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**INVOCATION OF ARTIFICIAL INTELLIGENCE IN
PAYROLL**



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Tämä pro gradututkielma tarkastelee tekoälyn hyödyntämistä ja sitä, kuinka tekoälyn avulla voidaan parantaa yrityksen suorituskykyä. Tekoäly on tulossa, tai jo on käytössä melkein kaikilla elämän osa-alueilla ja palkanlaskenta ei ole tässä tapauksessa poikkeus. Tekoäly on siis tulossa yhä aiheellisemmaksi myös palkanlaskennan alalla. Tekoäly on hyvin monisyinen teknologia ja sen käyttöönotto vaikuttaa koko palveluprosessiin, jolloin tekoälyn käyttöä täytyy tarkastella teknologisen näkökulman lisäksi myös strategisesta ja palveluprosessin näkökulmista. Tässä tutkimuksessa käytetään palveluiden modulaarisuutta palveluprosessin määrittelyssä ja selkeyttämisessä sekä siinä että mitkä asiat tulee ottaa huomioon tekoälyn käyttöönottoa suunniteltaessa. Tutkimus tehtiin käyttämällä empiirisiä tutkimusmenetelmiä ja tutkien sekä palveluntarjoajan ja asiakkaan kokemuksia ja oletuksia aiheesta. Tutkielman tuloksina voidaan todeta olevan havainto palveluiden kustomoinnin ja standardoinnin tasapainon löytämisestä ja että sillä on keskeinen rooli erilaisten asiakastoiveiden ja prosessin standardoinnin välillä, niin että palveluntarjoaja voi keskittää kaikki palveluprosessin keskeiset osat. Tutkielmassa kävi myös ilmi, että yritysten tulisi miettiä huolellisesti mitä hyötyjä se voi saavuttaa tekoälyn avulla ja että miten se tulee vaikuttamaan palveluprosessiin sekä missä se pitäisi ensimmäisenä ottaa käyttöön.

Asiasanat: Tekoäly, Liiketoimintaprosessin ulkoistaminen, Palveluiden modulaarisuus, Palkanlaskenta

ABSTRACT

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This master's thesis studies invocation of artificial intelligence in payroll and how it could eventually improve firm's performance. Artificial intelligence is coming or is already in use on nearly all fields of life and payroll is no exception to this. Use of artificial intelligence is coming more and more topical also on the field of payroll. Artificial intelligence is very complex technology to take use and it effects to entire service process, so implementation of artificial intelligence must be observed also from strategic and service process perspectives. In this study service modularity is being used to clarify service process and which matters need to be taken into account when planning implementation of artificial intelligence. The study was done by using empirical methods and researching observations both on service provider and customer side. Study resulted findings which indicated that balance between customization and standardization has a key role in answering to diverse customer needs and standardizing process, so that service provider could centralize all the core parts of the process. Study also found out that firms should think carefully what the benefit of artificial intelligence is and how it will affect to the whole service process and where it should first be taken into use.

Keywords: Artificial intelligence, Business Process outsourcing, Service modularity, Payroll

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1 Introduction

Artificial intelligence will most likely have significant effects to payroll operations and principal course of actions in the future. This was the base assumption for this master's thesis. Artificial intelligence is being highlighted in various contexts and its existing targets of applications span from nearly all fields of life. The main enabler for development of artificial intelligence is the fast-technological development on the field of information technology (Pan, 2016). This is also supported by the conclusions where digitalization is described to revolutionize many service processes, work tasks, data systems and required knowhow (Davenport, 2018; Iafrate, 2018). Digitalization and technological development set their challenges also to payroll and raises the requirements for productivity of labor.

Client company for this master's thesis, a software company which operates intensively in the field of payroll outsourcing, wanted to find out how artificial intelligence could be applied and used in their customer projects. This assignment studies artificial intelligence and its methods in a context of Business Process Outsourcing and more precisely payroll outsourcing. Target of this study is to find targets of application in payroll outsourcing services where artificial intelligence could produce business profits. Literature review from artificial intelligence connects cognitive computing, machine learning, natural language processing, object recognition, neural networks, deep learning, data mining and robotic process automation to be the main methods of artificial intelligence. These methods are explained more precise from the view of computer science in literature review. Business Process Outsourcing includes various different functions that can be outsourced, but in this case, focus is on payroll outsourcing, its definition, historical development, country specific facts in Finland, different regulations and upcoming trends. These are presented in literature review. Service modularity/modularization is also presented in literature review, including previous research relevant for this study and deeper insight for the definitions of module and interface

Theoretical base of this study is built by using service modularity framework (Pekkarinen & Ulkuniemi, 2008; Schilling, 2000; Voss & Hsuan, 2009) for identifying different service modules and their mutual relations via interfaces. Payroll outsourcing is a business field where standardized and customized service tasks are mixed and finding appropriate balance for every customer is critical point for success. This makes service modularity especially suitable theoretical framework for this study. Co-operation between modules via interfaces and functions within a module define the outcome of the service (Bask, Lipponen, Rajahonka, & Tinnilä, 2011). Dividing payroll outsourcing service into modules and identifying crucial points where artificial intelligence could improve modules or interfaces performance are those which can eventually result better productivity.

Study is topical also from the academic point of view, despite the fact that research around artificial intelligence has grown rapidly during the last years. Invocation of artificial intelligence in payroll or payroll outsourcing services is a topic that has not been studied earlier. Using service modularity theory in payroll outsourcing service context is also a topic that has not been academically studied earlier. These above-mentioned factors give academic reasoning for this study.

1.1 Objective of the study

Objective of this study is to find out how artificial can be used in payroll outsourcing services and what need to be considered when planning implementation of artificial intelligence. More detailed, dividing service process into modules and researching modules and interaction between modules to find suitable targets of application for artificial intelligence. Study uses empirical methods and publications mainly from the field of computer science when answering the research question. Research question is defined as follows:

- *How artificial intelligence can be exploited in modular payroll outsourcing service?*

Study is divided to two main themes, artificial intelligence and service modularity. These themes are first studied separately, and findings are combined in conclusion.

1.2 Thesis outline

Study is divided into eight chapters. Chapter two describes artificial intelligence and main concepts of it. Chapter three describes Business Process Outsourcing

and payroll outsourcing as well as Finnish legislation regarding payroll. Chapter four concentrates on service modularity and goes through relevant studies and theories relevant for this study. Chapter five explains research model of the study, research methods and the context of the study. Chapter six handles results of the study. Chapter seven is for analyzing results and reflecting findings with research model and literature. Chapter eight is the conclusion chapter of the study. Questions which were used in interviews can be found at the end of the thesis.

2 Artificial Intelligence

This chapter goes through artificial intelligence, its methods and special characteristics. Definition of artificial intelligence is being examined closely and underlying causes to its recent growth are explained. Data gathering is done by using academic publications and researches about the field of artificial intelligence, cognitive computing and machine learning. Practical publications and examples from business life is also used to widen the understanding of the topic.

2.1 What is Artificial Intelligence?

Artificial intelligence has become a popular topic among scientists, politicians and business life especially during the last few years. Expectations towards artificial intelligence and its future solutions are high, sometimes even exaggerated, but undoubtedly it will most likely change many of the basic ways to do things in the future. Universal dilemma with artificial intelligence is, that it lacks a common definition about what it is and how to define artificial intelligence. Definitions are plenty, depending on who you ask and in which context, but following will present some of the most used and widely accepted definitions about what artificial intelligence is.

First academic publications about artificial intelligence dates to year 1959, when John McCarthy published article "Programs and common sense", which presented results done in the first artificial intelligence project between 1956-1958. First descriptions about artificial intelligence described by McCarthy were an advice taking and reasoning done by intelligence machine (Morgenstern, 2011). Alan Turing explained computing machinery already in 1950 in so called Turing's test, where machine tries to imitate human, without being exposed as a machine when asking questions.

Artificial intelligence is widely accepted term for comprising machines which imitate human-like intelligent functions (O'Leary, 2013). Although defin-

ing what is human-like intelligence, artificial intelligence and intelligence in general is not unambiguous (Lawrence, Palacios-González & Harris, 2016). Jerry Kaplan (2016) highlighted that artificial intelligence is not a same thing as human intelligence, because artificial intelligence is task-oriented, situation adaptable rational intelligence. Artificial intelligence is often described via human intelligent characteristics and human-like thinking is a future target for artificial intelligence. Lawrence (2016), O'Leary (2013) and Nilsson (2005) described artificial intelligence for a way for machines, software's, systems and services to perform according to situation and task with intelligent way. All the following can be included under the term artificial intelligence: systems that think like humans, systems that act like humans, systems that think rationally and systems that act rationally (Russell & Norvig, 2016). More detailed Russell & Norvig (2016) divided artificial intelligence into eight different definitions which are included to the term artificial intelligence:

1. Ability to make computers to think.
2. Ability to make computers manage automatically different tasks, which contain decision making, problem solving and learning.
3. Ability to create machines, which can execute functions earlier done only by human.
4. Ability to get computers to make tasks, which human have done better earlier.
5. A branch of science, which aim is to analyze intelligent actions and build functioning systems based on that.
6. Machine modelling of a human mind.
7. Researching components related to human deduction and course of actions.
8. A branch of science, which mission is to explain and imitate intelligent behavior from mechanical perspective.

Artificial intelligence as a term suffers from, so called AI effect or odd paradox. This means that when some problem is solved with artificial intelligence it is no longer seen as an artificial intelligence rather than regular programming and calculus. Artificial intelligence is therefore rather future oriented term, even though different artificial intelligence solutions have been existing for decades. Examples of AI effect or odd paradox are for example automatic language translation, search engine recommendations and computer winning man in chess. (Russell & Norvig, 2016).

In theory, artificial intelligence has been existing from early 1950s, but it took some time before technology was enough advanced to enable first practical implementations of artificial intelligence (Aleksander, 2004). Nowadays artificial intelligence is widely used among different software's, applications, services, machines and systems (Russell & Norvig, 2016). Well known examples of artificial intelligence are for example: recommender systems in Netflix (2019) and in Amazon (2019), self-driving cars (Volvo, 2019) or Siri helper (Apple,

2019). Artificial intelligence is a normal part of many functions in both work and leisure time and it has replaced human in some functions. So far artificial Intelligence is being more of a background enabler for several functions, but for example autonomous driving shifts artificial intelligence from background technology to spotlight and making it the core enabler of this specific service. From business perspective, artificial intelligence supports three business demands: engaging employers and customers, process automation and creating understanding with data-analyses (Davenport, 2018).

Artificial intelligence faces lot of ethical questions and especially when machine is doing critical decisions, which can be life-threatening in some cases. One particularly important dimension in artificial intelligence is the fact and reasons behind the chosen decision by the machine. One especially hot topic at the moment are lethal autonomous weapon systems (LAWS), which are entering to the field of military industry (Russell, 2015b). These autonomous weapon systems are intended to do independent decisions when selecting and engaging targets without human intervention (Russell, 2015b). In this kind of decisions, reasoning why machine selected and engaged that specific target is vital to know. Another important topic to discuss are questionable objectives or negative targets, which machine can learn itself or by intentional intervention from human. Technology acceptance is also one thing to examine, for example how people accept artificial intelligence in different situations and situations where they are used to be contact with another human (Hodson, 2015). Recommendations given by artificial intelligence wake up questions, can these results be relied uncritically (Hodson, 2015).

While artificial intelligence is being highlighted in media and in different publications, both academic and non-academic, it is justified to ask is all this commotion well founded?

Chart presented below represents investments to artificial intelligence in companies in United States from 2014 to 2017 (CBinsights, 2019). Even though exact numbers about artificial intelligence are ambiguous, trend is obvious and show the growing interest towards artificial intelligence.

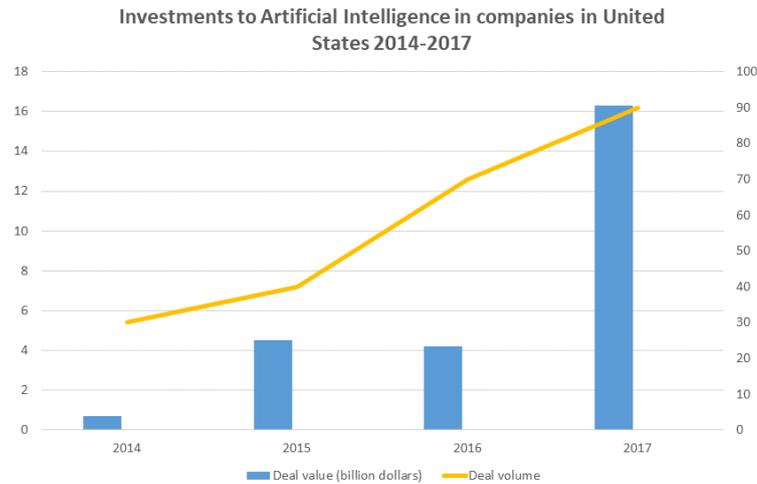


FIGURE 1. Investments to artificial intelligence in companies in United States 2014-2017 (CBinsights, 2019).

Technology and artificial intelligence are seen as a game changer or a savior, which will change everything and on top of everything else saves planet earth from climate change. Other extreme is machines, which will rule the world and enslave humans. (Nilsson, 2005) considered, that human-like super intelligent computers are still quite far in the future and we should remember realism when talking about artificial intelligence. Although VTT researchers (2017) claim, that technological development like algorithms, computational power and amounts of data will enable revolution change, which will be comparable with agricultural revolution in 1950s. So called “intelligent data processing” offers reasons to explain this revolutionary change (Russell, 2015a). Russell (2015a) explains this change with following factors:

1. Amount of data, videos, sensors and more intelligent equipment’s.
2. Lowered price of data processing and data banking
3. More advanced technology. Machines can analyze data even faster than it is being produced.
4. More rigorous research work. Nowadays research concentrates more on challenging earlier beliefs and practices of what man and computer can achieve together.

Surroundings and its requirements set base for why artificial intelligence and data processing have got so much attention during the last years. This finding is supported by Pan (2016) with following:

1. Our information surrounding has changed significantly during the last decade. Mobile devices, internet, sensors and wearable technology have become more and more popular. Devices utilizing different sensors expand between cities continuously and internet connects more devices, units and people together. Requirements, knowledge and skills spread across the globe among different user groups.
2. Social requirements for artificial intelligence grow rapidly, which leads to growth of research about artificial intelligence. Research of artificial intelligence does no longer be limited to academic research, rather than expanding also outside the academic world. New targets and ideas concentrate to smart cities, medicine, logistics, production, autonomous vehicles and other smart products.
3. Objectives of artificial intelligence have changed significantly during the last years. Everything began from a vision to make machine to imitate human thinking- and decision-making mechanisms as comprehensive as possible. Today, target is to get computers and humans to combine their ways to think and act, when it could be possible to achieve competitive advantage in business.
4. Data resources of artificial intelligence change. Artificial intelligence exploits databased algorithms when using mass data, sensors and networks and need for these algorithms grows continuously. Normal Turing test-like approach will be questioned in the future.

