of everyday life that cannot be avoided, be it the loss of life, health, or property”. Having an insurance has become the way to mitigate a potential financial loss for both individuals and organizations (Meyer et al., 1992).

The risk premium is based on what the insurance company needs to cover the insurance risk and the administrative costs (Randquist, 2005).
2.2 Underwriting
In an insurance all the insured in the collective are contributing equally to a common pool, when there’s an insurance claim this will be taken from the common pool. It cannot be predicted who will require to claim the insurance but when this happens everyone will share the risk (Hermerén, 1996).

The underwriting process is the process of determining whether to accept the applicant or not based on the risk which can be assess by reviewing medical information. This process is one of the most important processes for the insurance company so that they do not accept a risk too large and thereby accepting too much financial responsibility (Lee, Mark and Chiu, 2007). With more experience the company grows more confident and accurate in assessing and managing the risk they take on (Casualty Actuarial Society Enterprise Risk Management Committee, 2003). Assessing risks are a fundamental part of the insurance business, in order to meet the competition in the market the insurance companies are working continuously with improving their internal risk management processes by for example using more refined data analysis (Deloitte Center for Financial Services, 2015). Having a poor risk assessment can result in significant losses for the insurance company (Brown and Kamiya, 2012). The medical risk assessment is both costly and time-consuming in the application process (Bronsema et al., 2015).

To be able to determine the medical risk of accepting the customer a health application is part of the insurance application and is the basis for the medical risk assessment (Randquist, 2005; Perman, 1996; Bronsema et al., 2015). The health application needs to be complete to be assessed, and every time the company has to go back to the customer to request completions the prospect of competing the sale is reduced (Crable, Brodzinski and Frolick, 2008).

To be able to assess an application insurance companies requests a very large number of medical records from healthcare providers when they need more information about a something the customer have stated in their health application. Such as if the customer has stated that they have a diagnosis for example. This is requirement for the insurance company being able to conduct the risk assessment of the customer if there’s something that requires additional information. These can also be used when there’s an insurance claim to be assessed. The insurance industry is dependent on knowledge in the field regarding the probability of death or morbidity in relation to different diseases. This is a requirement for the insurance companies to be able to offer economical protection in case of a premature death (Olsén, 2005; Perman, 1996; Falkman, 2006). A basic requirement for the insurance company is the possibility to calculate the probability of a certain event, such a premature death for certain factors (Randquist, 2005). When risk assessing a customer they assess whether the customer equals a risk that is close to the average of the population or how much it deviates (American Academy of Actuary, 2010).

Surveys are made to establish the normal mortality rate (“Normaldödlighet”) in the Swedish population or the excessive mortality rate (“Överdödlighet”), these two factors can be used to assess the probability of that a person will die. Diseases of different degrees of severity is cause for excessive mortality rate. Understanding of the excessive mortality rate related to different diseases is important for the risk assessment. This understanding is produced through clinical surveys. Also factors
such as smoking can have an impact regarding the risk assessment. Smoking still qualifies the customer for the normal mortality rate group but some disease has to be investigated more carefully. Updates of the excessive mortality rate for diseases has to be made over time and these are based on medical publication and are not specific for the insurance industry (Perman, 1996). Perman (1996) states that the knowledge held by insurance companies is of importance as well.

Private insurance companies uses underwriters to conduct the risk assessment (Browne and Kamiya, 2012), some extra complicated assessment can be made in consultation with a doctor. The insurance companies are using their own set guidelines to assess normally occurring medical risk (Perman, 1996). The insurance companies need to establish a risk selection to ensure that not too many insurance claims occurs in the insurance collective (Randquist, 2005).

When an insurance claim occurs, a death for example, the claim has to be investigated. In some case suspicion of fraud may occur or that some information was not provided when creating the insurance. To investigate this medical journal is requested to assess whether the information provided in the application was correct. Incorrect information is cause for re-evaluating the validity of the insurance and the conditions of it. Incorrect information can be due to fraud or intentional withholding of information. But it can also be due to other reasons than it being the fault of the customer, it can be caused by misinterpretations, language barriers or insufficient information provided to the customer. The consequence of this however can be that the financial compensation is reduced or not pay out at all. To prevent this, it is of outmost importance to reduce the risk of an application not being filled out correctly and completely (Perman, 1996).

2.3 Digital Technological Evolution in the Insurance Sector
The digital technological advances in both the insurance sector as well as the financial sector has enabled the companies to rely on technological services that has changed the nature of both sectors. It has also changed the number of people that is needed to perform a service when more processes have been automated with the use of ICT. The insurance sector has started to provide more services online. This has increased the level of competitiveness in the sector (Garven, 2002). In the insurance sector the use of papers in the workflow is still very thoroughgoing (Royce, 2007). This indicates areas where improvement in digitalization can be made, and shows that not all processes has been made digital yet.

Garven (2002) discusses disintermediation and defines this as “the process of removing the middleman from a transaction”. When the introduction of sales over the Internet directly between producer and consumer started there was a prediction that this would reduce the number of jobs when the retailers could be bypassed, but in practice this most often introduces more jobs than it excludes. Often new opportunities for intermediation is introduced, which is referred to as disintermediation. Replacing processes with technological solutions does not mean that the need for interaction or intermediation will decrease. When the cost of actions as an intermediator in reduced it will be easier to enter the market with new solutions (Garven, 2002).
The advances in technology and the reduced cost of using it has enabled new cross-sales opportunities and increase the up-sell possibility. An example of this can be loyalty programs that companies offer their customers, as well as selling complementary products or services (Garven, 2002).

Insurance companies has a harder time to attract customers to their site and getting them to spend more time on their site than banks have for example. This should make it attractive for insurance companies to collaborate with other sites offering financial services that has more traffic on their site (Garven, 2002).

The insurance companies have to be able to recognize risk that are arising in the market, such as competitors, how their products are perceived, sold and maintained, in order to maintain their strategic risks. If they don’t monitor these disruptive developments, they risk decreasing the value of their offerings and business model. Disruptive elements can consist of changes in society, the market or technological advances that can introduce competitive threats. Strategic risk can also be associated with an opportunity that the company can take to increase their growth or competitive advantages. Some strategic risks that are emerging is technological advances and changes in the culture affecting the consumers demand. The advances in medical care also affects the business of insurance companies when the life span of customers are increasing and are therefore affecting their underwriting model. Additionally new competitors entering the market changes can change how the insurance companies has to communicate with their customers, when they have compete with tech savvy competitors and match the new demands from consumers formed by their online shopping experiences. In order to maintain their position it has become crucial to be proactive rather than reactive when dealing with strategic risk (Deloitte Center for Financial Services, 2015).

The insurance industry has to comply with growing demands of effectiveness and transparency as well as tailor to new economic environments. To increase safety new ways to handle solvency and risk management (Everis, 2009).

2.4 Digital Capabilities
In order for organizations to keep their competitive advantage the organization needs to keep building their capabilities. Keeping the advantage also means that the organization needs to be able to recognize the opportunities that may arise and continuously look to the future in order to anticipate the shifts in the competitive context. The continuous development of new digital technology needs to be part of the evolution of the company in order to maintain as an actor in the environment in which the company exists (Sandberg, 2014).

The boundaries of the different sectors are becoming more blurred and they are becoming more intertwined which affects the context and making it more complicated and changeable. The importance of strategic foresight is increasing in order to battle these challenges. A fast changing market also puts more pressure on the companies to have efficient processes and how they manage their business but in the same time being able to adapt to the changes in the market in order to survive in the competitive landscape. This includes both enabling this for the systems in the organization as well as the technical resources. A fast changing market also affects the life span of
organizational routines and increases the rate of transformation cycles, and the competitive advantages of change is fleeting (Sandberg, 2014).

Amit and Zott (2001) also highlights the digitalization and movement into a more online market has effect on the business strategies and competitive advantage. They discuss how e-business can open up new business opportunities and business models. One important framework they are discussing is the value chain analysis framework for instance addresses value creation. Most companies today have some level of their operations online today. The area of value creation in e-business is therefore very important (Amit and Zott, 2001).

Sandberg (2014) argues that strategies concerning digital aspects and business has mostly in later years been examined from a point of view where digital strategies are adapted to the business strategies instead of them being developed alongside each other. Today digital technologies are a key driver for strategic change. The design of digital technologies is becoming more flexible and can be combined in unanticipated ways, which can affect the scope of what the organization offers as well as the scope of the strategy. Previously the strategical decisions for IT related question has primarily been an issue for the IT departments, but as the benefits of IT and how it can impact the strategies has become more evident these decisions and analysis are not only the concern of the IT department any more. Only including IT in the organization does not contribute to survival in the competitive landscape, but the advances in technological development has made IT investment a requirement for survival (Sandberg, 2014).

Sandberg (2014) argues that way we view IT has changed over time. Between 1970’s and mid 1990’s IT was viewed as an independent tool used to support already existing processes. As the development of IT kept moving forward the view of IT evolved in mid-1990’s to consider IT to be an integral part of the work. Today, beginning in the 21st century, IT has become such an integrated part of our daily life, both at home and at work, that IT cannot be separated anymore.

Digital capabilities will not stay the same if the organization does not do anything. If they are not supported they will perish over time. When an event occurs, this can either be that the context in which the organization resides in changes or that the organization invest in IT, the digital capabilities of the organization will increase or decrease. The same decision made by different organizations may have different outcome depending on their prerequisites. When competitors take actions the landscape changes (Sandberg, 2014).

As the digitalization is moving forward the organizations in the industries affected need digital capabilities since the technology is so deeply intertwined. It is also of great importance to analyze the risks that can be introduced by change and that this is taken into consideration when considering strategic options (Sandberg, 2014).

Amit and Zott (2001, p.495) discusses virtual markets and describes it as: “Virtual markets refer to settings in which business transactions are conducted via open networks based on the fixed and wireless Internet infrastructure”. Virtual markets enable services provided being able to be reached to a low cost and instantly, as well
as not being limited by geographical factors. It also enables new ways of co-operation, connecting to other organizations and new opportunities for value creation.

One important area to consider when thinking of value creation is the cost of a transaction. How much it will cost for one stage of the process to be completed and another one starts. Transaction conducted in virtual markets can reduce the cost of each transaction. When calculating the transaction cost several aspects needs to be part of this calculation. For example, how much time employees needs to spend contacting the customer or other counterparts or processing documents. E-business can reduce other indirect cost of transactions such as increasing the frequency of the transactions when the communication is more open, it is not limited to only interacting with specific person (Amit and Zott, 2001).

Amitt and Zott (2001) presents sources of value creation in e-business and discusses the four value drivers for value creation in e-business, efficiency, complementarities, lock-in and novelty, and that they increase the possible value creation of e-business.