Research institute Gartner (2017) claims, that almost every single new software uses artificial intelligence in some level in year 2020. Companies producing new software's should be at least prepared or already producing systems with some level of artificial intelligence to answer market needs (Gartner, 2017). Research institute McKinsey (2017) estimates, that large global companies invested 20-30 billion dollars to artificial intelligence and most likely this amount will increase in every year. Artificial intelligence being existing over 50 years, is now getting viral in different fields of life both for companies and individuals.

2.2 Cognitive computing

Cognitive computing is a term, which emerges often in the same breath with artificial intelligence. Cognitive computing is defined as an intelligent computing methods- or systems, which execute computational intelligent with independent inference and imitating human brains, based on cognitive information theories (Demirkan, 2017).

Other approach to cognitive computing is based on IBMs research groups definition, which determined cognitive computing as iterative, adaptive, conditional, contextual and interactive (Modha, 2011).

Iterative and conditional are features, which mean that system can remember previous actions and functions and can therefore ask defined questions. Adaptive is a state, where system learns while targets evolve and information changes. Contextual is a feature where system can recognize, understand, separate meanings, syntax, time, place, industry, regulations, profiles, process, functions and targets. Interactive system can communicate with humans and software's. (Modha et al., 2011).

Interactive system can communicate with humans and software's. Cognitive system can therefore learn, have a dialogue, communicate with different interfaces and act according to contextual customs and knowledge. When comparing definitions between academic definition and IBM sponsored definition about cognitive computing, clearest difference is that Demirkan (2017) highlights brain imitating and theories, whereas Modha et al. (2011) concentrates on systems features. Simplified, systems using cognitive computing are modelled to imitate human brains and therefore these systems are able to interact with humans at least at some level, learn from experience, support decision making and handle spoken or written language (Noor Ahmed, 2014). Cognitive computing systems are learning independently and they are not constantly programmed or developed, rather than learning themselves via interaction and experience (Demirkan, 2017). Making conclusion from gathered data, aiming to given targets and even improve human brain senses are cornerstones of cognitive computing (Noor Ahmed, 2014).

When these features and definitions about cognitive computing are put together with artificial intelligence, can be seen that cognitive system is artificial intelligence with human-like features. Artificial intelligence and cognitive computing are, if not entirely same things, at least really close to each other as terms. Cognitive computing highlights especially human brains and these brain functions, while artificial intelligence is maybe bit more general term, covering intelligent functions done by machines. Connective factors are human-like intelligent functions, contextual and rational adaptation to predominant situation, as well as no need to make continuous programming and developing to the code operating the system.

2.3 Machine Learning

Machine learning connects closely to artificial intelligence and it literally means machines, which learn from example data and then machine can do the same functions with a new data (Louridas, 2016). Machine learning is an embodiment of artificial intelligence, so therefore same business demands comprise both: engaging employers and customers, process automation and creating under-

standing with data-analyses (Davenport, 2018; Louridas, 2016). Basic elements in machine learning are tasks, generalization and base data, which are handled within chosen classification algorithm, like linear regression, decision tree or neural network (Louridas, 2016). Machine learning is a set of tools for analyzing data, by independent learning machine without explicit programming (Domingos, 2012). Machine learning is a combination of statistics and computer science used for creating artificial intelligent systems and applications (Jordan, 2015). Example applications using machine learning are search engines, trash mail filters, recommendation systems, share trade and credit rating (Domingos, 2012). Robotics, speech recognition, handling natural language and diagnostics also utilize machine learning (Jordan, 2015).

Machine learning algorithms can be divided into three simplified categories: representation, evaluation and optimization. Representation means some formal language that the computer can deal with. This definition is equal to choosing to set of classifiers that the computer can possibly learn. Evaluation or evaluation function is for finding out good classifiers and to avoid bad classifiers. Optimization is a method for finding best scoring classifiers from the language. (Domingos, 2012).

As a conclusion, machine learning consists of learning from examples, generalization and using vast amounts of data for training. In this case machine is like human, they both need large amounts of diverse data and observations from surroundings to learn and create generalized conclusions for fulfilling its targets and objectives. As there was mentioned earlier, machine learning is the core technique of artificial intelligence and it is supposed to have significant impact to digital development.

2.3.1 Natural language processing

In theory, cognitive computing is capable to communicate with humans using natural languages both written and spoken, so therefore capability to process natural language is an essential part of cognitive system functionalities. Context, different interaction situations with people speaking different languages and different dialects create challenges for operating cognitive systems.

Natural language processing concentrates on creating calculation methods to understand human languages, as well as learning and producing outputs from natural languages (César Aguilar, 2017). Natural language processing is created to help, improve and analyze communication between human and computer or between humans (Hirschberg, 2015). Natural language processing target of application has usually been different translating tasks, but target is shifting more and more towards dialogue, data mining and sentimental analyzing (Hirschberg, 2015). Reviewing orthography, accessing information, categorizing data and computerized translation work are the most common practical examples using natural language processing (César Aguilar, 2017).

Having a dialogue between human and computer is especially difficult, because variations in speech, tones, dialects, echo and extra noise make recognizing challenging (Hermansky, 2013). So, computer is trying to identify message from speech signal. At the moment, Natural language processing concentrates the most spoken languages, but smaller languages are also slowly getting more and more attention from developing organizations (Hirschberg, 2015). This is a natural way to develop speech recognition, because it is reasonable to allocate resources to area with most market potential and after that widen the circulation.

2.3.2 Object Recognition

Object recognition together with natural language processing are important sub-factors when fulfilling artificial intelligent and cognitive computing requirements and promises. Object recognition is especially important, when cognitive system is making observations from its surroundings and with that adapts to the status quo (Cyganek, 2013). Observing production lines, observing traffic in autonomous car or adapting camera options to weather conditions are practical applications of object recognition. Object recognition has been existing for decades, as well as artificial intelligence and neural networks. Their practical targets of application have been rather simple until the recent decade, when technological development began to enable more complex and useful solutions (Cyganek, 2013).

Recognizing variations of different objects in different circumstances are getting more precise and general error percentage in object recognition was around 5% at year 2015 (Savage, 2015). Still, visual intelligence is poorly developed in many cases and cannot be fully exploit as an independent intelligent machine understanding reasons behind objects (Savage, 2015).

Object recognition is comparable with natural language processing, because both branches of science are almost the same stage of technological development. Both object recognition and natural language processing can therefore be seen auxiliary activities of artificial intelligence when detecting surroundings.

2.3.3 Neural Networks

Artificial intelligence and therefore cognitive computing include the concept of neural networks, which imitate human brains by making decision based on earlier experiences and occurrences (Noor Ahmed, 2014). This can be compacted as experienced based counting mechanism. Neural networks or neural computing can be defined as a knowledge about natural neural cells inside human brains, which has a natural tendency to store experience-based knowledge (Kwon,

2011). When looking closer, neural network has decentralized, parallel processing structure with processing elements connected via one-way connections (Graupe, 2013). Neural network is not artificial intelligence itself, rather than mechanism, which is used to implement artificial intelligence.

Neural networks are not any new inventions, first mentions and practical implementations dates back 1960s (Widrow, 1994). Neural networks have been used in machine learning algorithms from 1980s, but due to technical hindrances and challenges technical implementations were rather simple for quite a long time (Widrow, 1994). As mentioned, neural networks have been existing in theory and more or less in practice for decades.

Neural networks have four main promises, which are based on theoretical foundations (I Aleksander, 1989). The first promise is computational complete, which means that by appropriate neural structure and appropriate training all computational tasks are available to neural networks. Second promise is functional use of experiential knowledge, which can be translated so that neural networks can cover multiple sense-based functions like speech recognition, language recognition, context understanding and target understanding. Third promise is performance, which means capacity to perform tasks rapidly. Tasks that normal computers cannot perform. Fourth promise is insight into the computational characteristics of the human brain. (I Aleksander, 1989). These four promises stand still also in 2010 century, but with slight changes, like the third promise about performing tasks, that normal computers cannot do. So called normal computers can for sure perform tasks much faster than super computers in 1989.

Neural networks are algorithms, which are used in machine learning to perform artificial intelligent functions (Graupe, 2013). Neural network is not the only possible algorithm to be used in machine learning, because for example linear regression, decision tree, logistic regression and learning vector quantization are also algorithms used in the field of artificial intelligence (Kaplan, 2016). Neural networks were therefore looked more closer than other algorithms, because it is most used algorithm for artificial intelligence at the moment and can theoretically offer more possibilities than other algorithms (Graupe, 2013; Kwon, 2011).

2.3.4 Deep Learning

When talking about neural networks and recent development of artificial intelligence, deep learning is a field, that need to be explained detailed (Kaplan, 2016). Deep learning is a high-level algorithm, which quite often uses neural networks to execute its functions (Kaplan, 2016). Deep learning is especially suitable for handling large amounts of data and creating complex observations from these masses (Kaplan, 2016). Deep learning utilizes non-linear information handling techniques (Aggarwal, 2018). Deep learning is also learning from manner of representation, where raw data is input and computer creates auto-

matically required classifications and identifications from this input (Aggarwal, 2018). In that case, deep learning does not require learning from examples, rather merely from manner of representation.

Deep learning as a branch of science is a combination of artificial intelligence, graphic modelling, optimization, pattern recognition and signal processing (Zocca, Spacagna, Slater, & Roelants, 2017). Deep learning target of applications are for example translating spoken language to written language, recognizing objects from pictures and selecting object which would be interesting for the user, other words recommendations (Zocca et al., 2017). Deep learnings logic is to create a neural network itself, which then will solve some specific problem (Kaplan, 2016).

2.3.5 Data Mining

Data mining is a base feature of artificial intelligence, which together with algorithms and machine learning models generate intelligent operation complexes (O'Leary, 2013). Systems gather vast amounts of data, so called Big data and then this data is used to run artificial intelligence models. Big data's special characteristics are large data volumes, variation and rapid data creation pace (O'Leary, 2013). Artificial intelligence cannot function without data and especially appropriate data for the purpose (Iafrate, 2018). To exploit data more efficiently, it is important to find recurrent models and conformities.

Data mining is a combination of machine learning, statistics and database handling techniques (Han, Kamber, & Pei, 2012). Data mining's main purpose is to find conformities and ways to improve decision making from the historical data (Han et al., 2012). Most used techniques for data mining are tracking patterns, clustering, classification, association, outlier detection, regression and prediction (Witten, Frank, & Hall, 2011).

Data mining is a critical part of artificial intelligence, because data and large amounts of data create base structure for the machine learning process. In machine learning context, learning and making decisions require base data. Artificial intelligence and data mining both use heuristic and symbolic methods to solve complicated problems (Bose, 2001).

2.3.6 Robotic Process Automation

Robotic Process Automation is not itself a part of artificial intelligences features, rather than target of application, which uses artificial intelligence techniques to perform automation processes (Castelluccio, 2017). Robotic Process Automation, or RPA, is meant to automate those IT-processes which are routine like and where human can be replaced with a machine (Castelluccio, 2017). Robotic Process Automation is also defined as follows: "RPA tools perform statements on structured data, typically using a combination of user interface interactions or

by connecting to APIs to drive client servers, mainframes or HTML code”(van Der Aalst, Wil M. P., 2018).

Robotic Process Automations biggest problem now is, that it runs highly defined and simple tasks, usually without any higher intelligence to solve deviant or more complex tasks (van Der Aalst, Wil M. P., 2018). Machine Learning and Artificial Intelligence techniques offer opportunities to improve RPAs and make them more intelligent and therefore make RPA more viral in different business fields (Asatiani & Penttinen, 2016).

Robotic Process Automation is an important term in the context of this study and that’s why it was important to explain more closely together with artificial intelligence and machine learning.

2.4 Reflection

This chapter covers important terms related to artificial intelligence and their mutual relations as well as short insight to history of artificial intelligence. As it came out, artificial intelligence and its methods are not any new inventions, but technological development and decades of research work have brought these methods closer to our everyday life. Terminology and definitions about artificial intelligence differ a bit, for example when thinking artificial intelligence, cognitive computing and machine learning. These terms overlap each other’s and can partly be synonymies for each other’s, though each one still having some special characteristics. Artificial intelligence can be simplified as functions imitating human-like thinking and actions.

Artificial intelligence has also a rather strong marketing trend now and it is kind of trendy term in several different contexts. Large enterprises like Apple, Microsoft, Amazon and IBM have developed different artificial intelligence technologies and applications using these technologies are becoming increasingly universal. Critical opinions have also been presented related to strong artificial intelligence hype, because the fact is that artificial intelligence is still rather simple low-level intelligence. Critics have also reminded that artificial intelligence is not a beatific factor that will by itself solve economic challenges or for example climate change as some politicians have announced. Artificial intelligence and its methods presented in previous sections are presented in below (figure 2) by showing their mutual relationships and definition levels.

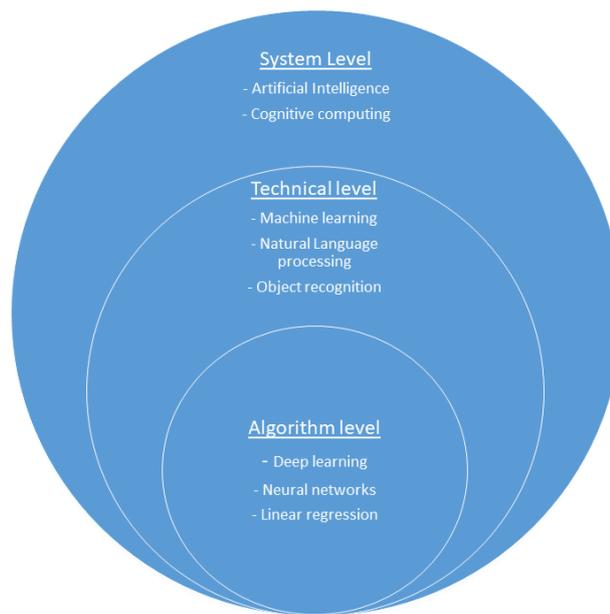


FIGURE 2. Methods of artificial intelligence.

When examining acceptance of artificial intelligence from theoretical perspective, the unified theory of acceptance and use of technology offers a firm ground for acceptance of this specific technology (Venkatesh, 2012). Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit are factors influencing to intention to use technology (Venkatesh, 2012). Variables controlling these factors are age, gender and experience (Venkatesh, 2012). Especially effort expectancy and performance expectancy might be potential factors for implementation of artificial intelligence both for consumer and for organizations (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, 2012). Age, gender, experience and voluntariness of use in organizational context can therefore define the shape of learning curve of artificial intelligence. In organizational context, primary thing is to create culture, that has accepted artificial intelligence as a part of its processes and employees can expect to gain advantage from artificial intelligence with a minimum amount of effort (Venkatesh, 2012).

Artificial intelligence can even be considered as an own field of science combining different features from different fields of science, as presented in different skill areas. Dividing artificial intelligence to different skill areas like natural language processing, data mining or object recognition helps to understand its vast forms of application.

Business models will undoubtedly change during the time and new operators and ecosystems can appear to the markets, due to the technological change occurred by artificial intelligence. Organizations must be prepared to this change, which can turn earnings logics upside down by cutting time, resources and even replacing human in different work tasks.

3 Business Process Outsourcing

This chapter discusses about Business Process Outsourcing (BPO). First in general level and then narrowing scope to payroll outsourcing in Finland and its recent trends and regulations. This chapter includes knowledge from academic papers and researches as well as paragraphs of a Finnish law. Practical examples and publications from the field of payroll and outsourcing are also presented to widen the understanding of the research context.

3.1 Development of BPO

Outsourcing of services has its roots in manufacturing outsourcing which became viral in 1970s, when western firms began to shift parts or entire manufacturing processes to areas and countries with lower production costs (Dossani & Dossani, 2015). Outsourcing services were not seen feasible act, because these were tied to geographical locations where administration was located (Dossani & Dossani, 2015). Technological development of data transferring and communication in the 1970s and 1980s led to possibility to try service outsourcing with same base lines as it was done with manufacturing industry (Metters & Verma, 2008). First outsourcing efforts were done in United States, where firms began to relocate some of their supporting services like payroll and helpdesk from urban areas to lower-cost rural areas (Metters & Verma, 2008). This was a pretty successful operation cutting average 20-30% of the back-office costs compared to locations in high-cost urban areas (Metters & Verma, 2008). This became rather popular way to do outsourcing, also in smaller scale in smaller countries than United States.

In the beginning of 1990s firms began to face difficulties with recruiting of professional staff and this led to raise of labor cost and lowered productivity in many areas (Davis, Ein-Dor, King, & Torkzadeh, 2006). This shifted firms outsourcing scope to other English speaking countries with lower cost-levels and possibility to get skilled labor (Davis et al., 2006). Countries like India, Ireland,

Israel and some Caribbean nations became first locations where large service outsourcing was shifted. Especially India was a popular location for outsourcing, because there were huge amounts of educated people with very low cost-levels and it has remained so until these days (Dossani & Kenney, 2007).

High technological development throughout 1990s just accelerated the pace of outsourcing by enabling more and more developed system for running back-office activities without being related to some geographical location (Dossani & Dossani, 2015). Call centers and helpdesks were primary services to be outsourced, because they are rather simple routine tasks and do not require so extensive expertise like payroll or human resource management (Davis et al., 2006). Although, experiments to outsource these more complicated back-office operations gave positive outcomes, so it led to widen the outsourcing scope also to range of back-office operations (Davis et al., 2006). Countries to like China, Philippines and Malaysia are nowadays popular locations for service outsourcing, because language skills and other required skills in these countries have reached required level, but in a same time costs are significantly lower than in western countries (Metters & Verma, 2008).

Business Process Outsourcing will most likely enlarge in the future, but some fundamental changes have already been seen in the nature of service outsourcing. Outsourcing is generally being perceived as a shifting work tasks to overseas, usually to Asia (Trefler, 2005). This trend has faced some problems, because several western companies have nearshored or inshore outsourced their previously offshore outsourced back-office operations (Hartman, Ogden, Wirthlin, & Hazen, 2017; Trefler, 2005). Reasons behind these nearshore or inshore outsourcing vary depending on a case, but some common features are being identified. First, in some cases quality issues in the service have been so significant that only option has been drawing outsourced operations closer to firms administrative headquarter (Trefler, 2005). Quality issues can be result of multiple factors like communication problems, lack of knowledge or lack of resources (Trefler, 2005). Secondly, costs in some outsourcing locations have raised due to fast economic growth of the region, resulting inshore locations to be more cost-efficient when including also indirect cost of outsourcing (Trefler, 2005).

Ever growing amount of data has its effects also to outsourcing business and these effects have been especially large within European Union and European Economic Area. Recent General Data Protection Protocol (GDPR) (Office of the data protection ombudsman, 2018) set several regulations regarding to personal data handling and restricting data handling to be done within EU/EEA countries. Many firms have shifted sensible personnel data handling processes to EU/EEA countries already before the GDPR, but this regulation will at the latest result a significant change of outsourcing back-office operations, regarding European firms.

Business Process Outsourcing is a global phenomenon and often literature concentrates just to Western World-India/China axis, even though outsourcing is done various contexts and between several different countries or regions

within a country. Service outsourcing has its roots in manufacturing business, as many other business trends as well, but it diverges to more and more to its own path all the time as it evolves. Global economic development and changes in different regions will most likely change the circle of outsourcing and countries where outsourcing is done will most likely to change in the future. Business Process Outsourcing is a complex entity with costs of economics, country specific regulations, level of costs, costs versus quality, economies of scale and synergy with firm's other business operations.

3.2 Characteristics of BPO

Business Process Outsourcing (BPO) has been a major trend for several decades and it spans to all fields of businesses around the globe (Belcourt, 2006). Outsourcing itself is an action, where company or organization contracts with service provider about producing some major function earlier done within the organization (Belcourt, 2006). Outsourcing is a one-way action, where resources are shifted from the provider to the user (Belcourt, 2006). Traditionally, Business Process Outsourcing have comprised so called "back-office" functions, which include supporting activities to core business (Buck-Lew, 1992). These "back-office" functions refer usually to payroll, finance and human-resource management (Belcourt, 2006; Buck-Lew, 1992). Reasons for outsourcing are many, but focusing on core business activities in competed and challenging environment is the main driver shifting toward outsourcing some of the "back-office" functions (Gerbl, 2016). Especially many small and medium sized firms have outsourced their payroll activities, because they have more limited resources than large firms and therefore concentrating to their core business is logical (Thomas & Thomas, 2011).

Costs savings are indicated to be the priority reason for outsourcing within the context of focusing on core business activities (Belcourt, 2006). Organizations providing outsourcing services are working in their area of expertise, so therefore outsourcing for example payroll to specialized service provider can offer significant economies of scale. Payroll is an especially suitable function for outsourcing, because payroll activities are highly standardized, so possible economies of scale are obvious (Dickmann & Tyson, 2005).

Avoiding problems due to attrition is also a significant reason for outsourcing payroll. This means that employee attrition or absence can have significant effect on running payroll activities on time and ensuring reliable service (Thomas & Thomas, 2011). Particularly if company is small and there is one or two persons working with payroll, so then effects of absence or attrition can be dramatical.

Increasing efficiency is also one reason why to outsource payroll. Doing payroll activities requires time consuming activities like hiring right persons, training these persons and then also managing these persons (Thomas & Thom-

as, 2011). Outsourcing can help organization to utilize just to their core competencies and training people in the company's core competence areas (Gilley, Greer, & Rasheed, 2004). These costly and time-consuming activities, which are not the core business area for a firm, can be done by the payroll outsourcing service provider.

Increasing productivity is important factor when considering benefits of payroll outsourcing (Thomas & Thomas, 2011). In small and medium sized companies' payroll is often part of HR or finance department, whereas in large companies usually have an own department for payroll. When payroll is part of HR or finance department, it is often seen as a support activity or extra task which is not the main duties to be done. When payroll has this kind "extra work" status in administrative functions, it is can be reducing motivation and productivity of the employees (Thomas & Thomas, 2011). The stress this can cause might results as bad quality of payroll and can decrease employer image (Gilley et al., 2004). When extra duties are outsourced, employees can concentrate to their core competencies and increase their own and firms' productivity.

Payroll activities vary among different countries and country-specific legislation can change rapidly setting challenges to payroll outsourcing (Dickmann & Tyson, 2005). Country specific legislation knowledge is therefore very important for avoiding misunderstandings, malpractices and ensuring a smooth service for the customers (Thomas & Thomas, 2011). Therefore, outsourcing can be good solutions for this issue, because payroll is the core business for outsourcing companies, and they must update knowledge continuously and hear government regulations. For example, taxation, special sections in collective agreements and related issues are often those to cause difficulties to firms (Thomas & Thomas, 2011). Outsourcing companies have required knowledge to follow these changes and put them into practice.

As these presented reasons illustrate, factors for outsourcing are directly or indirectly related to costs. Whether it is direct saving gained via accelerating amount of pay slips done by one wage clerk in outsourcing firm than previously in-house. Other way is to let human resource department to concentrate just to their main tasks by outsourcing "extra" payroll duties and which then increases productivity with better quality and faster task performance. Outsourcing releases precious time and money resources to firms' core competencies. Of course, there are numerous firms which have counted that it is more beneficiary for them not to outsource payroll or then it is just a matter of habit that has no need to be changed.

3.3 Payroll and Payroll Outsourcing in Finland

Payroll is a basic function in every firm and organization, because people monthly management of finances is based on incomes paid in payroll. Payroll is also a field of high data security due to sensitive income information and per-

sonnel data. Payroll is also highly regulated by the Finnish law and standardized with several collective agreements in different fields.

Outsourcing payroll is quite common in Finland. Exact statistics about the firms and public organizations which have outsourced their payroll are not available, but several factors indicate the scale of this business. In 2016 there were 4235 accounting bureaus in Finland and the amount employees was around 11 700 with net revenue bit less than 1 billion euros (Taloushallintoliitto, 2017). Accounting bureaus have also several other duties than just payroll, for example bookkeeping and travel claim control as well as the fact that size of the accounting bureaus customers varies a lot. Clear majority of accounting bureaus in Finland are small, employing 1-10 persons and having net revenue less than 1 million euros (Taloushallintoliitto, 2017). 10 largest accounting bureaus took almost half of the 970 million euro's revenue share in 2016, which means that even the number of accounting bureaus is rather large, the biggest have solid control of the business (Kauppalehti, 2018). Authorized accounting bureaus had around 50 000 customers in 2014 and these customers had around 300 000 pay slips per month (Helsingin Sanomat, 2014). These counts leave out some large operators that are software houses but not accounting bureaus, still doing payroll outsourcing as a part of their business. Actual number of monthly pay slips done by outsourcing operators in Finland can consisted to be several hundred thousand.

Practices for doing payroll outsourcing vary per service providers' business model and the size of the customer organization. Traditional accounting bureau model is to offer turnkey-service with all functions from working hours monitoring to delivering pay slips and salaries to employees. In this model employer purchases required software and service from accounting bureau and pays monthly fee for usage. Usually companies using this model are small sized and do not have resources or capabilities to maintain own payroll or IT sections (Taloushallintoliitto, 2017).

Other model is shifted for medium- and large sized companies, which do have lot more complexity in their payroll processes. When the size of an organization gets bigger, the amount of different collective agreements and payroll distinctions enlarges. This affects payroll processes making them more complex and time consuming. Medium-or large sized organizations usually have their own finance, HR and/or IT departments and therefore different enterprise sized software with built-in capability for working hours monitoring or sales bonus follow-up. This kind of more complex customs requires tailoring, customization and shifting of silent knowledge to make payroll process working well.

Companies operating on the field of payroll outsourcing business in Finland are not limited just to accounting bureaus like Accountor, Rantalainen, Talenom and Monetra but also to some more traditionally associated as a software houses and consulting companies. Companies like Aditro, CGI, KPMG, PriceWaterhouseCoopers and Deloitte are also working on a field of payroll outsourcing as well.

3.3.1 Regulations

Payroll is regulated by Finnish law and more precisely collective agreements and local settlement under collective agreements (Finlex, 2001). Contracts of the employment act is the primary statute collection to be followed in payroll, but usually this act is defined with industry-wide agreements (Finlex, 2001). Contracts of the employment act and especially industry-wide collective agreements include lot of exact statutes which govern payroll.

General Data Protection Regulation (GDPR) and Finnish Incomes Register are the most recent regulations setting new data handling requirements and objectives to payroll. GDPR enables better control and data security for consumers by allowing person to be forgotten, data transferring from one system to another, right for data protection and right to be informed if data security violation occurs (Office of the data protection ombudsman, 2018). Although GDPR does not fully apply to Finnish contracts of the employment act, because payroll information is required to be stored at least six years in paymaster's data bases or other bookkeeping storage (Finlex, 2015).

The Finnish Incomes Register is a nationwide database for storing Finnish citizens' individual wages, pensions and benefits (Incomes Register, 2018). Purpose of Incomes Register is to enable real-time monitoring and correspondence of citizens' earnings information and simplify different authorities work for gathering citizen data from different sources (Incomes Register, 2018). All information about wages must be sent to Incomes Register from the beginning January 2019 and this payroll data must be sent within five calendar day from payment day of the wages (Incomes Register, 2018). This five-day reporting time is especially challenging for payroll, because previously timeframe was one month and there were lot more time for fixing errors in pay slips. Five-day reporting time highlights early error detection and possible automated error fixing to avoid delays and fines for delivering payroll data to Incomes Register.

These recent regulations and National Architecture for Digital Services project in Finland are pushing authority enrolment towards digital environment. Same time regulations related to digital environment are being defined more precise. These regulations affect both directly and indirectly to payroll departments, whether it is in-house or outsourced.

3.3.2 Digitalization and Trends

Digitalization is the way to increase productivity, efficiency and maintain competitive advantage in many industries and payroll outsourcing business is no exception (Alexander, 2018). Digitalization enables automatization of routine tasks, quicker lead-times, man can be replaced by a machine in some parts of the process and possible new business opportunities can be found. Concrete

ways to fare are development of knowledge and courses, continuous development of employees and development of enterprise culture to meet customers' requirements (Alexander, 2012; Filenius, 2015). Payroll service must therefore be developed continuously based on feedback gathered from customers. Developing enterprise culture requires understanding of digitalization and change trends in surrounding society.

Examples of digitalization and change trends affecting to payroll are cloud services, Big data, mobile services, blockchain and machine learning (Alexander, 2018; Jia, 2017). For example, Big data and machine learning can together enable payroll outsourcing providers to understand their customers and habits better and with that help to improve services. Alexander (Alexander, 2018) lifts an example of possible future service for payroll where parts of the payroll process are outsourced to service provider, which uses combination of machine learning, artificial intelligence and human assistance.

Payroll and payroll outsourcing will undoubtedly be affected by artificial intelligence and its solutions, but actual solutions and proofs are still missing. VTT (2019) discovers in a report, that Finnish companies have rather good readiness to exploit artificial intelligence, but so far general line has been waiting. What is therefore positive is that percental amount of artificial intelligence experts and data scientist in Finnish companies is higher compared to companies in Sweden and in United States (VTT, 2019). These findings apply also indirectly to payroll business and give references for the future.