![Figure 1 Value chain analysis altered based on source: Amit and Zott, 2001](image)

When discussing efficiency, the efficiency of transaction is one driver, to reduce the cost for each transaction and this way the process will be more profitable. But it can also include the time spent by the customer to search for information. By being able to more efficiently provide the customer with information that is up-to-date and thorough, will decrease the time that the customer will require to spend searching and making it easier. This can also increase the basis on which the customer makes their decisions and thereby making providing the means for quicker decisions that are based on more thorough information. It could also reduce the number of mistakes occurring in the processes by making the transaction more streamlined, as well as reduce the transactions time and time required for fulfilling the order (Amit and Zott, 2001).
Complementarities are reached when the organization can offer a range of products together and this way gain more value that what would be reached when offering one product alone. Value can be created by offering the customers services both online and offline, this is called click-and-mortar. For example the organization can offer the customer to buy online but collect the order in a physical store, or also called bricks-and-mortar. Or offering complementary products beside the core transaction (Amit and Zott, 2001).

Lock-in can be reached either by customer wanting to repeat purchases or being motivated to stay as a customer (Amit and Zott, 2001).

Value creation can be gained by novelty, which can include new products or new ways of distribution and marketing. Organizations can create novelty by being the first to change the ways they conduct transactions or create alliances and thereby offer the customer new packages of products or complementary products. Change in the selling process can increase the efficiency in the transaction (Amit and Zott, 2001).

Patterson, Bonissone and Pavese (2005) discusses that the performance of the decisions system need to be monitored and maintained throughout the entire lifespan of the system, which Ara, Zarrabieh and Arastoo (2014) agrees on. The company therefore needs a strategy for maintaining the high quality of the system for as long as it is used in production environment. They define the lifespan of the system as spanning from the build phase to the use and monitoring of the system, maintaining and updating the system, retiring the system is the last step in the life cycle. During this life cycle the important aspects of the system needs to be defined and measured, it needs to be analyzed how well the system meets the desired performance and identify what is preventing the system from meeting the performance goals to improve these and control that the improvements has resulted in meeting the performance (Patterson, Bonissone and Pavese, 2005).

Patterson, Bonissone and Pavese (2005) discusses that when designing such system a trade-offs in the design needs to be made which needs to be kept in mind. They define the most common trade-offs below:

- Accuracy versus coverage,
- Accuracy versus interpretability,
- Run-time efficiency versus configuration-driven architecture.
3. Methodology

In this chapter I will present information regarding the research design and strategy along with the selected methods for data collection and analysis. Important aspects regarding the quality of the research and ethical consideration related to the research will also be presented.

3.1 Empirical Setting
In order to collect the data that is needed to conduct this research access is needed to more than one insurance company and gaining insight into their processes. The employees of insurance companies are the ones that possess the most knowledge in this area. Underwriters have insight in how they handle applications today and what sort of support they would benefit from as well as which risks they can identify from their perspective. Management or business developers have insight into which direction they like to develop their business and what support they could gain from.

3.2 Research Design and Strategy of Inquiry
3.2.1 Interpretive Paradigm
Walsham (2006) argues that in interpretive research the meaning that people assign to knowledge is important. Our interpretation of data is the way we have interpreted how others have interpreted the world. In interpretive research the context and shared meanings is of importance to understand, and how the information system may affect or be affected by the context (Klein and Myers, 1999).

In this research it is of importance to understand how the users of the automated risk assessment system interprets the context in which the information system will operate in. It is important to understand what may affect different people to construct their interpretations the way they do. There may be differences if they work for different companies or they have different functions in the organization. An automated process relies heavily on the preconditions that are the base for the assessments of applications. Pre-conditions will be affected by the context in which it will be used, and will be affected by the users whose mission it will be to set the pre-conditions. As presented, previous studies regarding automated risk assessment has been done outside Sweden, but the legislations regulating the field may vary between these countries which may affect the prerequisites for the tool. Processes specific to each company may also affect the prerequisites for the conditions specified for the tool.

In his article Walsham (2006) differentiate an involved researcher and an outside researcher. The outside researcher would typically collect the data by only conducting interviews and keeping a distance from the participants in the research. The involved researcher would be more involved in the field, as for example a participant researcher. Further he also discusses some advantages of involvement in the field. Some advantages mentioned was that involvement can be good for gaining a higher access to people and data. That the participants might be more inclined to reveal more information, as they see that the researcher are attempting to give something back to the organization. Instead of only collecting data to use disclosed from the organization.

In my view it is most beneficial to be an involved researcher in this research in order to gain a deeper understanding for the participants and the domain they are working
in. Only conducting interviews with the participants will not give me a deep enough understanding. It will be too superficial to go into details about what possible benefits and risks can be found related to implementing automated risk assessment. More extensive interaction and collaboration with the potential participants, underwriters, business developers, actuary and management, can be reached by conducting workshops as additional method to interviews. I believe that their input can be investigated more into depth by being more involved, and thereby contributing more to this research.

3.2.2 Participatory Design
For this research I will use Participatory design (Bratteteig et al., 2012). A core foundation of the participatory design is that the work is performed in close relation to the users (Bratteteig et al., 2012). Design in this context is not regarded as a set of pre-defined goals, but is a process of creating requirements together with the users. This process is very analytical and built on the collaboration between the designer and users and that they step by step create the requirements and continuously evaluate these. The requirements are established from a deepening insight into the context and the potential use of the design. The users can form a grasp regarding how the design can in the future assist them in their daily work (Bratteteig et al., 2012). Participatory design can help the designer to understand the work practices and if the considered solution will support the work task performed by the users (Elovaara, Igira and Mörtberg, 2006).

In this research the aim will not be to create a design of something that will be ready to be implemented. The aim will instead be to identify a set of additional areas that can be supported by the automated risk assessment system and risks that the system can introduce to work tasks. This list will be complemented with some additional analysis of how this can be supported or addressed, based on the input of the participants. The user in this situation would be the underwriters and additional stakeholders could be business developers, actuary and management. In this case the understanding of the context of which the users are working in is crucial for being able to investigate and analyze the situation further.

The solution of automatically risk assessing the application in the underwriting process of an insurance is already established. The aim for involving the ones using the information system and additional stakeholders would be to find new opportunities to support the strategy and the business. To investigate if this could be new ways of analyzing the data collected during the underwriting process, new ways of handling the risk management or new ways of supporting the development of new products. Or if this could support the sales process of other products in some way, i.e. upselling. In order to identify which areas additional benefits and risks can be found the knowledge possessed by the ones who are using the information system is crucial. Therefore the users and other stakeholders will be involved in this identification process.

Bratteteig et al. (2012) discusses that the information technology is not neutral, the worldviews associated with the context will play a part in defining the problem and the possible solutions. Due to this Bratteteig et al. (2012, p. 129) discusses some core perspectives. They highlight the importance of the user being able to having a say in the design process, and that they can influence the outcome of the design process. One
area where this is important is the question regarding which problems should be solved. This addresses the need for knowledge of both technical aspects as well as use-oriented when developing the design.

This research will investigate the problem by involving several insurance companies. The aspects associated with the life insurances may differ between the companies as well as the aspects of the context, such as the strategies or associated products. Therefore, these differences are important to keep in mind during the investigation. It is the underwriters that are supposed to be supported by the automated risk assessment system, and the additional stakeholders that can further benefit from the system. They are the ones that should be able to have input into which function they could benefit from and what functions could potentially pose a risk towards their work. Therefore, as stated above regarding participatory design, they should have a say in this process.

Mutual learning is another core perspective discussed which addresses the need for example designer and user to understand each other’s ways of thinking. The users are the ones that possess the most knowledge regarding the context that the design will be implemented in. It is therefore important for the designer to develop an understanding for the user’s domain (Bratteteig et al., 2012).

In order for the designer to be able to investigate the potential benefits and risk of implementing automated risk assessment in the underwriting process it is important for the designer to understand both the underwriting process and the automated risk assessment solution. The underwriters, actuary, business developers and management also need to understand the automated risk assessment solution in order to assess which functions they could benefit from or which could introduce risks in their work.

The third core perspective that Bratteteig et al. (2012) discusses is co-realization, which addresses the notion that users has the most domain knowledge, but may have less technical knowledge than the designer. The user may not think of all possible solutions without help from the designer. The visualization of possible solutions is important as a way to gain a mutual understanding of the proposed solution but also it enables the user to better evaluate the design, in regards to functionality, form and consequences.

As discussed above both designers and users and additional stakeholders need to have an understanding of the context and the automated risk assessment solution, in order to collaborate to find areas that could contribute to additional benefits or risks. The users and additional stakeholder can contribute with information regarding the domain and what opportunities that they can identify. The designer can contribute with knowledge regarding opportunities based on the information provided by the users and stakeholders that can be examined based on the technical knowledge of the designer.

Participatory design can be used to examine the tacit knowledge possessed and practiced by the users, which Spinuzzi (2005) stresses that the most of knowledge is and that this tacit knowledge is very valuable.

The aim of this thesis is to investigate the possible benefits that can support the business and the business strategy, and associated risks, of having automated risk
assessment in the life insurance underwriting process. Looking beyond just assessing the application it is crucial for the research to involve different users. They are the ones that can give insight into what support they would gain from and what areas should be explored. This way possible business opportunities can be identified and analyzed. In order to accomplish this the users must be allowed to think freely, and to be given the prerequisites to evaluate in which possible areas an automated procedure could support the business. It is important to look at the full picture and not limiting the focus too narrowly and risking missing both potential risk and benefits. The importance of having the user involved is the key factor as to why participatory design is the most suitable choice for this research.

By implementing a tool for automated risk assessment this would change the way an underwriter would perform their work tasks. In the literature presented above it has been made clear that the user should be considered to be allowed to influence the decisions that will affect their daily work. Being able to influence could also prevent some resistance towards the changes an implementation like this could bring.

The process of assessing an application can be assumed to contain a certain level of tacit knowledge that may differ between underwriters due to experience and social context. Both that the context and the previous experiences may have an impact on the assessments an underwriter makes, their interpretations of the world around them and their work tasks, needs to be taken into account when conducting this research since this can impact the outcome of the design process.

By involving users in determining which areas should be investigated this will increase the possibility that the most relevant and beneficial areas will be investigated. This will increase the contribution to the research in this area. As well as increase the contribution to the involved parties in the research. If the participants, both the companies and the specific users, feel that they also will gain something from the research they will likely be more willing to participate in the research and giving more fruitful insight into their domain.

3.3 Data Collection Methods
In order to accomplish what is mentioned above and to involve the users, interviews and workshops has been conducted. Several different user group has been involved, underwriters, products owners, management, developers of automated risk assessment tool and actuary. The age, gender and education have not been a driving factor when contacting people to be a part of the research. But I have strived to have a good dispersion between men and women in the research. The most important has been to involve all the user groups.

This research has included 10 interviewees from four companies on the Swedish insurance market and one IT company developing solutions for automated risk assessment. The participants have various roles in the company which includes medical risk assessor, actuary, advisor, product developer and management positions with an interest in the risk assessment process. The workshop consisted of three participants who all are currently working as medical risk assessors. The distribution of men and women among the participants is almost fifty-fifty.
In order to keep their identity anonymous their names have been replaced with a number. The interviewees are referred to as “Interviewee N” and the workshop participants as “Respondent N”.

3.3.1 Interviews
Walsham (2006) discusses that interviews can be a beneficial way to gain knowledge into the interpretations that exist in the chosen field of interest. Interviews should not be used alone, instead other means of collecting data should be used as well. Such as reviewing internal documents, if they are made available, and other publications that can be found regarding the organization. In this research interviews has been used both as a first step in gaining insight into the domain that would be studied, as a base for the workshop and as the main source of information, depending on the user group. Interviews gave a valuable insight into the interpretations of the participants and a good foundation to build on in further interaction with the participants.

The interviews have been conducted to give a deeper understanding into the context into which automated risk assessment could be implemented, and to identify potential benefits and risks. The questions in the interview were open-ended in order not to limit the interviewee in his or her thinking. The structure of the interview went back and forth between being semi-structured and unstructured in order to bring some topics that could facilitate a good discussion but still let the interviewee’s follow their train of thoughts (Denscombe, 2010). For each interview I had prepared a set of questions and topics (see Appendix III - V) that I wanted to investigate, but since the aim was to find areas that hadn’t yet been identified I needed the interviewees to follow their train of thoughts and asking follow up questions based on the areas they brought up. In this research I have interviewed participants that have a variety of positions and work tasks in the companies. I have therefore selected questions that are relevant to the position that the interviewee holds. The questions have therefore varied between the different interviewees, but there are a number of questions that is common for all interviews.

The first interview was with a responsible at a company developing automated risk assessment tools in order to get an understanding of this area and how such solution can work. I also asked about benefits and risk that they had identified already. This gave me a better understanding which I could base the rest of the interviews on.

Later I interview the rest of the user groups. The most important topics where if automated risk assessment could support them in their role and what potential risk they could see if this would be implemented. Depending on what they answered follow-up questions were asked. The interviewees were also asked to tell which tasks related to this area in included in their role. Questions were asked how automated risk assessment could have an affect on these.

3.3.2 Workshop
Workshop can be used to either get a shared understanding of a current situation, or be design oriented to get a shared vision (Bødker, Kensing and Simonsen, 2004). Workshop was used to involve underwriters in identify areas that would be of value to investigate. They are the primary stakeholders in the implementation of automated risk assessment since their work will the most impacted by this.
During the workshop different exercises were conducted in order to cover different topics. All participants in the workshop are working with risk assessment and they were chosen based on their previous level of experience with automated or digitalized processes. The aim was to have a diversity of previous background in this area. During interviews before the workshop the process of underwriting was identified and later modeled to have as a basis for further discussion in the interview. The aim with the workshop was to identify what sort of support they could gain from, which areas would not be supported, and what they would wish for in an automated risk assessment solution. By looking at a flowchart of their current process one exercise was to discuss if any activities could be eliminated to streamline the process if they could be supported by digital technological solutions.

The thoughts of the participants was the most important and the focus was to get them talking. Post-its were used to write down the ideas and then put up on a whiteboard.

3.3.3 Document Analysis

Some documents were made available to me. In this case I went through these and noted interesting information (Bødker, Kensing and Simonsen, 2004). These was used to build further understanding of the context and used both as basis for interviews and later analysis.

3.4 Data Analysis

Lichtman (2013) discusses that one way of making meaning of the data from an interview is to derive key concepts from it. This is done by using a process that among other includes coding and identifying themes. Smaller pieces of the interview can be coded and in these find important themes. Content analysis has been used to identify themes in the text that will be the outcome of the interviews and workshops (Lichtman, 2013).

The interviews have mainly aimed at gaining a better understanding of the domain in which the automated risk assessment will be operating in. The interviews also gave an initial insight into which possible areas that could be investigated. By going through the interview afterwards and identifying important themes that are highlighted in the interviews, this could be used to further investigate the potential benefits and risks. As Lichtman (2013) discusses the identified themes can be compared to each other to construct groups of themes and see which are overlapping. First I made the initial coding, and after that I went over the coding again to refine the codes, and thirdly made a list of the categories that I had found during the coding and pair the information into groups. This process has to be iterative and I went over the list again to see if categories can be refined, if redundancies can be removed and if I can see any critical elements. When this was completed key concepts could be derived from the coded data (Lichtman, 2013).

This strategy for analyzing the data was used both for the interviews and the workshop in order to analyze the data that I have been able to collect during those sessions. The interviews were summarized and the summaries were coded. The workshops was be documented by recording the workshop and making the participants using post-it notes to write down their thoughts. These was be collected and documented after the workshop, and later coded.
The aim was to have a list containing a set of additional areas where benefits for the business or risks can be identified with some further analysis to give insight into these.

3.5 Quality of the Research

3.5.1 Validity
The validity of the research refers to whether the data that has been collected is the right sort of data in order to explore the research area. But also if the data has been evaluated in a correct way. Issues concerning the validity of qualitative research has been pointed out, that it is difficult to prove that the researcher has done this in a correct way. Qualitative studies cannot be assessed the same way that quantitative studies could. The reason for this is that the social setting will change both over time and depending on the people involved. Due to this the research cannot be reproduced in the exact same way (Desncombe, 2010).

To battle the issues mentioned the researcher can ask the respondents to validate the data collected. Another aspect to have in mind when considering the credibility of the data is that the data is well founded in qualitative studies since the researcher has spent a lot of time collecting empirical data and conducting fieldwork. This will add to the solidity of the conclusions (Denscombe, 2010).

This research is to a large extent based on the interpretations of the respondents. In order to investigate what benefits and risk the perceive being associated with using automated risk assessment it is important to capture their interpretations. To determine what they would benefit the most and what support they would need they are the experts. The ones who have participated in the research have extensive knowledge within the area of life insurances and risk assessment. Their opinions and interpretations have a large impact on the decisions made by the companies. This makes their opinions of great validity. The participants in the interviews has had the chance to go through the summaries of the interviews in order to correct any misinterpretations in order to battle the issues mentioned regarding validity.

3.5.2 Reliability
Reliability refers to whether another researcher would be able to reach the same conclusion as the first one. This is almost impossible to know for a qualitative research, but it can be measured in other ways. By providing elaborate description of procedures and decision other researcher can evaluate whether this seems reasonable or not and if they would have produced similar findings. There must be enough information to be able to review the research (Denscombe, 2010).

By using a qualitative research to investigate the chosen area it will be a challenge to prove the reliability of the research. By using semi-structured and unstructured interviews, it will be difficult to show how a second researcher can reach the same conclusions depending on what the interviewees would answer. Question has been prepared in beforehand but depending on what the interviewees answered follow-up questions has been asked and the direction of the interview has been steered based on this. The interview has been recorded in order to increase the reliability of the
research. By only taking notes during the interview the researcher might miss important facts or get it wrong due to not being able to note everything the respondent was saying. By using a recording the researcher can listen to the interview and make much more detailed notes from the recording. But also having the possibility to listen to it more times to minimize the risk for misunderstandings.

In this thesis the methods and deduction of the conclusion is presented in close detail in order to make it possible for other researcher to review the research and how the conclusion has been reached.

3.5.3 Transferability
The question regarding generalizability is an issue for qualitative studies since it cannot be measured in the same way as a quantitative research could be. An issue that has been raised is how the researcher can show that the results can be generalized when using a small number to collect data from in comparison to a quantitative research would use in order to reach statistical probability. By providing the reader with enough information to be able to assess themselves to what degree the results can be applied to other situations is a way to battle this issue (Denscombe, 2010).

In this research a number of respondents with a variety of positions that may be impacted by the implementation of automated risk assessment have been selected in order to gain insight from different points of view. The respondents are also from a number of different companies in order to minimize the risk that corporate culture or internal opinions to have an impact on the data collected in the research. Even though the number of people participating is not enough to reach statistically probability it will increase the transferability of the research. By providing the reader with extensive information he or she will be able to determine the level of which they perceive the results to be transferred to other situations.

3.5.4 Confirmability
The question regarding confirmability refers to if the researcher is biased and therefore influences the results. A research cannot be completely free from influence, the researcher needs to interpret the data. The researcher needs to have an open mind when conducting the research, not disregarding data that is not in line with other collected data and investigating all possible explanations (Denscombe, 2010).

As mentioned it is difficult to be free from any influence, but the use of semi-structured interviews enables the respondent to steer the interview and make sure that information that is of great importance for them to be collected. As pointed out it is important for the researcher to have an open mind and to include all data.

3.6 Ethical Considerations
This research required access to information possessed by insurance companies in the Swedish market and companies working with developing solutions for the Swedish insurance market. In order to protect them and enable them to speak more freely it is of importance to keep their identity and the specific data they give away anonymous and not giving to well defined descriptions of the companies. No names of the participating companies have been included in the report and I have limited the description of the participants in order to minimize the risk of the companies being identified.
When conducting research, it is important to make sure that the participants in the research know that it is voluntary to participate in the research. Participants also need to be given enough information to enable them to decide whether they want to participate or not as well as what sort of commitment is expected of them (Denscombe, 2010). For this purpose, a consent form was created which the participants had to read and sign in order to show that they had received this information and that they understood. The aim of the research as well as how the information would be handled was included in this form. If someone would have chosen not to participate this would have been respected.

The participants of a research should not suffer any harm or economic loss as a result of their participation. The information that has been derived from the research should be considered as confidential and will not be disclosed with any parties outside the research (Descombe, 2010). As part of initiating the collaboration with the companies it was made clear to the participants that they would be able to review the information that had been extracted and intended to be used, in order for them to feel secure that sensitive business information is not made public. By sending the participants the summary of their interview they had a chance to exclude any information they didn’t want to be public, but it also gave them a chance to correct any misinterpretations from my side.
4. Empirical Findings

In this chapter I will present the empirical findings in the research based on the interviews, workshop and document analysis.