4 Service Modularity

This chapter handles service modularity. Service modularity is a rather new concept, even though modular thinking and modularity has been well known principles in product development and manufacturing industry for a long time (Bask, Lipponen, Rajahonka, & Tinnilae, 2010). Growing service industry and more service minded way to think business resulted to a question, that could these product oriented theories be used in services and service processes context and reveal possible benefits (Brax, Bask, Hsuan, & Voss, 2017). Service-dominant logic (Vargo & Lusch, 2004) has been a major driver towards service minded thinking in various business fields. In service-dominant logic customer's role as co-producer of the value is highlighted (Vargo & Lusch, 2004). Also, the high level of customization has a vital role in service-dominant logic, because customization of a service will most likely lead to higher level value co-creation of the service in question (Vargo, Maglio, & Akaka, 2008). Service modularity is a principle that examines complex service entities or processes and divides these into smaller subsystems, modules (Dorbecker, 2013). Modules can be designed and managed independently and they are connected with other modules within the same system via well-defined interfaces (Meijboom & de Vries, 2018). Tuunanen, Bask, & Hilikka Merisalo-Rantanen, 2012 described service modularity as follows "a system of components that offers a well-defined functionality via a precisely described interface and with which a modular service is composed, tailored, customized and personalized". Service modularity is a principle that is being studied in different context across different fields like healthcare, IT, logistics and financial services (Dorbecker, 2013).

General modular systems theory is the base of service modularity, offering previous research and basic theoretical framework mainly from product modularity. General modular systems theory defines which components can be separated and combined again to create new configurations with working functionality (Schilling, 2000). Product modularity theory cannot however be directly adapted to services, because level of heterogeneity is lot higher in services than in products (Cheng & Shiu, 2016). Also, personnel have more important role in outcome of the service process than in product manufacturing process (Cheng

& Shiu, 2016). Benefits gained from modularization are customization and personalization which will most likely result as higher income or lower costs, financial benefits anyway (Bask et al., 2010; de Blok, Meijboom, Luijkx, Schols, & Schroeder, 2014).

Relatively small amount of academic papers about service modularity makes topic new and partly unexplored area of research. This means that interesting findings are most likely to be emerged. Downside of such small amount of academic research is that theoretical foundations and evidence base are not that strong as they are for example with modularization of products and in manufacturing industry (Brax et al., 2017). Another challenge in service modularity is the fact that immaterial service processes are not as easily divided into concrete modules as the case is in production modularity (Brax, 2017).

As we can see, service modularity is rather young principle which is has its roots in manufacturing industry and it has been applied to wide range of topics in different fields. Challenge for being a new area of research is that amount of publications done in this area is still relatively scanty.

4.1 Theoretical background of Service Modularity

This paragraph examines theoretical background of service modularity and service modularization. Purpose of this paragraph is to enable theoretical framework for solving research question. Only models and previous researches relevant for this study are gathered to this paragraph. Table of previous studies and findings will be presented at the end of this paragraph. Literature about service modularity is rather young, but the amount of publications has increased during the last few years.

Pekkarinen and Ulkuniemi (2008) researched literature from the field of modularity in manufacturing and developing physical products. Target was to find ways how modularity in these fields could be used in the service contexts. Main findings of this study were four dimension of modularity: service modularity, process modularity, organizational modularity and customer interface which means identifying customer needs (Pekkarinen & Ulkuniemi, 2008). These four dimensions can be used to create value in business services. Study identified that technology, core knowledge and competencies of a service provider should be shared with all market segments and service offerings (Pekkarinen & Ulkuniemi, 2008). This requires organizational modules for organizing and standardizing coordination methods. On the other hand, coordination between modules, interfaces and within these should be as low as possible ensuring relatively independent functionality of modules (Pekkarinen & Ulkuniemi, 2008). Other main finding of this study was the essential role of customer interface. Customer should be integrated to the modular service platform, because customer need recognition and service co-creation are included in customer interface.

Voss and Hsuan (2009) studied service modularity in a quantitative study, which target was to widen the understanding of service modularity and architecture. First finding of this study was to create a systematic decomposition model for organizational architecture to map organizations existing architecture, estimating other possible architectures and identifying crucial interfaces between the modules or parts of the service entity (Voss & Hsuan, 2009). This decomposition is divided into four different levels for identifying current service processes and discover possible new ones.

First level, level 0, is an industry level architecture which is more of a high-level module identification including general industry wide interfaces like rules, legislation, standards and technological regulations (Voss & Hsuan, 2009). Industry level is a level where organization cannot do much for changing the design, because it includes all the other organizations in the same industry as well.

Second level, level 1, is service company/supply chain level where organization can design its own service processes, unlike on industry level (Voss & Hsuan, 2009). This level consists of all the supply chains and service processes that are within the organization, for example marketing, logistics, product 1, product 2 and Human resources management (Voss & Hsuan, 2009).

Third level, which is called service bundle or level 2, includes modules and interfaces within some specific supply chain/service process (Voss & Hsuan, 2009). For example, logistics can include customer service, invoicing, truck maintenance, etc. This level is comparable with the concepts of the front and back offices (Voss & Hsuan, 2009).

The last level, level 3 or service package/component is the smallest possible module where service can be divided into (Voss & Hsuan, 2009). In the logistics example level 3 can for example be individual elements of customer service like different customer services for different customer segment.

In addition to his four-step decomposition Voss & Hsuan (2009) also created service modularity function (SMF), which is a mathematical function for identifying the degree of modularity which can be achieved through the uniqueness of the service. SMF can also be used for calculating the degree of module replicating among a variety of service (Voss & Hsuan, 2009). SMF is meant for supporting decision making regarding service design and especially when exploiting a new service innovations (Voss & Hsuan, 2009b). The conclusion of this study was that unique service modules and elements are difficult to be copied by competing firms and that modularity is an important enabler for customization and new product development (Voss & Hsuan, 2009).

Bask et al. (2011) conducted a study which examined how modularity can be connected to business models and processes and widen the understanding how modular structures can be applied to services. This study used modularity and customization as a dimension to determine different services positions in the framework. Service models can have different combinations of customization and modularity which can be observed from perspectives of service offering, production and network (Bask et al., 2011). Customization in production

perspective is measured with the customer participation to the production process. In service process perspective customization is measured through the profundity of the customization experience for the customer (Bask et al., 2011). The degree of modularity in production perspective is measured by using modular principles in production. In the service offering perspective by product variants offered in different modules and levels of the service for the customer to mix and match modules in way they want (Bask et al., 2011). Modularity in the network perspective is measured by the responsibilities of the suppliers and customization means degree of dedication in the mutual partner relations (Bask et al., 2011).

In a study made by Tuunanen and Cassab (2011) the target was to find out how software engineering methods and experiences could be integrated with the service process modularization and then observe how this affect to user's trial of service innovations. Researchers examined this by investigating customer response to modular reuse and modular variation of service encounter process in new offerings in a service of high task complexity and in a service of low task complexity (Tuunanen & Cassab, 2011). The study resulted with findings, that modularization has significant positive impact for perceived utility for the offering in question. Modularization also increases the likelihood for using service extensions (Tuunanen & Cassab, 2011). Modular reuse versus variation is therefore dependent on the level of complexity of the base service (Tuunanen & Cassab, 2011). Tasks with high complexity are more suitable for modular reuse than tasks with low complexity, which are more suitable to modular variation. This study also came up with a finding, that modular reuse in high task complexity adds more value to the service than requires user's participation to the production process (Tuunanen & Cassab, 2011). Modular variation includes variety and customization of the service offering, which makes it especially suitable for low task complexity services enabling these features for the users (Tuunanen & Cassab, 2011). Conclusion of the study was to validate that service platforms and service families of different in software product management.

Carlborg and Kindström (2014) studied three Swedish firms in manufacturing business to observe the role service modularity while developing and delivering services with diverse customer needs. Customized services with standardized process modules can help to achieve cost savings (Kindström & Carlborg, 2014) and also increase flexibility and add customer value (Bask et al., 2011; Rahikka, 2011). This research emphasized the importance of knowing and mapping existing processes and existing modules before creating new module based service offerings (Kindström & Carlborg, 2014). With careful mapping of processes and modules service delivery can be improved and development of existing and potential new services can be made more fluent (Kindström & Carlborg, 2014). Importance of knowing customer and its processes is maybe the most noteworthy finding of this study, because it is vital to find balance between the standardization and customization and mark resourced stable between the customer and the service provider (Kindström & Carlborg, 2014).

TABLE 1. Previous researches relevant for this study.

<i>Authors</i>	<i>Research frame</i>	<i>Main findings of the research</i>	<i>Suitability for this research problem</i>
Pekkarinen & Ulkuniemi, 2008	Qualitative study to explore modularity literature from the field of manufacturing and developing industry to implement modularity also to service context.	Modular service platform with service, process, organizational and customer interface dimensions can be used to create value for business services.	<ul style="list-style-type: none"> • Ground for service modularity with four interface dimensions.
Voss & Hsuan, 2009	To study service modularity with mathematic model.	The degree of modularity together with unique service modules support product development and customized services. Service entities with unique service modules are difficult to be replicate by competitors.	<ul style="list-style-type: none"> • Illustrates service modularity in different accuracy levels. • Mathematic function for calculating degree of modularity.
Bask, Lipponen, Rajahinka & Tinnilä, 2011	Case study to exploit how business models and processes can relate to modular structures.	Through customization and flexibility combined with modularization, firms can gain competitive advantage when developing new services.	<ul style="list-style-type: none"> • Four extreme categories for helping to define level of customization and modularization.
Tuunanen & Cassab, 2011	Examine how service modularization effects on customer's trials of new service innovations.	Perceived utility of enhanced offering and likelihood of trial for service extensions are increased by modularization. Task complexity determines the effect of modular reuse vs variation.	<ul style="list-style-type: none"> • IT-context is especially suitable for this study. • Modular reuse vs variation is dependent on service complexity is a good benchmark point for this study.

Carlborg & Kindström, 2014	What is the role of service modularity in between efficient services and diverse customer needs?	Careful mapping of existing service modules and balance between standardization and customization are the main factors for economic success	<ul style="list-style-type: none"> • B2B context is suitable for this study. • Researched customer processes are similar with this study context.
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4.2 Modules

Modular system is created by modules and interfaces connecting these modules. In literature terms modules, components and elements are used separately, often meaning same things with different terms (Meijboom & de Vries, 2018). For example, de Blok et al. (2014) uses term component as a smallest meaningful unit where service system can be divided. Rajahonka (2013) defined module as follows “a relatively independent part of a system with a specific function and standardized interface”, which is quite widely accepted general definition for a module. Modules can be service elements or processes, often described to be the smallest units into which service system can be divided into (Pekkarinen & Ulkuniemi, 2008). Meijboom & de Vries (2018) compiled a study which included results that modules in service system have three main design principles which confirm service modularity and modularization.

The first design principle is that each module should have some *specific functioning*, which will then be connected to overall service system (Meijboom & de Vries, 2018). Independent modules functions should be specified as special function inside the service system, so that no other modules have equivalent functions (Ulrich, 1995). *Specific functioning* can be defined in general level, like payroll payment, or in more detailed level like hourly wages payment of department A.

The second design principle is *relative independence*, which means that modules should minimize dependency with other modules, but same time maintain mutual collaboration (Campagnolo & Camuffo, 2010; Meijboom & de Vries, 2018). This principle underlines the ability to make customized service offering for customers by mixing-and matching modules, but not affecting functioning of other modules.

The third principle is *standardized interfaces*, which means interfaces and linkages with standardized applications for communication and interaction between modules (Meijboom & de Vries, 2018; Voss & Hsuan, 2009). Interfaces make sure that these relatively independent modules work well in a same entity.

There is a lack of common ground when defining module, component, etc. and this makes construing different studies bit challenging. This is most likely result from service modularity's/modularizations young age as academic re-

search topic. Although previously presented definitions for service module still give general understanding what module is and what characteristics it has.

4.3 Interfaces

Interfaces are mentioned to be important part of service modularity and their importance is being highlighted in several studies. As mentioned in earlier paragraph, service modules are connected to each other via interfaces, which then enable service system to function as it is supposed to work (Schilling, 2000). Interfaces in modular service paradigm are responsible for smooth flow of customers and information between modules, creating the actual system with these integrations (de Blok et al., 2014). Despite interfaces essential part of service modularity academic research about this topic is still rather scarce.

Voss and Hsuan (2009) explained that interfaces have important role when customers are moving from one service module to another, when executing the service process. (Tuunanen et al., 2012) highlight the importance of standardized interfaces when connecting service modules in new ways for ensuring effective service process. (Bask et al., 2010) offer more practical insight to interfaces by recognizing that interfaces can consist of both human and technical aspects between people or/and between components. Examples of interfaces can be standards, contracts or specification of division of labor (Bask et al., 2010).

Interfaces are identified and accepted in general modular systems theory (Schilling, 2000) and their role is mentioned widely in literature about service modularity, but studies where interfaces have a central role are just few. De Blok et al. (2014) examined the role of interfaces using elderly care as a case context. Interfaces are widely identified to have a central role in general modular systems theory (Schilling, 2000) and in service modularity as well (Bask et al., 2011; Rajahonka, 2013). de Blok et al. (2014) distinguished interfaces in two level. First the component level, meaning links between components contents and secondly service package level, meaning links between involved service providers. These two levels can then be divided to four different types of interfaces according to interfaces aim meaning variety or coherence. First is so called O-C interfaces (open-customer flow) enables structure for combination and recombination of components according to customer demands. O-C interfaces are categorized to be within service components for supporting variety. C-C interfaces (closed-customer interface) are also within service components but they support coherence. C-C interfaces organize components independencies and ensure components create predictable system for customers moving from one component to another. O-I interfaces (open-information flow) are among service providers enabling variety in service packages. O-I interfaces mission is to gather service providers together and make sure that information exchange between providers works well. This is because fluent information flow between

different service providers is vital for well working service package. C-I interfaces (closed-information flow) are also among service providers and their task is to ensure coherence and unity. C-I interfaces objective is to reduce information exchange between different service providers by managing independencies and supporting information flow between service providers.

Interface definitions and deeper insights in service modularity are quite few, but (de Blok et al., 2014) offer understandable and logic framework for identifying interfaces between different components and service providers. Although their study is based on health care services, so applying it directly to other contexts should be considered with care.

4.4 Service process modelling

Service process need to be defined on process level to find existing modules and interfaces from service process that is being examined. In order to do to this, service process must be defined in a detailed level, describing this study's service process. Service modularity being the upper-level concept, service blueprinting using MINDS framework illustrates the lower-level service process in detailed level. This service process identification helps service provider to recognize modules, interfaces and their mutual relations. Service blueprinting (Shostack, 1984) is a well-known framework used for service design and identifying possible operational problems. Service blueprinting divides service process into four different levels: Customer Actions, Front-stage, Back-stage and Support Processes (Shostack, 1984). Customer action and Front-stage are those levels of service which are above the line of visibility, meaning visible to customer (Shostack, 1984). Back-stage and Support processes are not visible for the customer and they are separated with a line of internal interaction (Shostack, 1984). Service blueprinting being the fore ground for service design Texeira et al. (2017) created Management and Interaction Design Perspective for Service Design (MINDS), which integrates management and interaction designs. MINDS is a continuum from traditional service blueprinting, because technology usage and technology-enabled innovations and services are emphasized in this model (Grenha Teixeira et al., 2017). MINDS framework is divided into three levels where designing service concept is the highest level (Grenha Teixeira et al., 2017). This level illustrates service benefits offered to the customer (Grenha Teixeira et al., 2017). Mapping of possible services used by customer are also done in this level.

Second level is the service system, where frontstage and backstage processes, people, support activities and other possible elements are visualized and organized to support the service concept (Grenha Teixeira et al., 2017). This lev-

el is a combination of service system navigation and storyboards (Grenha Teixeira et al., 2017)

Third level, the service experience blueprint is the most detailed and there the scope is the service encounters at each possible interface (Grenha Teixeira et al., 2017).

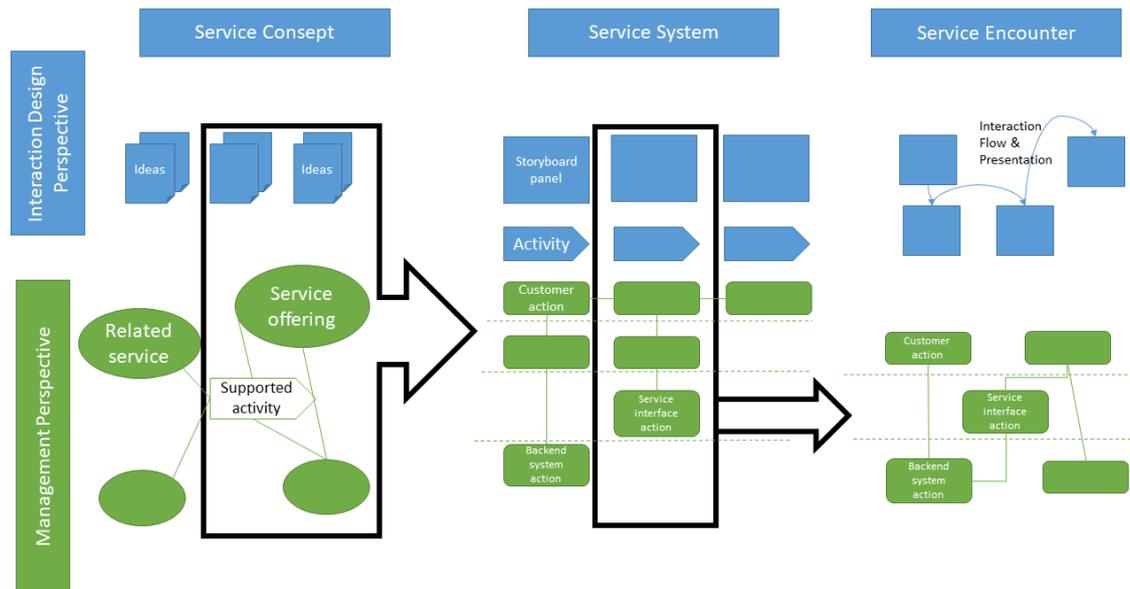


FIGURE 3. MINDS conceptual framework (Grenha Teixeira et al., 2017).

MINDS conceptual framework and especially second level, service system, is being used in this study to identify and define current service process. First level is bit too general for purpose of this study and service encounter level is on the other hand bit too detailed for this study. MINDS conceptual framework is also used when designing new services, but that is not the case in this study rather than identifying service process, its modules, interfaces and how artificial intelligence can be exploited in this service process. Exploiting artificial intelligence in this study can open new business opportunities, but that is not the main purpose of this study.

5 Empirical methods

Purpose of this qualitative case study is to clarify how artificial intelligence can be used as a part payroll outsourcing process. Service process is examined closely by dividing it into separate service process modules. This entity is being mapped by interviewing experts both from suppliers and customers side. Understanding this entity and expectations towards artificial intelligence from different perspectives, will widen knowledge of the topic as well as help supplier to answer customer's needs. First section of this chapter is research method, which is followed by data collection. The case is illustrated next and final section is going through the analyzing method. This chapter is for explaining the technical and practical methods of the empirical part of this study.

5.1 Research method

Research method of this study is case study research by using qualitative methods. Case study research is a study which examines phenomena on their natural surroundings using one or more data gathering methods (Benbasat, Goldstein, & Mead, 1987). Case study research does not have strict guidelines or borders and research area is not being controlled or manipulated at all (Benbasat et al., 1987). Understanding quality and meanings of the target are central parts of a qualitative study (Lähdesmäki et al., 2009). This case study research examines from the viewpoint of computer science how artificial intelligence can be used as part of payroll outsourcing process, which means that phenomena includes in addition to technical understanding also strategic, business and restricting factors.

Case study research is being used for answering questions "why" and "how" to understand how complicated processes work (Benbasat et al., 1987). Payroll outsourcing process is rather complicated and includes several actors, systems and interfaces, which are vital to whole business and therefore ques-

tions like “why” and “how” are relevant. Also, the fact that this specific subject has not been studied earlier, makes case study research justified in this case (Benbasat et al., 1987). Case study research generalizes theoretical assumptions, but by gaining deeper understanding of the topic, not by generalizing populations (Yin, 2012).

Qualitative research is usually done by using one or few of the following data gathering methods: interview, enquiry, observation or data based on different documents (Tuomi & Sarajärvi, 2009). Data gathering method in this study was semi-structured interview. Semi-structured interview was the main data gathering method, because of its flexibility and possibility to wide discussion about the topic (Tuomi & Sarajärvi, 2009).

In semi-structured interview, interviewer and interviewee discuss certain pre-determined themes and questions related to them (Tuomi & Sarajärvi, 2009). It is typical for semi-structured interview, that some perspectives are determined in advance, but not all. Methodological point of view, person’s interpretations are highlighted as well as meanings created by persons and how these meanings are based on interaction (Tuomi & Sarajärvi, 2009). Target of this method is to find meaningful answers for research question and problem adjustment. Question themes are related to researches framework, meaning previous knowledge about the topic (Tuomi & Sarajärvi, 2009).

Case study research using quantitative methods and semi-structured interview was chosen for data gathering method, because target is to gather both service providers and customer’s assumption and opinions about artificial intelligence and how they see its suitability for payroll outsourcing service. Semi-structured interview enables flexible discussion with the interviewees, which is important to notice in this case due vast interpretations about artificial intelligence. In addition to interviews, part of the data is gathered from enquiry done earlier this year. This enquiry was done separately as part of company’s internal research about their employee’s thoughts of payroll outsourcing processes function. This enquiry is used for supporting findings from the interviews. These data gathering methods enable diverse and wide scope for different aspects that are being studied.

5.2 Data gathering

Data gathering was done with semi-structured theme interviews, which took place during April and May 2019. All together 10 interviews were done and 8 of these interviews were done on service provider and 2 interviews were done on customer side. Customer side interviews were done in a same company which is a significant automobile manufacturer and employees several thousand people in Finland. Distribution of interviewed persons included one deficiency and that was an unequal number of interviewed persons between service provider and customer. Persons who were interviewed work on rather high-level positions, so especially arranging interviews with customer side participants turned

out to be challenging. Persons who were interviewed had following titles Senior Delivery Manager, Senior Payroll Manager, Delivery Manager, Product Manager, Manager Automation Development, HR Director, HR Service Manager. Some additional observations might have been revealed with larger number of customer side participants.

Interview, especially semi-structured theme interview is a suitable data gathering method in qualitative research (Myers & Newman, 2007). In this study, semi-structured interview was the most suitable way to examine the topic, because it leaves room for improvised discussion about the topic (Myers & Newman, 2007). Improvised discussion is important in this study context, because the topic is rather abstract and is has not been studied earlier, so exact assumption and structured questions most likely would have not revealed different aspects of the topic. Questions were divided into two main themes artificial intelligence and service modularity. Artificial intelligence questions handled general questions about artificial intelligence, persons own opinions about artificial intelligence and current stage/level of artificial intelligence in the firm. Service modularity theme questions were identifying modules, interfaces and possible problems between different service modules. Interviewed persons from service provider worked on a payroll outsourcing unit and their titles were "Delivery Manager", "Senior Payroll Specialist", "Senior Delivery Manager", "Automation Manager" and "Product Manager". Main criteria for interviewees were, that they should be on a different manager levels of payroll outsourcing service. Interviewed "Automation Manager" and "Product Manager" where from software development unit, but they are in close contact with payroll outsourcing unit. These interviews were added, because persons in these positions have wider technological knowledge than those who work on payroll outsourcing unit, who therefore know the process throughout.

From customer's side, there were 2 interviews and these persons had titles "Manager HR Services", "Director HR" and. These were chosen, because they work closely with service provider, so they have the best perspective to payroll outsourcing services from the customer side. Interviewed persons represent two large scale firms from retail business and manufacturing industry. Both firms' employee several thousand persons and they have significant impact to Finnish economy.

Interviews lasted between 20 to 90 minutes and they were recorded both phone and computer. Interviewed persons' ages where between 27-60 and 9 out 10 where women's and one was a man.

Researcher and author of this study clarified his own relation to this study by following the good habits of interview (Myers & Newman, 2007). These habits were executed as follows: Researcher positions himself with interviewees by explaining his professional background and connection to client firm. Researcher has worked 2,5 years on client company.

Researcher used same questions and question framework for both service provider and customer, because they both belong to same service process and interact in daily bases between each other, even though they are different com-

panies. Traditionally payroll has been part of companies' core functions, but during recent decade and especially recent years outsourcing payroll activities have become more and more popular. So that is why there are no big distinction between customer and service provider, because they are part of a same process, working together towards common goals.

Researcher presented follow-up questions for interviewees per terms they used or if there was a suitable place to go deeper around that specific question.

Researcher was very flexible about the interviews schedules and gave interviewees freedom to decide the timing of the interview.

Interviews were kept fully confidential and all identifiable mentions about the interviewees were anonymized.

5.3 Research model

Research question of this study was "How artificial intelligence can be exploited in modular payroll outsourcing service". Question is about what the possibilities and expectations toward a technology, artificial intelligence in a context of payroll outsourcing. Eventual target for the organization is to increase productivity and efficiency by using artificial intelligence in payroll outsourcing process.

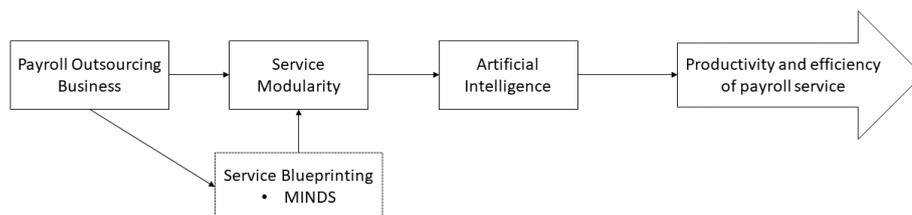


FIGURE 4. Framework of this study.

First the framework strives to model the payroll outsourcing business process using Service blueprinting and MINDS conceptual framework. After the process is modelled, it is divided into service modules which represent different

parts of the payroll outsourcing service process. Artificial intelligence is then examined closer and its possible improvements to payroll process are detected.

Service blueprint payroll outsourcing process is modelled below by using MINDS conceptual framework (Grenha Teixeira et al., 2017) and studied organizations internal models about payroll outsourcing process.

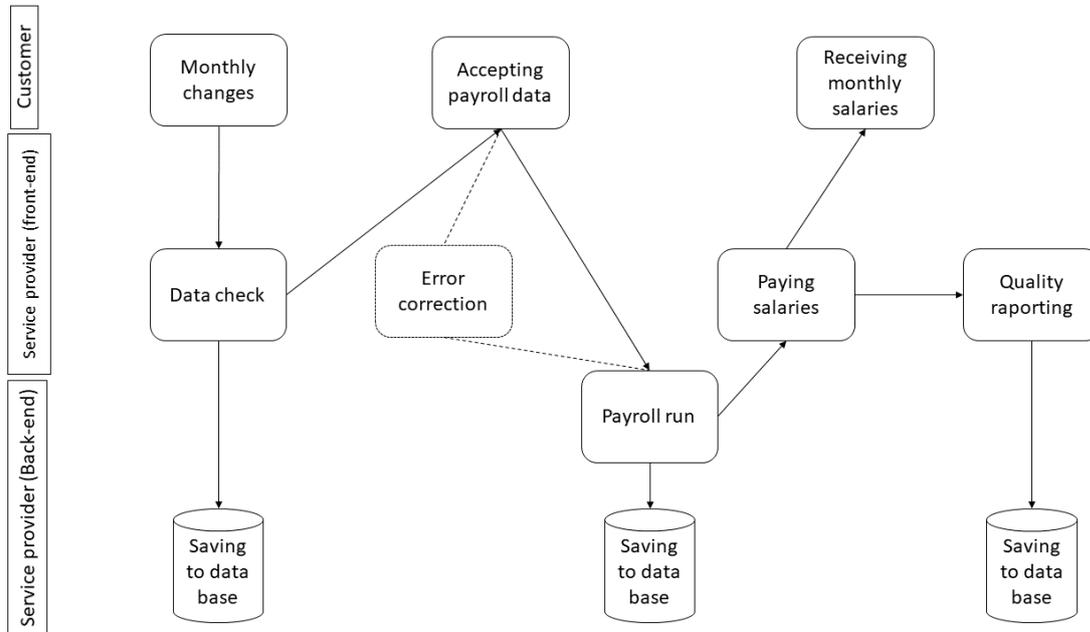


FIGURE 5. Payroll outsourcing service process.

5.4 Case: Payroll outsourcing firm

The case organization of this study is a payroll outsourcing firm, which is also a significant player on payroll and HR software businesses in Finland and Nordics. Firm has subsidiaries in Sweden and Norway, but they operate mainly as own companies due to different regulations, payroll processes and business climate in each country. Finnish limited company, which is the target of this study, has operations in in different locations in south, central and north Finland. There is also a significant number of employees in Estonia under the Finnish firm. Number of employees is few hundred and customers are mainly private sector companies, which size varies from few dozen employees to Finland's largest companies employing thousands of people.

The payroll outsourcing completely its own business unit, that concentrates only to outsourcing business. Other business unit, software business is completely its own sections developing payroll/HR software's to companies, which has internal payroll and HR offices. Payroll outsourcing business unit uses mainly software's made by the same company, but in some cases, customers have required to use some other software for running their actions. Payroll outsourcing is an action where third party makes the payroll functions, but the actual data is owned by the first party. Companies using this payroll outsourc-

ing service mainly have more than 100 employees and the biggest one's employee several thousands. The customer companies operate in different fields and their employees usually belong several different collective agreements, because the nature of different work duties. Different collective agreements, local agreements and special conditions make payroll actions challenging. Payroll outsourcing differs also from the traditional internal payroll with the fact, that firm making outsourcing does not have access to the original data or different data sources. First party delivers the data to payroll outsourcing according the agreement, which can for example be Excel-file, CSV-file or direct import from working hours monitoring system. Data can also be gathered more than one system making data flow more complex.