4.1 The Concepts and Categories
The interview and workshop recordings were transformed into written summaries and analyzed. The analysis was performed according to the following strategy. Initial codes were extracted from the summaries. These was extracted, analyzed, refined and analyzed again in an iterative process, this resulted in 35 codes. These were categories in iterative process that would give as refined categories as possible and but giving the reader a clear view of which main categories was found in the research. In the beginning these were quite broad so they were refined until only 8 remained. These include Process, Obstacles, Future process, Benefits, Risk, Future, Implementation and Resistance. Bellow these empirical findings are presented in according to these concepts and categories.

The empirical findings that has been part of the analysis and is presented below is either directly part of the automated or manual risk assessment process, closely linked to the process or a result of it. These findings have been included because I have determined that they are of great value to the investigation of automated risk assessment. The category Process for example is included to give the reader an understanding of the context today, in order to better understand the proposed changes in the future process and associated benefits and risks.

4.2 Presentation of Empirical Findings
4.2.1 Process
The interviewees have discussed that the processes for applying for an insurance and performing the risk assessment of the application differ somewhat between companies today. It differs depending on how digital their processes are, whether it is an application for in individual insurance or for a collective insurance and the sales structure of the company.

Questions
Interviewee 1 describes that they work primarily with group insurances and that this is somewhat easier to make an initial determination whether the application can be approved immediately or if a risk assessment has to be performed, than it would be for an individual insurance. If the customer can answer no to a certain set of condition the application can be approved. This also result in fewer risk assessments. Interviewee 4 also describes that they have tried to make the initial assessment easier by giving the customer a set of questions to answer, and if the customer answers them in a certain way the application doesn’t need to go through risk assessment.

The guidelines for the questions that the company ask in the application is determined depending on what risk the insurance company is willing to take on and their demand for profitability, according to interviewee 10.

Many of the interviewees witness about the process including applications in paper format. Interviewee 1 describes that the customer meets an intermediary and fills out
the application which is sent to a risk assessor which has to enter all the information into the insurance system.

There is a risk that questions in the questionnaire can be misinterpreted, both in questionnaires in paper and digital format, as stated by interviewee 4.

Interviewee describes that when assessing the risk of a customer applying for a life insurance different health questionaries’ can be used depending on how detailed they need to be. This is determined by the amount that will be insured, but also depending on insurances that the customer already has or of the customer applies for insurance that will cover someone else’s life, for example a partner.

**Additional information**

When using a health questionnaire in paper format often result in incomplete information provided by the customer. In order for an application to be assessed the health questionnaire has to be complete and that approximately 25% of the applications are incomplete, as stated by interviewee 2. Interviewee 1 informs that in his experience 5-10 % of their application requires some sort of completion due to incomplete information. Interviewee 8 believes that they have to request completions or medical records for approximately 85 % of the applications.

Several of the interviewee says that there’s a large risk that the customer never submits the completions or health questionnaires. Interviewee 4 says in the interview that at former company the interviewee worked at, almost half of the customer didn’t submit, after a reminder some customer submitted, but still many didn’t receive the insurance. A lot of time is invested in monitoring the applications, sending out reminders and such activities.

**Medical records**

If the customer has indicated that they have some disease the risk assessor has to request a power of attorney to access the medical records for that specific diagnosis or treatment. As several of the of the interviewee has told the process of requesting the medical records is very time consuming. Interviewee 2 explains that it during the risk assessment that the need for medical records are identified. They send out a letter with the power of attorney to the customer in order for them to sign and send back. It can take two weeks before they receive the signed power of attorney, in the meantime they might need to remind the customer. The medical records are requested from the healthcare provider that treated the customer. The time it usually takes for the health provider to provide the medical records varies a lot, some have a more well established function for doing this, others needs to be reminded three times before they provide it. Interviewee 2 experiences that this can take up to three months before they have the medical records. The risk assessment can be performed before they have the complete information.

Respondent 2 states that one of the issues with collecting medical records is that the power of attorney is only valid for that specific record created by the specified healthcare provider. If the customer has been treated at another healthcare provider this will be discovered when they receive the first record, and they need to request a new power of attorney. Respondent 3 express that this is very time consuming.
Interviewee 2 says that the insurance cannot be issued before the risk assessment is completed, but it will be valid from the day the application was sent in but only of the application is approved. Otherwise the application will be rejected and the customer will have waited a very long time to receive a reply about the insurance being rejected.

**Conducting the risk assessment**

According to the process in which interviewee 8 works, they have 5 days to begin a risk assessment, although this doesn’t mean that the risk assessment will be completed.

Interviewee 2 describes some important aspects to keep in mind when performing the risk assessment process. When a customer applies for an insurance, the company is obligated not only to look at the application for the new insurance but also be aware of risk factors that may have been identified in earlier applications. If the insurance company does not fulfill this, they cannot claim that the customer has provided incorrect information in the application because the company should already be aware of this risk. There may be functions implemented in the system to support this process by providing a notification informing that this customer has to be assessed due to earlier risk factors. Interviewee 7 describes that if a customer has given false information or failed to inform the insurance company of any diagnosis or such that has been asked about the customer’s beneficiaries for the insurance will not receive the money when there’s cause for an insurance claim. It is therefore important for the customer to provide all relevant information.

The risk assessor makes their assessment of the application based on guidelines created by the insurance company. When asked if there’s a risk that different risk assessors may assess the same application differently, interviewee 7 mentions that the guidelines are not laws informing the risk assessor that they have to say yes or no to an application. The assessment is supposed to be based on the guidelines together with the risk assessor complete picture of the customer. She also says that yes there could always be a risk that applications can be assessed differently due to the human factor, but that they are working with processes to minimize this risk. For example, every other week they have a doctor that they can ask for advice if there’s applications that they are uncertain about how to assess. They also looking at for which applications they need medical records and health applications in order to make sure the customers receive an equivalent assessment.

Interviewee 5 describes that when companies offer their employees insurances they can also offer them to have a co-insured, which can for example be wife, husband or a child. Adding the co-insured requires a health assessment and that the main insured approves the addition.

Interviewee 9 explains that there’s regulations stating that the customer has the right to an individual assessment.

**Communication**

During the time that the application is under assessment the customer or advisor may contact the risk assessor to get information about the progress of the application. Which both interviewee 2 and X recognizes as an activity the risk assessor needs to perform that takes time away from the actual assessment work.
Advisor
Interviewee 3 works as an insurance advisor and states that as an insurance advisor you are obligated to assess the customer whole need for insurances and inform the customer about this. This is part of “Omsorgsplikten”. When they meet the customer they need to discuss the needs that the customer has and if the customer decides to apply for a life insurance they can be assessed either through a collective or an individual risk assessment depending on the life insurance that the customer applies for. This in combination with the amount the customer wish to insure decides which questionnaires the customer has to answer. Normally the customer need to answer a six sheet long questionnaire in paper format.

Interviewee 3 identifies three large challenges in this process. One is that the customer often has questions regarding the questionnaire, that they either don’t understand the questions or they are unsure what is relevant to bring up in the questionnaire, such as a cold that they have had in the past. The advisor is not allowed to assist the customer in determining what is relevant or not to include, but has to refer them to a risk assessor in this case. But they can assist the customer in helping them understand the questions. The second challenge is that the customer often chooses to fill out the papers at home, but many do not submit the questionnaire and therefore they don’t receive an insurance. Which leads to the customer not having an insurance that he or she needs, and that the advisors’ sale did not go through. The third challenge is that the advisor needs to always know which questionnaire that the customer needs to fill out.

Interviewee 3 states that mistakes can be made, that they hand out the wrong questionnaire and consequently have to get back to the customer to ask them to fill out the right one. Having to tell the customer that they made a mistake in this process is perceived as risking the trust of the customer since it can raise questions whether the advisor doesn’t entirely know what they are doing. If the advisor it is customer with substantial assets they may have to contact the customer again if the application was rejected or if the customer received an increased premium.

Premiums
Simplified the premiums for the life insurance are set according to premium income versus insurance claims. Additional to this actuaries look at mortality surveys that are common for the whole industry and the company’s premium reserves according to interviewee 6. The pricing of the premium is reviewed yearly, and includes looking at statistics of claims and comparing the company’s pricing against the rest of the industry’s.
4.2.1.1 Context and Process based on the Empirical Findings

A rich picture can help further the understanding of the situation. The rich picture below portrays the context of the risk assessment as it is today. This picture has been created by summarizing the information provided by the participants in the research, which means that it may not portray how it looks everywhere in the market.

Figure 3 Rich picture showing the context of risk assessment
Based on the interviews and in collaboration with interviewee 8 the following process model has been created to show an example of a risk assessment process.

![Risk Assessment Process Diagram](image)

**Figure 4 Example 1 of a risk assessment process**

Another example of what the process can look like is presented below to show how time consuming the entire process can be. This picture of the flow is created based on document analysis conducted on material provided by interviewee 9.

![Risk Assessment Process Diagram](image)

**Figure 5 Example 2 of a risk assessment process**
4.2.2 Obstacles

Questions
During a discussion regarding the questions in the health questionnaires interviewee 7 discusses choosing the number of questions put in to the questionnaires needs to be balanced between the customer experience and what the insurance company needs to know. Further she mentions that the industry has for several years moved towards more and more detailed questions, which she sees as a risk that eventually no one in their 30-ies will be able to pass the questionnaires without remarks.

There’s also a balance regarding how much information about the customers that the company should request when weighing how easy the customer perceive the company and how much information the company needs, as interviewee 7 states. They consider that this is an important balance in order to fulfill customer value. If they approve 10 sick people the other 1000 will have to pay a higher premium, and will this really be in the customers’ best interest.

Lost sales
Interviewee 8 discusses that out of 10 customers 3-4 doesn’t submit their completion of information even when they have received a reminder, that they feel it is to troublesome.

Interviewee 3 mentions that customers don’t trust the postal service with their health applications so often they visit the advisor to hand the papers to them. Further adds that the process is inconvenient, which decreases the number of signed insurances and that there’s probably more signed insurances with fully working condition since it is easier.

Interviewee 8 tells me that when they have completed a risk assessment they have to sort all the documents they have handled for the application. The sorting takes 40 minutes per day, which is one more activity that takes time away from the risk assessment.

Information
Interviewee 10 says that there’s often customers that doesn’t understand the questions in the health questionnaires and that there’s hard to understand who will receive the money in case of death, i.e. the beneficiaries.

As previously mentioned it is important that the customer answers the health questions correctly. Interviewee 2 sees that there’s a risk that the customer misses answering a question or by mistake checks the wrong box due to the questionnaire being so extensive. Also that they may not feel that the follow up questions applies to them. Also interviewee 1 considers it a risk that customers misinterpret the questions, and that they don’t understand the consequences of the questions and replies.

When for example looking over the guidelines for the product interviewee 10 experiences that the information which they can learn for is lacking because it’s not possible to store the information in a structured way in the systems they have today.
4.2.3 Future Process

*Medical records*
One of the challenges in the current process is that the collection of medical records is very time consuming. One desired way to battle this challenge is if the customer would be able to give a power of attorney in the application process according to interviewee 8.

Using a digital way of signing the power of attorney, such as “Mobilt BankID”, they would not be a need for distributing papers for the customer to sign, according to respondent 3.

*Customer pages*
Interviewee 8 feels that one distraction in their work is that they receive a question regarding the status of the application. One way to minimize the time they have to spend on this and being able to keep the customer more informed is to have a page for the customer to log in to containing all the information about their insurances and applications. At these pages they could see for example that the risk assessor has requested medical records and can get information that the application will take some time to compete. Or find information that the risk assessor needs a power of attorney to request medical records. Interviewee 7 would like to have another secure way of communicating with the customer so that they don’t have to write letters to the customer, which is time consuming and the letters are containing sensitive information. The communication should be able to be used to both show the status of the case and answering questions.

When interviewee 8 mentions that they receive question regarding the status of the application these question is also often asked by other stakeholder in the company. More information could be provided in the system so that internal stakeholders can look there to find information about the status instead of contacting the risk assessor.

Respondent 2 sees that there would be a beneficial if the customer could be able to do all the completions on the customer pages, and if messages could be sent to the customer to go into the pages when they need to provide some additional information or approvals.

*Automatically risk assessed applications*
Interviewee 8 thinks that a number of applications could be handled without involvement of the risk assessor. Interviewee 8, respondent 1 and respondent 3 all states that there are a number of diseases that they cannot accept according to the guidelines today, these would not have to be assessed by a risk assessor instead the customer could receive an answer right away. It would free up more time if they didn’t have to administrate these.

The customers that are sent to the risk assessment should only be the ones that are truly in need to be assessed by a risk assessor are preferred by interviewee 2. The rest of the application should be handled by the system.

*Information in digital format*
The information regarding the customer and the application should be collected in digital format to avoid handling papers. According to interviewee 8 this would
eliminate the 40 minutes per day that they have to devote to sorting the papers that they have been handling during the day and the need for scanning the paper documents.

If the applications can be handled digitally the process of approving the application can be simplified. As respondent 3 describes if the information can be registered in the insurance system at the right away when the customer applies for the insurance, the risk assessor could go in and look over the application directly in the system and approve without having to enter the information themselves.

Respondent 2 adds to the comment by respondent 3 regarding the simplified approval process that notifications could be added to alert the risk assessor that there’s something that they should look into, to reduce the risk of missing something.

If the information regarding the customer is collected digitally controls can be implemented to prevent the customer from missing to answer questions that will generate completion in the process today as stated by interviewee 9.

Interviewee 6 would request information about the cause of death to have better statistics to base premiums on. Information about how processing time of the application would help when working with reserve allocation.

**Rejection**
Enabling rejections online would save time for the risk assessor when there is some factor that according to the guidelines would be a definite rejection, as mentioned by respondent 3.

Interviewee 7 also sees that there would be a benefit with being able to have standard text for the motivations for the rejections, but still being able to adjust these when needed if they don’t entirely fit the assessment.

**Online chat functionality**
One desired additional functionality by respondent 3 would be to enable the customer to chat directly with the risk assessor online. Either to answer questions that the customer has or to assess the application right away, this would also be a way to give rejections online.

**Applying online in meeting with an advisor**
If the advisor could provide the customer with an application online the process could be begun right away as suggested by respondent 2, and in some cases the customer could get an answer right away. If the customer cannot get a life insurance, then they could be advised to apply for another insurance.

Interviewee 10 also thinks that if the customer could get an answer on the application right away this would lead to more completed sales.

**Data analysis**
Interviewee 6 would request more data to analyze to have a better base for determining that the company has a premium that both reflect the risk and being competitive. Information regarding previous claims could contribute to this.
Also interviewee 10 request more data to analyze regarding the customers’ needs to better segment the customer and see that the adjustments made in the products are the right ones. The respondent would see the value of being able to this both for the company’s whole customer base but also for an individual customer. If they could analyze the customer base there may be an opportunity for up sales, and making sure that they always have a relevant offer for the customer’s life situation and analyzing which event in a customer’s life that would change the need for a life insurance. When they are meeting a customer that has already shown interest in the product they should be able to have an accurate analysis of the needs of the customer.

Interviewee 5 would also like more data to analyze but would like to have more data that the customer creates and shares with the insurance company, besides the data that is created in the risk assessment process. This would require an incentive for the customers to share this information with the insurance company to be created.

Being able to analyze the data can contribute to information about the customers’ behavior such as by which questions they leave the application process or if they go back to a previous question. The data structure enables further analysis according to interviewee 9, and data warehouse export would enable the user to use different parameters to analyze the data.

Questions
A change that interviewee 5 thinks is interesting in the future is to use more proactive questions when interacting with the customer, both in the application but also when the customer already has an insurance. By using proactive question after the customer has been approved for the insurance they can work continuously with the risk of the stock, more than they do today.

Today the insurance company doesn’t ask any questions regarding life style which is something that interviewee 4 can have an effect on how long the customer will live.

The questions asked to the customer should be customized in a way so that the customers that doesn’t have to be risk assessed should be asked as few questions as possible to get them through the application process as quick as possible as suggested by interviewee 4.

Interviewee 4 thinks that it is important that the risk assessment is an integrated part of the sales process so that the customer doesn’t feel that they are sent to another part to be assessed. But also that when automating the process this should not just be automating the current logic of the risk assessment but finding a new way to getting the customer through the process as quickly as possible. Both interviewee 4 and 9 thinks that in the future process the aim should not be to pick up as much as possible but instead only picking up the ones that are really necessary to and getting the rest through the process as quickly as possible.

Interviewee 9 thinks that the automatic risk assessment can be used in the future to assess the risk for a collective in a company bought insurance. Questions can be customized to assess the company based on factors such as sickness absence, previous cost of risk and profession.
The process can be altered as suggested by interviewee 9 to see which amounts the customer can apply for based on the information they get in the application process, which could be an opportunity for upselling.

**Additional functionality**
For the application that needs to be manually assessed interviewee 2 would like to have notifications in the system if there’s a previous known risk.

When the application is handled digitally interviewee 8 would benefit of having a function that is keeping track of which applications are oldest and for how long each application has been waiting to be assessed. This way they would know which application that has the highest priority.

### 4.2.4 Risks

**Legal**
Interviewee 9 addresses the need for taking the legal aspects in mind when considering which assessment that can be made automatically.

**Security**
As noted by interviewee 4 the security is important for the future process. The customer reveals information about diseases and doctors’ visits which is sensitive data, and it is important to make sure that only authorized people can see the information and prevent unauthorized access to the data.

Some customers might feel hesitant to give away information in a digital process in fear that this is monitored, but that the same risk exists today with paper applications as well, but that it might feel more public when collected in a system as stated by interviewee 1. Interviewee 3 also thinks that there may be concern regarding integrity and privacy.

**Questions**
When deciding how much information to ask of the customers there are a risk that the insurance element disappears if it gets to granular states interviewee 4. If everyone with a higher risk gets a higher premium and all the ones with a lower risk gets a lower premium, then the collective won’t carry the risk together.

Interviewee 5 also recognizes the risk if too much data can be collected about the customer that the real risk profile might be revealed and that the premium in some cases might be too high for the customer to be willing to sign up for the insurance.

Interviewee 1 and 7 raises the concern that if a customer can see what sort of result their answer to a question will be they might test their way to the most beneficial outcome and therefore change previous answers. That there’s risk that it is easier test their way through the application process with fraudulent intentions.

Making the health questionnaire digital could make it easier to ask the customer more questions, but when choosing which questions should be asked there needs to be a balance not to ask questions that are too sensitive, is a risk raised by interviewee 10.
There’s a risk if the changes are implemented too quickly that something will be overlooked when creating the questionnaire, but interviewee 2 thinks that this can be countered by implementing this gradually.

**Risk assessment**

The individual assessment has to be maintained and not be too generalized, there is media risk that a customer feels wrongly assessed, is highlighted by interviewee 4.

Interviewee 5 regards that it will require a lot to be able to automate the risk assessment for the really complicated applications and that these will still require a manual risk assessment.

The guidelines for the risk assessment needs to be a living thing, interviewee 10 raises the question if some applications could go through that shouldn’t, but also recognizes that a business case can be made to assess which risks the company is willing to take. The level of risk the company is willing to take is an indicator for how much they should be willing to open up the guidelines.

As interviewee 6 stresses the automated risk assessment system needs to be thoroughly tested.

**Reply**

When working with motivations to the rejections it is important not to make the customer worried. Interviewee 7 exemplifies this with a rejection regarding overweight and that there’s a heighten risk for heart disease, it doesn’t mean that it will happen but the risk is higher.

Respondent 3 also sees that there’s a risk that automatic replies may be too impersonal, and that the company might need to be able to explain the reply more than the automatic reply might allow for. Talking to a person would allow the risk assessor to explain the rejection in terms that they would like to hear.

**IT infrastructure**

Interviewee 10 stresses that the automated risk assessment system needs to be stable so that the customer won’t get error when they are filling out the health application and needs to start over. The system must also be able to interact with all the necessary internal systems.

**4.2.5 Benefits**

**Customer experience**

Interviewee 8 thinks that the customer will experience the application process much easier if the health application is digital than if it was a paper questionnaire. Interviewee 3 thinks that besides making it easier for the customer to answer the questions, the customer will more easily understand what information is requested and the risk for them feeling like they are lying because they don’t understand is reduced.

If the health questionnaire is digital it could be customized so that the customers who don’t need to be risk assessed won’t have to answer more questions than absolutely necessary according to interviewee 6.
If some of the applications could be assessed automatically without manual work the customer could receive an answer directly which stated by interviewee 10 would be a benefit. This could increase the number of sales when the risk of losing the customer because it takes too long is minimized.

For the corporate customers there would be a big benefit if the process is as simple as possible to save time. Interviewee 5 gives an example that if a customer has thousand employees then spending 10 minutes per employee amounts to a lot of time.

Interviewee 5 thinks that including life style questions in a digital dynamic health questionnaire could help educating the customers in life style decisions. Such as questions if the customer includes fish in their diet or only red meat when they see what follow-up questions their answers generate.

**Completions**

If the health questionnaire is digital interviewee 8 thinks that the number of completion would reduce since the customer cannot miss filling it in. Which would also reduce the total time for risk assessment as they have previously had to send out letters and wait for a reply.