Firm has decided to examine possibilities to use artificial intelligence in some parts of their payroll outsourcing process, but there have not been any specific or exact targets of application so far. By interviewing experts, from Business Process Outsourcing (BPO) unit, Software development unit and from support service unit target is to find those points of the process where using artificial intelligence could gain business benefits and where it is possible in the first place. Payroll outsourcing process is always unique to every single customer company, but general lines are usually quite similar. This generalization is being used for modelling payroll service process and dividing the process to different modules and interfaces.

How artificial intelligence could be used in payroll outsourcing is not being studied earlier nor academic or practitioner point of view, so that is why this topic is suitable for single case study research (Benbasat et al., 1987). Also, the context area of the study and using modular theory in this kind of service process give new perspective to this research question.

6 Results

This chapter present all the main findings of the interviews and draws conclusion from these findings. Results are presented in two separate sections, first questions related to artificial intelligence and secondly questions related to service modularity. Artificial Intelligence is divided into following sub-themes: Future changes, applicability, challenges, benefits and current state. Service modularity is divided into following sub-themes: interaction, manual work, modules, data transfer and customization.

6.1 Artificial Intelligence

This part begins with look into biggest and most important future changes on the field of payroll outsourcing. Next sections handle applicability of artificial intelligence in payroll outsourcing and that follows sections of challenges and benefits artificial intelligence. Last part of artificial intelligence theme is finding out the current state in use or planned use of artificial intelligence.

6.1.1 Future changes

First question of the study was to find out the biggest changes coming. Answers varied a little bit according to interviewed persons title and duties. Persons who were working closely with payroll mentioned automation several times and they mentioned some practical examples were automation could beneficial. Artificial intelligence was mentioned, but not as often as automation. Persons seemed to have understanding about automation, but artificial intelligence was more like next level. Legislation changes were also mentioned in interviews. In general, the answer for this question were rather short and general.

Automated things are coming more and more, and robot is doing more of the payroll clerks' duties.

Of course, there are these known changes like upcoming annual leave legislation and new working time legislation.

I would say that growth of automation. It means that now payroll administration and payroll processes have lot of manual things and there is lot of exceptions which are inserted there modified manually. But if we can minimize exceptions and can produce standardized material also on the customer side, so less effort is then needed.

Answers were more detailed for persons who were working closely with new technologies and developing new solutions.

Kind a way one is the developing the automation inside the payroll system and then the thing that I am doing with the RPA is kind of an addition to that. We kind a way buy time for developing the payroll system and then there is that artificial intelligence, let me correct machine learning. For example, verifications or then theses data validations.

So, do count chatbots and that kind of things as well? So, using a chatbot could be a thing that interests payroll services. So, now we are selling consulting services and I think that those questions are mostly real generic. So same questions are asked repeatedly. I think that chatbots are not only for customer service, they could also be used for making job orders.

Customer sides answers varied a little bit from service provider side answers. This though is not a surprise, because customer has a different viewpoint to this case and his/her work duties are different from the persons interviewed from service providers side. Customers were also thinking the entire HR-section, not just things related to payroll.

The biggest changes for us are probably done, because our company has changed a lot during the last 2-3 years. Due to that, HR has also been forced to change.

But when we look forward from this moment, I would say that it is the trend and the need for change are the things we are contributing. "lean" way of working is the thing we must concentrate.

On our field changes in legislation are probably the biggest future changes. That is probably a thing that will affect us significantly. Now there has been lot more legislation reforms than usually and it has affected a lot to payroll and HR and to how managers are trained.

Legislation was a thing which came up in nearly every discussion. Automation and robotics were another thing that came up several times, but it was more general and actual changes occurred by automation were left a side.

6.1.2 Applicability

Second question handled applicability and especially applicability of artificial intelligence in payroll. Nearly everyone had a positive idea about using artificial intelligence as a part of payroll process. Yet practical implications were just few and Robot Process Automation was often mixed up with Artificial Intelligence. Explanations for why artificial intelligence would be applicable to payroll services were quite short.

Yes, I assume that it fits well to some simpler tasks, but not for more complicated ones.

Well I see that it fits very well. Of course, it requires quite a lot of improvements and changing the ways processes and things are done. And also, the way how payments are accepted by the customer.

I believe that artificial intelligence could help a lot. Especially if we think that what I was just thinking, that those exceptions should somehow be detected and removed from there. So artificial intelligence could easily learn those routine processes and those which are repeated. And if artificial intelligence cannot do something, so then payroll clerk can do it.

I think it fits, but the big thing that also affects to the use of RPA is how standardized those processes are.

Despite the positive acceptance, negative and challenging issues were raised quite fast when the conversation moved on. Especially more persons with more technical background and customer side raised several challenges considering the use artificial intelligence in payroll.

Because this is this kind of outsourcing service and there is something like 70 contracts with customers and several subsidiaries, so that the amount of companies is even bigger. There is tremendous amount of changes on how the process is executed. So, this makes using automation more difficult. And what I am thinking considering artificial intelligence, is the data, data lake. So practically artificial intelligence has the challenge of gathering enough data that can then be used in machine learning. There might be data, but the processes vary. And then there is also all the union agreements and possible local agreements. And if we think about the chatbot, so of course it can be done, but some customer group must be chosen first because it cannot be developed simultaneously to all different customers.

Generally artificial intelligence should be used lot more. But then there is the question of ethics. Find the place where business benefits would be biggest, without braking any lines of ethics.

In general applicability of artificial intelligence in payroll was seen a positive thing and even some practical targets of implications where mentioned.

6.1.3 Challenges

Challenges of artificial intelligence where asked to find out how interviewees saw the challenges and hinder in using artificial intelligence in payroll. Artificial intelligences ability to think and the level of solving issues raised the most questions. Many of the interviewees shared the thought that artificial intelligence is not a same level with human thinking. Other significant challenge was a lack of standardized processes in service provider side.

That it maybe that artificial intelligence not able to think as advanced as humans. Yes apparently, they cannot yet.

Some artificial intelligence could solve the problem, our current robot cannot.

Concrete challenges and problems related artificial intelligence where mostly related to service providers own processes not that much to technology itself. It is clear, that interviewed person has lot more knowledge on their payroll processes than artificial intelligence technologies, which is clearly seen from the answers. Standardization and exceptional situations where seen concerning, not only from service providers side but also from customer side. Payroll outsourcing is not a one-way action from service provider to customer, rather that continuous two-way action where knowledge and information is shared all the time.

Well probably our biggest challenge is, that those our processes are not standardized. Like some minor functions and customer specific differences.

Well maybe it is that, or at least I do not see it (artificial intelligence) as an able to interpret these exceptional situations or surprising situations.

Maybe mostly that everything should be rather standardized, so that artificial intelligence would be useful. World is not ready for that yet, or at least the customer side is not ready to receive standardized material.

One especially interesting finding was the ability to combine technical knowledge with business-specific knowledge. Amount of data and gathering of data where not seen as big issues but common understanding about what we want to achieve with this technology and how was more question raising.

That what is the target and where do we want to use artificial intelligence at first place. And then there is the fact that we different processes here. Or then we can

think OK, we have different processes, but then we different processes relates authorities. And is the information in digital format? It is a challenge.

Change management came up with one interviewee. The topic of what to do with all that free time that automation and artificial intelligence enables, at least in theory. Perspective is often technic based, and process or workflow perspective is often ignored or just not mentioned.

From organizational perspective is that how much payroll clerks agonize their roles in this changing environment. This is a thing I often miss when discussing about automation, which usually only the technical side. And this means changes in job descriptions and which means change management if artificial intelligence does that so what a payroll clerk will do with all the free time? [...] That it requires also change management for humans, not just for technology.

In payroll outsourcing service has also one major difference when it comes to data ownership, because service provider does not own the data. Service provider only handles the data and using this customer owned data in artificial intelligence training and as data lake can be problematic.

Yes, if we look it from the cybersecurity law perspective, so then the data is owned by the customer and we are just processing data. I am not 100% sure how it goes, but we do own the data on our payroll servers and can use for our own purposes.

Transparency and traceability were also seen important and somehow challenging issues in this relation.

There must be clear processes and patterns how to execute those.

But I don't see it like if we think payroll software or payroll clerk, so I do not think that is should be some sort of guard of robot or artificial intelligence who reads it like bible. More like if someone screws up so it can be identified from there.

Several challenges and problems where raised up depending on the interviewees work position. Persons working closely with daily payroll activities had common thoughts about lack of standardized processes and especially problems on customer end. Robot process automation persons and customers were more concerned about data ownership and documentations.

6.1.4 Benefits

Purpose for this question was to find out possible benefits which artificial intelligence could deliver and to find practical examples where artificial intelligence could be used. This topic raised lot of discussion and interviewees found several targets of applications where artificial intelligence could be used. Quality was

clearly the first thing that nearly all of participants named as a benefit of artificial intelligence.

Well, first of all I would fix the quality side. Yes, human can detect things and it has its pros and cons. But I think that going through all that amount of data, tens of thousands of things and rows in a file, we just cannot go through all of those. With a help of automation and artificial intelligence we could focus better when the mass is big.

Quality is more stable and reliable. There are no human errors and hopefully also the benefit of saved time.

Particularly the accuracy is the thing. That it can detect different changes better than a human eye or excel or something else. Artificial intelligence learns all the time from the data. [...] I think that it can add accuracy, a lot.

Quality was mentioned several times and the ability to detect errors from large data amounts. Even though quality as a benefit came up several times, answers were more general level comments. Making process as simply as possible for end user, humans, were one benefit that interviewees mentioned raised up. Meaning that automation and artificial intelligence could execute all time-consuming or otherwise boring tasks and human would just be a specialist who would do the most challenging tasks.

The thing is to make it simpler, to make interface more simply and simplify required actions. Then we could make it more effective in terms how people use their time. I do not see it that reasonable that people add everything to the software. There must be wiser solution for that. That is the biggest benefit I think, that useless use of time disappears.

But if we think automation and artificial intelligence as a whole, so it is a good solution for simple, conveyor type of tasks. Human errors reduce like saving errors or typing errors.

As the discussion moved on, there came one concrete examples for how artificial intelligence could help daily work and this solution could be integrated rather short period of time. Discussion was to use a chatbot or similar solution on customer service.

Yes, I see, because we receive a lot of simply questions. Tax card questions for example could be a good example. And that kind of, if you have been employee from the beginning of the year, so then the tax card is from the beginning of the year and you have received it automatically.

No reason why there should be a human on the other end. Or at least I do not have that kind of thoughts that there must be a human. [...] From our point of view, when you think those thousands and thousands of employees whole live 24/7 rhythm and three shifts except on Sunday, which means that those services should be usable all the time and that essential knowledge at least. So is it a human, robot, chatbot or something else is completely irrelevant question?

Not necessarily need to be a human on the other if those questions are enough easy and limited, so that chatbot can answer to those questions. Only problem is that we have over 70 nationalities, of course it is either Finnish or English, but it can still be a problem. If we think from the employee point of view.

Benefits of artificial intelligence are obvious, time savings, better quality and better productivity can be achieved via these functions, at least in theory. These same themes repeat nearly always when discussing about the benefits of artificial intelligence. Concrete examples or targets of applications are therefore not that easily discovered. Example about chatbot is one very concrete and even quite easy to put into practice functionality, which also received very positive feedback from the interviewees.

6.1.5 Current state

Current state of a new technology or discussion around it are always interesting to find out, because they reflect the mental state of the topic, even if it would have been not taking into practical use yet. There has been lot of discussion about the artificial intelligence inside the company, which is quite commensurate with the public discussion about artificial intelligence.

Yes, there has been a lot of discussion about it. During the last few years it has come up a lot and we have established this automation team and asked from the payroll clerks what would be those tasks they first would like to get rid of.

In my team yes, we have discussed about it. In a sense that it should be investigated and take into use. We have these pilot projects starting on other countries. Mut nothing concrete has been done so far, it is more like "hey artificial intelligence", but that's it.

Absolutely the right direction. I have that kind of good feeling and I believe that we will pick up steam with this and get more automations to be done. Somehow strong believe for that.

Some critical opinions about the current situation was also raised. There is clearly a miscommunication between company's management level, strategic level and the executing or operational level about what we should do with the artificial intelligence.

Top managers have talked about artificial intelligence, but those discussions have been more throwing ideas without any real substance knowledge. They might understand that technology, but substance knowledge about payroll is missing which means that those throws are just throws. Kind of high-level things that here we would need something.

This same discussion raised severe problems in the company's management level, which are not entirely related to artificial intelligence, but which

most likely have effect to company's whole ability to function. Recent redundancies have clearly strained the atmosphere.

The reality was that this organization was drawn on a paper, but there was nothing about responsibilities. [...] Our company's CEO: s management style does not give enough room for own thinking, rather than he is very deep in the details. I have been out of radar recently, because he has probably not seen a need to interfere to my daily work. But when I have seen it from the side, that expertise in not appreciated and he cannot justify it with facts. [...] I have talked to HR about this and they admitted that this recent organizational change did not really worked out. But nothing changes. If our CEO would resign so then the situation could be different. But I think that his management style harms our organization quite a lot. To these moods.

Of course, there is lot of things to be developed on the payroll side and also because there is lot of different kind of people working there. Some of those have been used to work on some specific way, in which case the change can feel difficult. Probably change management is needed. We are on a turning point.

Unclear responsibilities and lack of industrial peace have an impact to entire organization and to the ability to discuss and execute artificial intelligence pilots or to take it into wider use. This uncertainty was also obvious in many other interviews although it was not mentioned that clearly as in those two citations.

6.1.6 Software robot

Service provider uses software robot on their service process, but so far it has no functions which could be identified as artificial intelligence. Although software robot is very potential place to start using artificial intelligence. That's why experiences from this robot and possible targets for development were discussed.

Well those experiences which I have are positive.

I have that kind of impression, that they have done large processes with it, which benefit all our customers. So, there is still the need for those more special cases. Of course, they in organization think about what benefits the big mass, because it sells.

Well it has some fancy things. But somehow, I got a feeling that they are not that well finished as they should be. We all don't know what they have done with the robot. Communications is a thing that should be concentrated more.

So, then we realized that this just a small group of people working with this, including the management level and there was discussion about hey what are you doing, or you should do.

Generally, people see software robot as a helper for them and experiences have mainly been positive. Communication about new features is one thing that seems to have so improvements to be done. Open communications related to software robot is essential in order to acceptance for it and that the employees would not be afraid of new changes.