In cases of some diseases or diagnosis one can know right away that the risk assessor will require medical records and it would be a benefit if this could be requested from the customer right away according to interviewee 2.

**Automatic risk assessment**

Automatic risk assessment would give the risk assessor more time to handle the complicated assessment instead of devoting so much time to administration or requesting completion according to interviewee 8. Interviewee 10 thinks that this can further develop the risk assessors’ knowledge when they have more time to develop their expertise in risk assessment.

Interviewee 7 thinks that automated risk assessment can reduce administration cost and interviewee 6 thinks this could have an impact in lowering the premiums.

If motivations to rejections could be automated or enabling use of standard text this would save time for the risk assessor according to interviewee 7.

Interviewee 2 believes that if the risk assessment is automated the risk for difference in the assessment of different customer is reduced.

Automated risk assessment would allow the company to sell more insurances with the same number of risk assessor according to interviewee 2.

**Communication**

If other stakeholders in the company can get information about the status of the application in the system this will reduce the time the risk assessor needs to spend on informing and answer their questions according to interviewee 8.

Respondent 2 thinks being able to communicate with the customer digitally and request additional information this would reduce the need for paper communication.
Suggestions for applying for a life insurance triggered by different events in the customer’s life could increase sales and the reputation of the insurance company, according to interviewee 3. For example, when the customer has applied for housing loan the customer will be in need of a life insurance, which could be communicated to the customer via their mobile phone. Including a proposal for insurance amount and a way to apply for it in an app in the phone.

Communicating with the customer digitally is not a way to lose contact with the customer but a new way to interact with the customer, which interviewee 3 sees a benefit. The main reason for losing the customer is that they don’t hear anything from the company.

Security
If medical records could be collected digitally it would be more secure than sending these via postal service which was stated by respondent 3. Interviewee 3 also recognizes a benefit in transferring the data in health questionnaire digitally instead of sending the questionnaire via postal service which isn’t completely secure.

Analyze data
Having more data would give the risk assessor more statistics which would add to their professional development which is requested by respondent 1 and respondent 3. Respondent 2 also thinks that the additional data would enable them to plan in beforehand when they need additional personnel or when they have to prepare for extra load of work. The data could be used to adjust the guidelines as mentioned by interviewee 10, but also introduce new knowledge into the industry.

Interviewee 5 thinks that if they can give the customer incentive to contribute to additional risk data besides the data they give today this could improve the way new customers can be risk assessed. In addition, this could also contribute to capture a need of the customer that the customer doesn’t see themselves and being proactive potentially prevent an insurance claim if the risk of the customer dying is reduced.

The additional risk data could be used to assure that the company has the right reserve allocation according to interviewee 5.

The customer need can better be assessed by using the data collected in a digital dynamic application process is mentioned by interviewee 5.

Interviewee 4 states there might be an opportunity negotiate agreements with reinsurance company when the insurance company has more information.

Sales process
Interviewee 3 believes that if the health application is simplified when making it digital this will increase the incentive for the advisor to sell life insurance when they know it won’t be too much trouble for the customer to complete the process. They can start the risk assessment process in the meeting, and if they could get an answer right away this would be a great benefit for the advisor. The guidance a dynamic health application could offer could provide assistance for less experienced advisors. If the administration that is required by the advisor in the process today could be reduced they would have more time to spend on meeting customers.
Questions
Digital dynamic health questionnaire allows the company to customize the questions to what they are actually asking for, which is harder in a paper health questionnaire since they have to cover all eventualities. If the customer can answer specific questions instead of free text-field the risk assessor will get the answer they need without having to request completion because the customer has been too vague according to interviewee 2.

According to interviewee 1 the industry has moved towards using fully working as a way to risk assess the customer, if dynamic health questionnaire is implemented and this isn’t experienced as more difficult the industry could use an individual health assessment more than today. Which might be a well needed change for the industry. The change in question could potentially open up the possibility to create more specified product and insuring other patient groups.

4.2.6 Future
Most of the interviewees addressed the issue that the insurance industry has to keep up with the technological development and digitalization to be able to maintain being relevant in the market. Some of them said that this is something that will happen soon.

Both interviewee 5 and 9 thinks that in the future the risk assessment process could be connected new technology such as activity trackers or gym membership.

Interviewee 1 is one of the interviewees that would like to have a shared bank for medical records where all of the medical records can be collected and retrieved in one place. This is something that doesn’t exist today but that might be created in the future.

4.2.7 Implementation
Interviewee 9 thinks that when implementing automated risk assessment the company should start with a limited number of diagnosis that they are sure of, learn from this and then expand to more diagnosis. Both interviewee 2 and 8 wants the risk assessor to be a part of creating the guidelines that the system should assess according to. Interviewee 8 believes that communicating information about what is happening during the implementation is important to make everyone feel involved in the process.

4.2.8 Resistance
Interviewee 8 sees it as a risk that some risk assessors might see this as threat or negatively. There may be questions regarding if they can truly rely on the system and that they are used to working according to certain routines. Interviewee 2 thinks that the resistance can be reduced by involving the risk assessor in the implementation process. Interviewee 8 says that patience is important when implementing something like this, that the risk assessor will get used to the new process after some time.

Interviewee 7 believes that the way a proposal for implementing automated risk assessment is received depends largely on how this is presented. If they can keep the same number of risk assessor the news will be received more positively.
All the participants in the workshop identifies the internal IT-infrastructure as obstacle preventing automates risk assessment and the desired functionality to be implemented.

4.3 Summary of Empirical Findings
The interview has shown that there are a number of things surrounding the risk assessment that create obstacles for the company. The insurance company has to balance how much information they acquire from the customer and how to make the process as easy as possible for the customer. Today the process is often seen as complicated which creates problems that leads to reduced number of sales. Problems such as that the customer doesn’t send in their health questionnaires, they miss or misinterprets questions which require completions, the customer doesn’t trust the sending health information through postal service and there’s a lot of time consuming activities.

In the future process the respondents in the interviews has requested many changes in order to make the process surrounding the risk assessment more time efficient. To reduce time consuming activities they would like to be able to request the power of attorney electronically. Electronic communication with the customer would make them not having to send letters when requesting completions or answering questions. Information of the status of the application both to the customer and internal stakeholders would reduce questions. Implementing automated risk assessment for all types of applications that this could be implemented for, both rejections and approvals, would give the risk assessors more time for the ones that really needs to be manually assessed. Collecting the information in the health questionnaires and the application process electronically would reduce the need for completions and risk for misinterpretations of the questions, and give the company more information use for analysis and statistics. A chat and additional support in the system would support both the customer and the risk assessors.

There’s risk that has been brought up during the interviews. These are risks regarding security around the data, having a stable IT-infrastructure, how the questions are created and how much information should be collected about the customers. When making the questionnaire dynamic there’s a fear regarding the customers acting fraudulent. When assessing the applications automatically it is important not to lose the individual assessment and not worrying the customer in the answer to the application.

There’s also a lot of benefits that has been identified and the interviewees thinks that the benefits outweigh the risks. They believe that the customer experience will increase when the process is more digital and simplified, that the number of completions will be reduced and the company can communicate with the customers digitally. The future process will give the risk assessor more time to work with the complicated assessments. Some thinks that the digital communication will increase the security, and it is a benefit having more data to analyze.

Among the interviewees there’s a consensus that the insurance companies has to keep up with the technological advances in order to stay relevant on the market, but that there are some things to take into consideration when implementing this, such as how the change will be received and not doing it too quickly.
5. Discussion

In this chapter I will present the analysis of the empirical findings. Later in the chapter I will present a discussion regarding the result, the connection to the research question and the conduct of the research, including the role of the researcher and theory.

5.1 Analysis of the Empirical Findings
In this section the empirical findings are discusses in relation to the theoretical framework presented earlier in chapter 2.

5.1.1 Current Situation
The interviewees have described how the process today is very inefficient and that there’s a lot of room for improvements and that more support of IT is desired. As Sandberg (2014) discusses the company needs to continuously build their capabilities and keep up with the development of new technology to be able to maintain in the market they are today. Further he discusses that digital technologies are a key driver for strategic change and that a fast changing market affects the life span of organizational routines and increase the rate of organizational routines (Sandberg, 2014). Ward and Peppard (2003) discusses that several companies has been able to accomplish significant improvements in their operations when redesigning business processes, and redesigning business processes to gain better advantage of IT capabilities.

The understanding of the present situation and processes is imperative to discern the opportunities and risks in the current strategy (Peppard and Ward, 2003). Understanding how the interviewees experience the situation has therefore been very important in order to see which improvements would be needed to redesign the process to make it more efficient and create more benefit for the company. In this case the business process as described by Peppard and Ward (2003) is the application process that the customer goes through to sign up for an insurance. As they have defined activities the risk assessment as a key activity for that business process and the health applications is a key entity within this.

5.1.2 Future
Sandberg (2014) discusses that it is getting increasingly important to have strategic foresight and adapt to the changes in the market in order to survive in the competitive landscape. Investment in IT is required for survival and the digital capabilities will not stay the same if the organizations doesn’t maintain them (Sandberg, 2014). It has become evident during the research that increasing the digitalization level in the risk assessment process of life insurances and other important activities that are closely linked, and that several actors in the market is interested in automating the risk assessment. When some actors are starting to implement the automation this will change the context in the competitive landscape. This will as Sandberg (2014) describes increase or decrease the digital capabilities of the company. In this case it will most likely increase the digital capabilities for the companies that implement automated risk assessment, but risk decreasing for the ones that doesn’t. Garven (2002) has identified that when the industry previously increased the number of online services the competitiveness in the market increased. This further adds to the statement that the implementation of automated risk assessment will alter the
competitive landscape, and that the insurance companies have to take actions to survive.

The interviewees have stated that they believe that this is just the beginning, the advances in digitalization will only increase. The insurance companies have to have a strategic foresight to adapt to the changes that is occurring around them. To survive in the new landscape they need to keep building their digital capabilities and competitive advantage.

5.1.3 Future Process and Benefits
The changes in the future process that was presented in the previous chapter aims at reducing the obstacles that exist in the process today, increase the digitalization in the process and take more advantage of the capabilities of the company. This will include both automating the risk assessment but also activities and key entities that are of great importance to the process of assessing an application.

One important factor is that the required time for completing this process will be reduced. By digitalizing more communication with the customer the amount of letters sent out to the customer and the time spent on sending these and waiting for the reply will be reduced. In the current process many experience that a very large part of the applications requires completions or access to medical records. In the future process the number of completions will be reduced when the data can be collected in a digital process, which is mostly paper based today, since the customer cannot miss questions and the hope is that the customer will not misinterpret the questions in the same extent as today. The time spent on administrative task will also be reduced.

According to Amit and Zott (2001) conducting transactions on a virtual market can reduce the cost of each transaction, for example by reducing the time required to spend on each transaction. In this case all the changes that will reduce the time required to complete the risk assessment of an application will reduce the transaction cost.

The interviewees have stated that they spend a lot of time communicating the status of the application to the customer and other internal stakeholder, as this can be reduced when the level of digitalization of the process is increased. This will as Amit and Zott (2001) describe that e-business can reduce the indirect cost of the transactions and increasing the frequency of the transactions.

When the majority of the applications will be risk assessed automatically that the risk assessor identifies that they won’t have to look at, it will enable them to spend more time with the more complicated applications. This in combination that the company will have more data to analyze and learn from will increase the knowledge of both the company and the risk assessor. This will increase the digital assets as defined by Sandberg (2014). The data can help the company further build their knowledge about the market and support them in making business decisions (Chen, Chiang and Storey, 2012).

Garven (2002) argues that insurance companies have a harder time to attract customers to their site and get them to spend more time there than banks do. The future process will improve the customer experience and decrease the obstacles that
they are facing in the process today. This will hopefully mitigate the risk that the customer drops out partly through the application process online but also when they have to fill out the health application.

Amit and Zott (2001) presents the value chain analysis which consists of four value drivers, efficiency, novelty lock-in and complementarities. All of the above discussed changes of the future process contributes efficiency as a value driver. The future process will have a reduced transaction cost, the customer experience will be increased and the total amount of time required to complete the process will be reduced.

![Value chain analysis altered based on source: Amit and Zott, 2001](image)

Complementarities as a value driver can be achieved when value is added by having more than one product together than having one them separately (Amit and Zott, 2001). In the future process the interviewees wanted to increase the opportunity of cross-sales and up-sales by being able to trigger communication to the customer at certain life cycle events. For example, promoting complementary products when either when buying the life insurance or promoting the life insurance when the customers buys another product, or promoting the life insurance when taking a housing loan. Also by offering optional products when informing the customer of a rejection. The increased level of digitalization will enable the insurance company to collect and analyze data, which can be used to create new opportunities for sales and improved analysis of the customer’s needs. Anand et al. (1998) argues that the competitive landscape is making it increasingly important to increase the profit generated from the current customers. By analyzing the data using data mining can contribute to finding new useful information and increase the potential for increased cross-selling. This method would give more profit in two ways. One is by increasing the likelihood of the target customer buying the proposed product by having conducted the analysis. The other is that the target group would be smaller but more accurate which would reduce the cost (Anand et al., 1998).
Lock-in can create value by increasing the motivation of the customer for additional transactions and strengthening the relationship with the customers (Amit and Zott, 2001). One of the interviewee’s expressed the wish to have more IT support in the sales process. Both having more digital processes that they can use in the meeting with the customer but also supporting them in providing the customer with the right health applications, and that mistakes in these processes would risk the trust of the customer. By improving the process and thereby potentially improving the relationship with the customer this can prevent the customer from leaving the insurance company for a competitor (Amit and Zott, 2001). By improving the way the system can make recommendations to the customer concerning products and insured sums the customer could be further motivated to interact more with the system (Amit and Zott, 2001). Some of the interviewees believe that the security of the information in the health questionnaire can be improved by collecting the data electronically instead of sending the questionnaire via postal service. This could contribute to a strengthen relationship with the customer by improving the transaction safety (Amitt and Zott, 2001).

Novelty is the last value driver discussed in the value chain analysis, which can be achieved by changing the distribution, marketing or introduce new products (Amitt and Zott, 2001). The simplified process will change the distribution and could enable further change in distribution by providing the advisors with a new system where the customer can fill out the application and health questionnaire in the meeting electronically. Enabling the customer to sign power of attorney electronically would eliminate inefficiencies in the buying and selling process (Amitt and Zott, 2001). Which would be further improved if a central electronic storage of medical records that would simplify the collection of information regarding diagnosis that needs to be further investigated.

5.1.4 Risks
The outcome of a decisions may vary even though they make the same decision depending on the prerequisites of the different organizations (Sandberg, 2014). It is therefore very important to investigate the potential risks that may arise if an organization implement automated risk assessment and then see which risk may be relevant for that specific organization.

Interviewees discussed the risk of the security of data. If the data is collected electronically and more data is stored the integrity and confidentiality of the data needs to be maintained (Wylie et al., 2000). The interviewees brought up the fact that when digitalizing this process some customer might feel hesitant to give away their information online or in a digital format. The opposite was also brought up, that many might feel hesitant to send their information via postal service and that giving it away electronically may be a benefit.

The need for stabile IT-infrastructure was also discussed and the availability of the system needs to be assured, that it is able to respond to requests according to the service levels that has been specified (Wylie et al., 2000). As the technological advances in society continues to move forward we rely more and more on digital data and therefore the above mentioned aspects are becoming increasingly important (Wylie et al., 2000).
As Patterson, Bonissone and Pavese (2005) argues there has to be a clear strategy for how to ensure the quality of the performance of the system throughout the lifespan of the decision making system. Interviewees have expressed that they want to be able to monitor the output of the system in order to determine how to move forward with automatically assessing more applications, given that the system won’t assess all the application straight from the beginning.

![Figure 7 Performance monitor process. Source: Patterson, Bonissone, Pavese, 2005.](image)

The interviewees have expressed that there’s a risk associated with the automated risk assessment, that the assessment has to still be individual and not too generalized. The guidelines are the base for the decision making should be a living thing so that this can be adjusted when the insurance company learns more about the assessments and the level of risk the company is willing to take on. The same as stated above is applicable for this risk, there should be a clear strategy in place for monitoring and evaluating the guidelines used for the automatic risk assessment (Patterson, Bonissone and Pavese, 2005). Kraemer, van Overveld and Peterson (2011) discusses that algorithms making assessment are value laden and that there’s ethical aspects that needs to be taken into consideration when determining the thresholds which determine the outcome of the process. The algorithm can produce false positive or false negatives, meaning assessing a person as healthy when the person is not or sick when the person is in fact healthy. Deciding which of these are preferred is an ethical consideration that needs to be made by the designer of the algorithm which makes the algorithm value-laden. How to act on this information is the responsibility of the user of the algorithm, in this case the company (Kraemer, van Overveld and Peter, 2011). In this case regarding automated risk assessment and provided that not all applications will be assessed automatically but can be sent to a risk assessor when it is deemed to be complicated enough, the consideration is to set threshold that determines which risk they are willing to take. Analysis has to be carried out to determine whether they prefer false positives or false negatives, and how they can mitigate the risk by determining how to capture the compacted case to send to a risk assessor.

5.1.5 Resistance
Some of the interviewees have expressed that there might be some resistance in the organization regarding implementing automated risk assessment, mainly from the risk assessor. In order to fulfill a successful implementation this resistance needs to be addressed and mitigated. Kotter (2012) argues that resistance can be mitigated using his eight-stage process of creating major change. This includes creating a sense of urgency by analyzing the market, the potential crisis and opportunities (Kotter, 2012).
If insurance companies in the market are starting to implement automated risk assessment and builds their digital capabilities from this there is a potential crisis that the company will not be able to survive or stay relevant in the advancing market. The communication during the change will be very important for the change. A guiding coalition needs to be created with enough influence to lead the change, the vision needs to be created and communicated repeatedly as much as possible (Kotter, 2012).

5.2 Connection to the Research Question
The research question for this research was: What are the possible benefits and risk associated with adopting automated risk assessment in the underwriting process of life insurance seen from the company’s perspective?

The empirical findings presented shows which potential benefits and risks that the participants of this research identifies. There is no customer included among the participants of the research but is instead focused on examining the impact on the internal stakeholders in the company and how they would like to be supported by the solution regarding automating risk assessment of life insurance. The research has produced a number of benefits and risk associated with the automation of risk assessment. The research has also produced additional information regarding the current processes of the companies that has been a part of this research and how the participants would like that the future process would look like. Additional to this information regarding obstacles currently existing today that complicates the implementation of automated risk assessment, resistance towards this and suggestions for implementation has also been identified and incorporated in the analysis. This was not fully expected when initiating this research but an important addition to this area, and something that can contribute to automation initiatives.

5.3 Discussion of the Result of the Research
The research has resulted an extensive list of potential benefits and risk. Having included many different stakeholders associated with this process from different companies has been a strength of this research. However due to time limitations the number of respondents that could be included in the research had to limited. Therefore, this result could not be generalized across a majority of companies. If the available time for the research would have been extended the number of participants could be increased and thereof the generalizability. Looking back, I think that there would have been beneficial to have more workshops to generate more ideas in group. As the output of the one I held was very fruitful and the participants had really good discussions regarding how they would like re-design the process in the future and they could build on their ideas together.

The result of the research has extended beyond the research questions since it in the investigation of this has been important to understand the current process and the desired future process. I have in this thesis shown an example of how a business critical process in the insurance market can be analyzed from the perspectives of strategic planning and e-business.

5.4 Discussion of the Role of the Theory
The theory presented in chapter 2 that is related to this topic has been of importance to present in this thesis in order to give both me as a researcher more knowledge in the area but also enhance the understanding of the reader. Providing some basic
information regarding insurance is important for the reader to understand the results presented and the analysis of the, if the reader doesn’t have a deeper understanding of insurances and important elements if this. The information collected regarding the digital framework and the advances in the insurance market has been important in order to analyze the results and conducting the research.

5.5 Discussion about the Participatory Design
For this research I have used participatory design in order to involve the stakeholders in the research, which I’m very pleased with. This has been crucial in order to reach the results I have. The aim for the research has been to highlight the potential benefits and risk in implementing automated risk assessment for life insurance. Bratteteig et al. (2012) as discussed in chapter 3.2 argues that it is important to involve the future users in the design process and that there are three core perspectives for the user involvement. They are users having a say, mutual learning and co-realization. In this research I believe that I have been able to include the future users by conducting interviews and workshop to collect their opinions and how they would like the future process to look like. The workshop has also increased the mutual learning by enabling them to share their experiences and ideas for improvements. Together with the participants of this research I have identified a number of potential benefits and risks, which draws upon the co-realization.

This is not well-established on the market, therefore I haven’t been able to measure an existing system but have been dependent of the input from the interviewees. My hope has been to be able to highlight more potential benefits and risk than the company currently developing such solution that I meet initially had been able to. Involving different stakeholders in the company has therefore been a very fruitful way to uncover what they believe they would benefit from and which risk they could imagine could need to be handled.