I have understood that there are these B/C persons whose task is to give more understanding about the robot and its updates. But it is still bit coming, it has not fully been taken into use.

Of course, it can be developed all the time, in a way that we think new functionalities for what to do. And if there are some errors so then we fix them, develop the process and widen the offerings for what we can do with the robot.

Maybe the main result from software robot theme was to remember open communication and informing for the employees about new capabilities and updates. Also, to remember in communication to create a picture of a tool or a helper, not a replacer, because then reactions are negative. Otherwise software robot didn't raise any interesting or notable findings.

6.2 Service Modularity

Service modularity was another main topic of this study and the purpose of it was to find out the level of modularity in payroll outsourcing. Also identifying different modules, how data is transferred and what is the level of customization were sub questions for identifying possible targets of application for artificial intelligence.

6.2.1 Interaction

Interaction between the service provider and customer have very important role in how service process works, both good and bad. Interaction has a key role in service process so that's why functionality of this relationship must be studied closely. In this study there are comments both from the service provider and customer side. First some results and thoughts from the customer side.

Mainly as said earlier, we have had good open partnership. Of course, there has been bit more challenging situations during the past four years. I would say we have had maybe two of those kinds of situations where we had to admit the facts and discuss how to get forward with this.

I think it works very well. We have had a very open relationship. Now when I think this past one and half a year, so we have had breaks and obstacles. Especially when there have been personnel replacements it has been more challenging. But discussing and going through things we have managed to go forward.

Customer side is clearly very satisfied with the interaction and they had only few cases during the last four years when there were problems, which is not a lot. Then results from the service provider side.

I think it is mainly good. Of course, certain type and certain customers are challenging than others. But it depends on the customer and what expect from us and what think they will buy and get. I have clearly noticed with certain customers, that they have not understood what the contract includes and what are our services.

Well our communication channels would maybe require some improvements to make communication more fluent from the customer point of view. But otherwise it is generally good.

I think it is generally good. We have certain co-operation meetings and steering group meetings, those are like standards. The thing we still could improve is the quality of customer service, that how you answer to e-mails or phone. Those really basic things, because we also have to remember that not all payroll clerks are customer-oriented.

Service provider side was also quite satisfied with the interaction and communication and how it works. There were still some parts where customer service could be better like the quality of the customer service and how to respond to customer feedback. Service provider side is clearly more critical towards their service than customer, but this natural because there are always some things in a service process which could be done better. Generally, the interaction between service provider and customer works well and it enables functioning service process.

6.2.2 Manual work

Manual work and phases where manual work is needed are possible targets of applications for artificial intelligence. These manual work phases also clarify different modules in the service process, which can then be identified as potential places for automation and artificial intelligence development.

A Lot. If we look this on general level, it is a lot. Then there are also exceptions. There are really electric customers, but no single completely electric customers. Well for example company cars are always manually added to the system. [...] Changes in salary, some contracts are saved manually and in some cases hour cards are interpreted manually.

Well quite a lot still. I have these quite big customers, so for example sick leave certificate and tax cards are manually. So, there are surprisingly much mail coming. Employee contracts are manual, they are not scanned at all.

The amount of manual work was quite significant. Every single customer, bit over 70 companies as a customer, had parts of the service process completely

manual. And not just manual, but on a paper. Meaning that printing and scanning are required several phases of the process.

At least in this department where I visited, the biggest share of the manual work comes from written mail. And this is a thing that I do not know how it can be changed. Other thing is the customer consulting, email duty. It is also that kind of thing which cannot be done any other way. [...] In general, there are those papers delivered by the customer, which for some reason cannot be get out of the regular process. Then these must be saved manually and also corrections must be done manually. Part of the corrections must also be done manually and if the payroll software falters, so then everything must be done manually.

It varies a lot, from another extreme to another. Almost completely manual material or almost entirely electric, or somewhere in between these two. We have a huge dispersion regarding the size of our customers, from few hundred payslips per month to several thousand payslips per month. So, it is bit difficult compare, but generally lot of manual work.

In this phase it came clear that amount of manual work is still huge. Difficulty in this is that customer companies are different sized, and they operate several different fields, which makes their organizational cultures very different. This has effect to digitalization and the level of digitalization. Service provider has limited possibilities to effect customer companies' policies and processes, because big company can almost say to service provider how they want things to be done. This makes it difficult, because obviously service provider does not want to lose its customers to competitor.

6.2.3 Modules

Modules was to find out the amount of separate or independent functioning parts of the payroll outsourcing process. Payroll outsourcing service process follows certain basic pattern and there are several separate modules connected via different interfaces. Payroll process is quite standardized process, because legislation and regulations control the process. Despite the rather strict regulations there is still room for changes and customization in the process.

So there is this receiving process as a whole, which includes control group meetings, payroll service meetings, payroll matrix, which means that it is done individually to each customer. [...] When whole this long process is done and accepted, comes salary to production and when start to count in according to month- and year calendar what we have. First we take material in and after that we make a payroll run and after that there is checking, customer accepting, paying the salary and bookkeeping. There are quite a few, depending on customer about 6-10 processes which need to be considered.

Every payroll rotation has that similar round, which occurs monthly or twice in a month depending on how the salaries are paid to each customer.

Well it depends what kind of payroll outsourcing packet the customer wants to have. But if we think kind of hands-on service so I would divide it to delivering customer material and then the whole month, like consulting or guidance service what ever we produce on the spot. Then there is making the payroll files, accepting salaries and then of course creating the payment files, reporting to authorities and continuous co-operation meetings with the customer.

Payroll outsourcing process is quite stabile and recurring modules or phases are customer delivering the material, making the payroll files, customer accepting the salaries, reporting to authorities, paying the salary itself and making required bookkeeping's. Then depending on a customer there are different meetings and consulting sessions, but those six previously mentioned modules are included in every single monthly payroll process.

There were slight differences on interviewees answers, depending on which level they work. For example, lower level managers or payroll specialist identified more modules than higher-level managers. It seems to depend quite a lot of what is defined as a module. But here the purpose was to identify main modules to create a model of payroll outsourcing process.

6.2.4 Data transfer

Data transfer has a vital role on knowledge intensive services, where payroll outsourcing also includes. Target was to find out how data transfer in this service process works. Possible problems in data transfer between modules are then potential places for artificial intelligence solutions. Data transfer within the service providers systems and teams was working well and the biggest problems occurred on the first phase of the service process when the data was transferred from the customer to service provider.

Mainly it works well, but there are also those situations where the customer, because of some external reason does not understand or they do not follow the schedule.

Well it depends a little bit, but I think that the biggest challenge is between the customer and service provider. Because if we think, things can happen quite fast, so it can easily be like that even though there might be completely different agreements and timetables on a contract.

Of course, there is always some mistakes in material, but because we charge from those errors, because it increases our work. So that's why customers try to send as correct material as possible. More manual the data transfer is so slower and more inflexible it is, with all those excels and everything.

On service providers side the biggest problem was the data transfer from customer to service provider. Incorrect material and especially delayed material caused most problems, because the whole process suffers from these delays and extra works. Also, different data formats caused problems, for example big excel files with lot of information are really time consuming to go through. There

was one clear problem in the service providers internal communication and it was the ownership of back-log. There were clearly two opinions about who owns it and who is responsible for it.

Maybe the biggest problem is who owns the back-log. Is it the product manager or is it the BPO (payroll outsourcing unit)? They (BPO) most likely think that they own it and they most likely have their own shadow back-log.

This kind of ownership and responsibility contradiction is obviously not ideal, and it can have serious outcomes for the service process, and it can decrease the service quality.

Customer side had also their opinions about how the data transfer and communication could be better, according to them.

Inflexibility and ignorance about what that hectic here really is. Of course, sometimes there is flexibility and lot of flexibility, but it is not constant. Service provider can be flexible when they have good moment, but when it is bit more difficult moment so then they are not flexible. [...] Then there is this what causes problems to my team is when there is a new payroll clerk starting on service providers side, so then there are these questions. That the payroll clerk does not ask his/her colleagues rather than from us. Although our, HR-specialist job is not to train service providers payroll clerks.

During the conversations data transfer and communications were bit mixed up, which is understandable because they overlap each other and are partly same things. Inflexibility from the service providers side and not holding on schedules on customer side were the biggest problems. Data transfer or technical aspects of it were not discussed much, interviewees mentioned shortly that technically everything works well and there are no problems with software's themselves.

6.2.5 Customization

Last of theme of discussions was customization. Customization has a central role in service modularity but on the other hand researched organization has a long-term goal to standardize the payroll outsourcing process as much as possible.

Well there is somewhat we have to modify. I actually have these newer companies, or they have new contracts which are aimed to be rather standardized.[...] Yes that is the target, that everything would go according to that standard. Of course Finnish legislation and collective agreements affect so that everything cannot go according the standard.

It would make our job lot easier in many cases if we achieve standardized processes. It is that kind of vision for us, also in future.

It was obvious that standardizing processes really is an important target for the service provider organization. By standardizing processes amount of work would be lower and tasks could be performed faster. Standardizing the whole process is still unlikely or even impossible, because customers are different sized, and they operate on several different fields with several different collective agreements and even with different legislation. It is more likely have several standardized packages for different sized or different field companies. But even with this complete standardization is rather difficult.

So that it would be efficient we need to have wrapped packages. Of course it depends on the service center, what is the scope and what we can serve. But I think that most simple thing would be service packages according to customers size or level of service they want to get which are offered with no big deviations.

Level of standardization and what do we mean with standardization is also a thing that was raised up several times. Standardization of service process might mean different thing on high managerial level and payroll clerk level.

I think people always understand standardization completely wrong. I think that standardization does not mean just a one thing, it can also mean for example that certain collective agreements are standardized and operations models inside these groups.[...] On high level these thing have been drawn but immediately when go to more specific level so of course there are differences. And more down we go so more differences there are.

Despite having the standardization of the process as a long-term target expectations towards it are quite realistic and most of the interviewees thought that it might not happen in a while.

There is that challenge with our customers and how different they are. That there are companies with one office and office-workers. Then there might be one with tens of offices, for example chain of shops which have managers with different ways of doing things. And then there are different systems in different companies. Material delivering processes has several tailoring's, like how, from where, when and which kind of material is being delivered. But generally paying salaries, payroll and order payments are quite similar. But then there are these customer specific reports which they want different ways or with different things, that there might be just small differences. Others require wide reports and others are okay with brief reports. Others might require completely different things. Is company a public limited company or no has also an influence. Public limited companies have different requirements for reporting.

This citation above describes the situation quite well. Certain parts of the process are similar, like paying the salaries, sending information to tax authorities and paying employee pension fees. But then there are several parts of the process which are different depending on the customers field, size, geographical locations and customers own processes and systems. Customization is also more important to bigger customers, because they usually have several unique

processes or requirements. These big customers are also that important for the service provider that they can influence quite a lot to service providers processes.

Now there is a lot of customization on processes which are good for the customers, but which cause a lot of work for the service provider. Service provider is targeting to more standardized processes with customization on some parts of the service process.

6.3 Summary

As a summary, interviewees had a general knowledge about artificial intelligence, mainly gained from media and not that much from company's internal channels. With an exception of few persons who are working with the latest technologies, so they have quite a lot of knowledge about artificial intelligence. Although it is not yet in practical use in the company. Discussion around artificial intelligence was identified to be intensive and one of the future changes in payroll outsourcing. Other significant change factor was legislation. It was seen more topical and concrete than artificial intelligence. Legislation is more present, and it is a thing that company must follow, rather than artificial intelligence is not a compulsory factor to have now.

Applicability of artificial intelligence in payroll outsourcing was a positive and feasible thing. In general, the acceptance was good, but when discussion moved on to deeper factors of artificial intelligence, the acceptance was not that good anymore. Several challenges were raised, for example variety of customers and variety of customer data.

Challenges of using artificial intelligence were mostly related to payroll outsourcing processes both on the customer side and service provider side. Technological challenges were not seen that significant, which can be because interviewees know their own processes throughout, so it is easier to find challenges from there. Ethical issues and data ownership were also seen as challenges. Standardization and customization were also seen as a challenge and this same issue was raised several times during the interviews.

Benefits of using artificial intelligence were better quality, time saving, ability to handle large amount of data and then gain better productivity via these. These benefits are quite traditional benefits when considering artificial intelligence and its cons. Otherwise discussion about benefits did not raise any new or deviant observations.

Current state of artificial intelligence could be seen quite normal for several companies. Discussion around artificial intelligence is growing, and it is seen as a very important factor in the future, but concrete practical actions are missing. Divergent target about how to use artificial intelligence was raised when talking about current state. It is also a challenge to the whole process of adapting artificial intelligence to be part of payroll outsourcing service process. Especially challenging according to interviews was that high-level managers do not listen to their subordinates, which leads to this conflict. Management habits were also

criticized on a wider scale, not just considering the adaptation of artificial intelligence.

Software robot was included to this theme bit of an independent part. Purpose was to gather practical experiences from it and then try to find suitable purposes for artificial intelligence features within the software robot. General opinions about the robot were positive and its automation functionalities were seen positive and it improved overall productivity of the service process. Communication about the new features of the robot or how it can help payroll clerks was by the contrast seen unclear and somehow mysterious. This was a clear indication also to the future if artificial intelligence is taken into use, that open communication about it extremely important in order to get wide internal acceptance and understanding for it.

TABLE 2. Main findings of artificial intelligence.

Future changes on the field payroll outsourcing	Applicability of artificial intelligence in payroll	Challenges that artificial intelligence might cause	Benefits that could be gained by using artificial intelligence	Current state of artificial intelligence in company	Software robot and experiences about it
Automation and artificial intelligence	AI fits very well for payroll	Ethical issues	Better quality	Lot of discussion about AI	Positive
Legislation	Can help a lot	How to use the data?	Time saving	Divergent targets about how to use AI	More open communication about the robot
		Data ownership	Ability to handle large amount of data	Lot of talk but nothing concrete	
		Standardization vs customization			

Generally artificial intelligence has clearly been a topic with lot of discussion but very few concrete actions. Everyone seems to have some sort of view of artificial intelligence, but they tend to differ from each other. There were also quite divergent opinions about the current situation and what is the direction for the organization. Interesting finding with these divergent findings is the fact that employees in branch office had lot more positive thoughts than the people in headquarters, who saw lot more challenges and problems. Also, RPA robotic process automation is quite often mixed with artificial intelligence, which is although understandable because these terms are quite close to each other and one to the other in some cases. There were no significant differences between the service provider or service user in the current state, even though these companies operate completely different fields. So at least it is evident that there is a

lot of discussion around artificial intelligence, but very few concrete actions no matter what the field is.

Service modularity was rather challenging theme to discuss with the interviewees, because terminology and the whole concept are quite new and only few interviewees had heard about it before, or they had come across with it on the field of manufacturing industry. This was expected, so because of that questions were formulated to be more understandable so that questions would reflect persons every day work and be close to the interviewees every day work.