As a limitation for this research the aim was not to produce a prototype of the design, but instead a list of the outcome. But if I had more time available it would have been very interesting to spend more time and create a prototype of a possible information system that would incorporate the desired future process expressed by the participants. This could potentially further enhance the understanding and enable finding more potential benefits and risk that could be incorporated in the future process.

5.6 Limitations of this Research
This research was limited to investigating automated risk assessment of life insurance, however many of the interviewees stated that a lot of both the benefits and risk can be applied for other risk insurances such as health insurance. It would most likely be beneficial for the insurance company to automate the risk assessment of as many of their risk insurances as possible if they decide to do it. This would make it easier for the customer to understand the process of applying for an insurance if it is as similar as possible for all the products. The company would also be able to take advantage of the benefits for more than one process.

The legal aspects of the output were also out of scope for this research, since I lack both time and knowledge to accurately examine these aspects. Due to this the legal aspects would need to be examined for some of the proposed changes in the process.
before implementing these. One example of this would be the possibility to give automated rejections in the application process to ensure that there’s no legal obstacles associated with this.

5.7 The role of the Researcher
I as a researcher have limited experience using these methodologies that has been applied in the research. With more extensive experience the result could potentially have been different. This research has however provided me with a lot more experience, but of course there’s room for improvements.

I have experience from the insurance industry but from an IT perspective so my knowledge does not extend to medical risk assessment. Therefore, I have had to spend a lot of time to understand the process and important factors that affect the assessment of the application. This had been achieved both by reading articles I the subject but also gaining more understanding from the interviewees. This has required me to sort out some vague understandings of the process during the interviews, but it can also be beneficial to have someone from the outside analyzing the situation.
6. Conclusion, Contribution and Future Research

In this chapter I will present the conclusion of this thesis, the practical and theoretical contribution and suggestions for future research.

6.1 Conclusion
This research has been conducted using participatory design with the motivation that investigating this issue would require the participation of stakeholders connected to the medical risk assessment process and the potential automation of this process. The stakeholders are the ones working, either directly or indirectly, with this process every day and they are the experts of this domain, therefore having their view of this is imperative. After investigating the topic of this research and interviewing employees of different companies and gaining knowledge about their processes my belief is that there’s a lot room for improvement in the processes and room for increasing the level of digitalization. Increasing the level of digitalization and automating more of the process would highly benefit the company, the employees and the customers.

Considering the formulated research question for this research I conclude that the ambition of this thesis has been achieved:

What are the possible benefits and risk associated with adopting automated risk assessment in the underwriting process of life insurance seen from the company’s perspective?

A large number of potential benefits and risk that need to be addressed has been identified:

Risks:
- Legal
- Security around data and integrity
- How to develop the questions
- How to determine the guidelines for the risk assessment
- Providing automated replies
- IT infrastructure

Benefits:
- Enhanced customer experience
- Reduced amount of completions
- A large portion of the risk assessments of applications can be automated
- Digital communication
- Enhanced security
- More data to analyse
- Simplified sales process
- Simplified questions

Additionally, more important aspects such as how the stakeholder would wish the future process should look like, some of the obstacles and resistance that would require to be battled has also been brought into light in this thesis.
As stated in chapter 3.2.2 the aim for the research using participatory design was to identify a set of additional areas that could be supported by the automated risk assessment and potential risk associated with this.

6.2 Theoretical Contribution
The previous studies that has been found during this research has either been conducted several years ago which doesn’t account for the digital technological advances made in recent years. The studies that is the most relevant to this topic has not included how they handle some of the more complicated aspect, such as medical records, that is a requirement for the risk assessment on the Swedish market.

This research contributes with a more recent investigation of automated risk assessment for life insurance. This also contributes with potential benefits and risk associated with automating the risk assessment from the company’s point of view. The research has been conducted using participatory design in order to investigate the potential benefits and risks according to the internal stakeholders, how they could be supported and how they would want the future process to look like. This way the internal stakeholders that are the future users of this automated system are part of the design process of bringing these aspect into light.

6.3 Practical Contribution
As shown by the answers by the participants in this research all of the companies that is included in this thinks that they would benefit by developing the medical risk assessment process to increase the digitalization or automation in the process. All the participants are in agreement that what is implemented today is only the beginning, the advances in technology and the implementation of this in these processes will increase. To stay relevant on the market they have to keep up with the digital advancements in their market but also in society.

The practical contribution of this thesis is to further highlight the potential benefits of increasing automation and digitalization and the risks that needs to be addressed. Also this thesis can contribute with ideas for improvements in the risk assessment process and the application process for life insurance. This thesis concludes desired requirements of these processes by employees working with this every day, and is based on their knowledge and what they see would be highly beneficial. In the analysis, the information retrieved from the participants have been linked to the literature in this area to further show why this information is of great importance.

6.4 Future Research
The ambition of this research has been to investigate the potential benefits and risks of automating the medical risk assessment for life insurance. The number of participants has had to be limited and can therefore not guarantee that these results are general for all companies on the insurance market. Future research could be made on a larger number of participants both from larger number of companies but also more people from the same position across different companies to increase the level of generalizability. I have not been able to investigate if there’s a company in Swedish market that has a system that has fully automated the risk assessment process and has therefore not been able to measure the added value of an automated process in reality. Future research measuring the benefits and investigating risk that has come up during
the implementation and usages of the system in production is required in this area. The legal aspects of which of this changes are possible would also require to be researched in the future. Some of the interviewees discussed the term fully working as a condition as a base the risk assessment if a customer can be approved for the life insurance, and that this may not be a good way to assess the application. Future research could investigate whether the implementation of automated risk assessment using a complete health risk assessment could be more beneficial than assessing on the base of fully working. Another interesting are to conduct further research in would be to investigate how the use of digital and dynamic health application form can affect the questions asked to the customers. Could the nature of the questions change, such as mentioned by some interviewees that more life style questions could be included. When the information is collected in an electronic form the possibility of using this for big data analysis increase, and what effects can this have. For example, could this increase the knowledge of the company or industry or if it could have an effect on the pricing of the insurance.
References


Appendices

Appendix I: Informed consent for interview
Förfrågan om deltagande i studie: Intervju

Denna studie genomförs för att undersöka vilka fördelar och risker som kan identifieras när en automatiserad riskbedömning implementeras i nyteckningsprocess för livförsäkring. Denna studie genomförs inom ramen för masteruppsats vid Linnéuniversitetet. I denna studie är kunskap, erfarenhet och åsikter från riskbedömmare samt andra identifierade intressenter viktiga för att identifiera områden som kan stödjas av denna process, alternativt där risker kan införas som behöver hanteras.

Du är tillfrågad då du är trors vara en intressent för denna process.

Att medverka i denna studie är frivilligt och Du har rätten att närsomhelst avbörja vidare medverkan. Ditt bidrag är viktigt för denna studie för att genomföra en välgrundad analys av fördelar och nackdelar som kan vara associerade med införande av automatiserad riskbedömning av livförsäkringar.


Namn på personer eller företag som deltar i studien kommer inte publiceras.

Om önskemål att läsa igenom sammanfattning av intervju innan den tas med i redovisning av resultat från studien och bedöma vad Du tillåter vara med i resultatet, vänligen kryssa i Ja nedanför, annars kryssa i Nej.

__ Ja

__ Nej


Program: Master i Informationssystem vid Linnéuniversitetet. Handledare: Jaime Campos, jaime.campos@lnu.se.

Jag har härmed tagit del av ovanstående information, haft möjlighet att fråga efter övrig information och godkänner deltagande i intervju som del av denna studie:

Namnförtydligande:
Datum:
Signatur:
Appendix II: Informed consent Workshop
Förfrågan om deltagande i studie: Workshop

Denna studie genomförs för att undersöka vilka fördelar och risker som kan identifieras när en automatiserad riskbedömning implementeras i nyteckningsprocess för livförsäkring. Denna studie genomförs inom ramen för masteruppsats vid Linnéuniversitetet. I denna studie är kunskap, erfarenhet och åsikter från riskbedömmare samt andra identifierade intressenter viktiga för att identifiera områden som kan stödjas av denna process, alternativt där risker kan införas som behöver hanteras.

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Om önskemål att läsa igenom sammanfattning av workshopen innan den tas med i redovisning av resultat från studien och bedömma vad Du tillåter vara med i resultat, vänligen kryssa i Ja nedanför, annars kryssa i Nej.

__ Ja
__ Nej

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Jag har härmed tagit del av ovanstående information, haft möjlighet att fråga efter övrig information och godkänner deltagande i intervju som del av denna studie:

Namnförttydligande:

Datum:

Signatur:
Appendix III: *Interview questions for risk assessors*

This some examples of the questions asked in the interviews with the participants.

- Which activities would you like to remove from the process?
- Which activities could be replaced by automated routines?
- Which activities are the most time consuming?
- What support would you benefit from?
- How would your work regarding the risk assessment look like in a dream scenario?
- Is there any sort of applications which you would like not to have to risk assess?
- Would you be supported by more data analysis?
- How could automation be implemented in the risk assessment process?
- Could the number of questions asked to the customer be reduced?
- Do you see any benefits in automating the risk assessment process?
- Do you see any risks in automating the risk assessment process?
- Do you see any obstacles with the current process?
- Which stakeholders could benefit from automating the risk assessment?
- Do you feel that you have enough information regarding the customer?
- Do you think that increased digitalization could have an effect on the sales?
- How would you feel about if the process was automated?
- How long does a risk assessment usually take?
Appendix IV: Interview questions for actuary

This some examples of the questions asked in the interviews with the participants.

- What do you base the premiums on?
- What input or support do you need?
- What information do you need to follow up on the risk for the collective?
- Is there any support that you would like to have?
- Do you see any risk in automating the risk assessment process?
- Do you see any benefits in automating the risk assessment process?
- Do you feel that you have enough information about the customer?
- Would you like to be able to follow up on the insurance claims?
Appendix V: Interview questions management

This some examples of the questions asked in the interviews with the participants.

- What support do you need in your position?
- Is there any support that you would like to have?
- Do you see any risk in automating the risk assessment process?
- Do you see any benefits in automating the risk assessment process?
- Do you feel that you have enough information about the customer?
- Would you be supported by more data analysis?
- Do you think that increasing digitalization in the risk assessment process could have an impact on the sales?
- Which stakeholder would be affected by implementation of automated risk assessment?
- Do you see any risk or benefits with the current process?
- Have you thought about automating the risk assessment process?
- What do you think will happen in the future?
- Do you know if there’s any company on the market that has implemented automated risk assessment?
- How could automating the risk assessment support the company?