Interaction between customers and service provider was mainly working well and no big challenges were detected. Customer services and person related issues in customer service were only negative things which were found.

Manual work and the amount of manual work is large. Manual work takes a significant amount of time in service process and it was clearly seen as a big challenge. In this case manual work was multivariate, meaning that there are several not so simple reasons behind it. Customer processes and how they deliver data and material has an important role in this, because all the data that comes to service provider comes from the customer. Also, the size of the customer company and the field where it operates affect to the amount of manual work because some industries are more automated than others and size can also make significant difference.

Modules of the payroll outsourcing can be summed up to delivering the material, making the payroll files, customer accepting the salaries, reporting to authorities, paying the salary itself and making required bookkeeping's. This structure is quite simple, and it does not cover all the service modules that can be found in different customers, but it covers the basic modules are in every service process.

Data transfer and data transfer between the modules found out to be potential place for artificial intelligence, because there were several challenges in the data transfer. Delays from the customer side were the biggest challenge in data transfer. Delays on the customer side can be caused by several reasons, especially if the customer is a big company with several offices or manufacturing facilities which can cause variable practices in data delivery. Different data formats between the customer and service provider and different data formats between service providers own interfaces caused lot of delays.

Customization was the question to discuss and it revealed some interesting findings. Service providers target in a long run is to standardize the service process as far as possible, because then they could maximize the productivity by offering the same standardized service process to all their customers. This has a quite direct contradiction with the customer's needs, where they would like to have even more customized service than now or at least maintain the same level in the future. Some of the customer companies are big ones and undoubtedly, they have power to influence service providers processes. Finding the right kind of balance between standardization and customization would probably be the solution in the future. It also came clear that none of the inter-

viewed persons believed a complete standardization of the service process since legislation sets different requirements to different business fields.

TABLE 3. Main findings of service modularity

Interaction	Manual work	Modules	Data transfer	Customization
Mainly working well	Lot of manual work	Stabile structure of basic modules	Delays from customer side	Customers want customization
Few minor defects	Customers with different processes	Few special modules on nearly every single customer	Different data formats	Service provider wants to increase standardization
	Different sized customers is a challenge		Inflexibility by the service provider	

Here it became even more evident, that persons with higher technological knowledge had lot more things to tell and discuss. Modules were an exception, because number of modules was different when according to the level of person who were interviewed. More higher-level managers saw fewer modules than lower level managers. Maybe the most interesting and conspicuous finding was the contradiction between customers need for customization and service providers need for standardization.

7 Discussion

7.1 Answering the research question

The target of this study was to find out how artificial intelligence can be used and exploited in payroll outsourcing services through possibilities and expectations that employees and customers have. Study was done by interviewing managers from payroll outsourcing firm and some of their customers. Research question for this study was:

- *How artificial intelligence can be exploited in modular payroll outsourcing service?*

Research question included two main themes “artificial intelligence” and “service modularity” so because of that questions were divided to these two main themes and at the end answers were combined to get the answer to the research question and find general high-level conclusions.

Interviews revealed that discussion around artificial intelligence is growing all the time. Artificial intelligence and automation are seen the biggest changes in the future, this is also supported by several studies and researches. Internal discussion around these themes is also growing steadily. Despite the continuously growing discussion there seems to be severe lack of common understanding what to develop and how, at least in this studied organization. To be able to maximize the benefits of artificial intelligence, common goals and targets of application are essential to have. Many of the academic researches which handle artificial intelligence are technology oriented and approach is often from technological perspective. Technology itself is just one part of the process and not whole solution to better performance (Kaplan, 2016). In this study it came evident that most of the interviewed persons were expecting artificial intelligence to be some sort of higher power that will solve the problems. Especially person on a higher managerial level had that kind of image. Lower level managers approached artificial intelligence with more detailed and critical point of view.

Knowing the service process throughout is essential before new technologies can be taken into use or even start planning to use new technologies (Demirkan, 2017). This study revealed that is not necessarily the case, because there was a clear lack in communication between high strategic level and implementing strategy. According to the results first thing to do when planning to take artificial intelligence into use, is to build common ground and common goals inside the organization.

Software robot was used as a practical example for technology acceptance (Venkatesh et al., 2012). Software robot represent a concrete example technology that is being taken into use in this case firm. Of course, there are also other new solutions and technologies, which are used but software robot was still most recent and significant technological update in this firm. Software robot or RPA (Robotic Process Automation) is ideal for handling large amounts of data and performing simple pre-defined tasks (Castelluccio, 2017). Case firm uses software robot in several tasks and they also have an own team for the robot, which mission is to improve its functionalities and create new features for it. This study revealed that when discussing about artificial intelligence, firms existing software robot was the most logical place to implement it. Communication about the software robot and its updates plays key role in technology acceptance (Venkatesh et al., 2012). When the software robot was taken into use, it was named and there was open communication about upcoming updates and a two-way interaction between payroll clerks and software robot team about what to do next with the robot. But after a while communication about the robot was stopped or decreased significantly, even though development continued as previous. This created uncertainty and too high or too low expectations for the robot and its capabilities. Effort expectancy and performance expectancy where the most important capabilities which were discussed (Venkatesh et al., 2012). In this organizational context, primary thing is to create culture, that accepts artificial intelligence to be part of the process, as it has been with software robot. Open communication must be highlighted so that employees have realistic expectations for artificial intelligence, and they are not afraid of it due to headlines and discussion in media about how robots will take all the jobs.

In addition to existing software robot that works with approval of files and detecting errors, chatbot was mentioned to be another suitable artificial intelligence solution to be taken into use. Different kind of artificial intelligence solutions using natural language processing are used for example in first line phone calls in some banks and municipalities to direct caller to right person or department (César Aguilar, 2017). Chatbot was seen to very realistic and suitable solution to customer service to give answers to most common and simplest questions. Customers were also open-minded to chatbot solution, because some customer firms run their operation 24/7 and people are living in different rhythms, so they do not expect that there would be person answering the phone rather than robot. Challenge in using chatbot is to have a dialogue between human and robot, because people have different variations in speech, tones, dialects and echoes (Hermansky, 2013). This same problem was also identified

in interviews, because this one example customer has over 70 different nationalities working in the firm, so there are several different dialects and level of English is undoubtedly variable. Finnish speaking or understanding chatbots are found from the markets, but the challenge is the low number of Finnish speakers which limits the development. This is a common problem for small languages and language groups, but these smaller languages are getting more attention from developing organizations (Hirschberg, 2015).

Another important finding in this study comprised interaction between the customer and service provider including data transfer between these two sides. Communication between the service provider and customer was generally good and there were no big problems, but data transfer was seen more problematic. In this case data transfer included delivering the material from customer to service provider in time and in right format. Manual work was also seen as a major challenge for the service provider when trying to maximize productivity and service quality. Manual works is mainly caused by the processes on the customer end, but also few occasions on service providers side. Business Process Outsourcing is problematic in some cases, because there are two different companies but they are work as a one company on that task that is being outsourced (Belcourt, 2006). When some business process is outsourced to some other party, it does not mean that it is entirely outsourced to be a separate part, so that customer do not need make anything for that process anymore. Business Process Outsourcing is co-operation between a service provider and a customer, where both sides should work together toward common goals (Belcourt, 2006). Interaction between service provider and customer might be good on operative level where daily tasks are done as the way they should, but interaction and communication on strategic level is clearly not good enough. Customer companies are of course different, others are one of the largest companies in Finland and others employ less than 100 people, but there is still clearly a lack of strategic communication to how service provider and customer could improve their common processes and gain better productivity through that. Data mining was discussed to be able to offer solutions for improving communication between service provider and customer by offering clustering, classification, association, outlier detection, regression and prediction (Witten, Frank, & Hall, 2011). Classification and clustering were mentioned in interviews as a possible solution to improve data transfer and prediction of possible divergences in payroll data.

Processes on the customer side were identified quite difficult to change, so focus on improving processes should be done on service providers side. Data transfer between the modules on service providers side was identified to be rather good. Although artificial intelligence could replace humans in some modules, like in module "paying salaries", which is quite simple task the amount of salary is already calculated, and the payroll clerk chooses the right bank account where the money is take and where it is the paid. Despite being quite simple task, the mental barrier by letting a robot to pay peoples salaries can still be quite high.

When examining communication and interaction, there was one matter that cannot be passed, and that is the communication between the middle managers and high-level managers inside the service providers organization. It came clear that communication inside the organization is not working in the way it should be, at least between few units and strategic managerial level, because the comments about firms' high-level managers were direct and negative.

A clear contradiction was found between standardization and customization, because service provider was targeting to more standardized processes, but customers were keen to maintain existing level of customization or even increase it in the future. Although none of the interviewed person believed that completely standardized service process could be possible, but service packages for different industries or different sized companies were identified as ideal goal for the future. It is vital for the service provider to find right kind of balance between customization and standardization, because right kind of balance can both create cost savings for the service provider and offer better quality service for the customer (Kindström & Carlborg, 2014). Customers tend to have diverse needs which can be caused by the field they are operating, internal guidelines, legislation or just the way they are used to operate without any peremptory provisions (Kindström & Carlborg, 2014). Service process in payroll outsourcing nearly always includes the following modules customer delivering the material to service provider, service provider creates the payroll files, customer accepting the salaries, reporting to authorities, paying the salary itself and making required bookkeeping's. In addition to this there can be extra modules for some customers because of legislation or their internal requirements. It is important to recognize the processes and modules in the process when trying to find balance between standardization and customization (Kindström & Carlborg, 2014). Interviews revealed that first places where artificial intelligence should be used are simpler tasks with some additional thinking making it too difficult for traditional software robot to execute. Interviewees had quite rational way to talk about artificial intelligence and despite the high talks on media, they were not expecting too much from the artificial intelligence in practice.

7.2 Implications for research

This study examines service modularity and artificial intelligence in a context of payroll outsourcing, which makes it a combination that has not been studied earlier. This study widens the understanding of service modularity found in previous studies (Pekkarinen & Ulkuniemi, 2008; Voss & Hsuan, 2009b; Bask et al., 2011; Tuunanen & Cassab, 2011; Kindström & Carlborg, 2014) by looking closer how service modularity works and could work in a high-regulated context of payroll and payroll outsourcing. Artificial intelligence in is a topical phenomenon at the moment and will most likely have significant effect to several business fields, including the field of payroll outsourcing (Davenport, 2018). The field of payroll is very regulated by legislation and collective agreements,

which make this context rather different than many others. Basic process of paying and calculating salaries is similar regardless of the branch (Thomas & Thomas, 2011).

Davenport (2018) described how artificial intelligence supports different business demands by engaging employers and customers, process automation and creating understanding with data-analyses. These three business demands were also the main demands for the service provider in this study for why to observe targets of application for artificial intelligence.

Pan (2016) describes that social requirements for artificial intelligence have grown rapidly, which leads to growth of research about artificial intelligence. This is obviously the reason why studied organization wanted to study how artificial intelligence could be used in their processes. Need for studying artificial intelligence can sometimes lead to misunderstandings and cause confusion, if it concentrates only to technical side and finding technical solutions (Pan, 2016). This was supported in the study by several interviewees. It is important to know the process throughout and recognize different roles and responsibilities in the process and then think how artificial intelligence could serve this completeness (Pan, 2016). Study revealed similar observations and confirmed that process knowledge is very important when planning the use of artificial intelligence.

The most obvious implication for research was to confirm the findings of Kindström & Carlborg (2014) about how careful mapping of existing service modules and balance between standardization and customization affects to the firm's performance. Study revealed that contradiction between standardization and customization exists in this study and will most likely cause challenges between the service provider and customers. Reuse of modules helps to create economies of scale and this is the same thing why service provider tries to standardize their processes (Kindström & Carlborg 2014).

Payroll outsourcing service process can be identified as a high-complexity service process from the view of modular reuse and variation (Tuunanen & Cassab, 2011). This study thought has some special characteristics like very strict legislation concerning the field of payroll, which is statutory part of business (Finlex, 2001). According to Tuunanen & Cassab (2011) modularization has significant positive impact for perceived utility for the offering in question. This is important finding also for this study, because payroll outsourcing service in this examined organization is a modular service and it has multiple modular characteristics but is not identified as modular service inside the organization. Most likely this is due the young age of service modularity theory and the fact that it has not been studied that much yet (Brax et al., 2017).

Business Process Outsourcing is a co-operation between the customer and service provider, meaning that knowledge and data are shared (Belcourt, 2006). Artificial intelligence requires large amounts of data to be able to learn, think and execute functions. This means that traditional relationship between the customer and service provider will change, not only to be one-way data flow from customer to service provider rather than service provider using the customer data

to teach artificial intelligence and then use this same data as base for other customers as well (Louridas, 2016).

7.3 Implications for practice

This study gives several implications to practice, especially to those firms which operate in the field of payroll outsourcing, like accounting firms, but also firms on other fields can gain benefit from this study.

Service provider, a firm that operates in the field of payroll outsourcing in Finland wanted to how artificial intelligence could be exploited in their operations. Studied organization or service provider in this case could implement service modularity and modular thinking to their processes. One of the biggest challenges in the future is finding the right balance between standardization and customization. This study recognized essential modules for the service process, meaning that these modules are included into every single service process which service provider operates. In addition to this there are several other modules which are more customized or additional ones for customers which require additional services. Phone call service is one example of these additional services that are not included for every customer, it must be separately purchased. By identifying this service module and using artificial intelligence techniques, productivity of this module can quite easily be improved. Using chatbot instead of human on phone call service, resources can be centralized to essential service process and still be able to offer customized service with as good quality or even better quality than earlier. Chatbot enables 24/7 phone call service which has not been possible so far and this would be significant improvement to those customers where employees work in different shifts and weekends.

Another solution for finding the balance between standardization and customization is to create service packages to different sized customers or service packages to customers operating on different fields. Identifying modules in both scenarios is also important, because again essential process can be identified, and additional modules can be added according to the size or the field of customer.

Knowing the service process throughout is very important when use artificial intelligence is being planned, not just concentrating on technologies. This technology concentrated thinking can lead to severe misunderstandings and will most likely cause conflicts between employees, as this study revealed. Use of artificial intelligence is a large change, because its target is to replace humans so it should be planned carefully how the process will change and what these employees who artificial intelligence replaces will do in the future.

Open communication about new techniques and its effects is important, because general acceptance of reforms and technology gives confidence to employees and knowledge about upcoming changes. Uncertainty about the future can therefore cause several problems and keep people in the dark. Communication includes also communication between customer and service provider. In

this kind of service process where service provider is reliable to data delivered by their customers, good communication and common guidelines are very important. Both sides should understand that they are working together towards common goals, even though they are different companies. This is a thing that should be implemented also to operative level of customer companies and not keeping it only on strategic level.

When planning the use of artificial intelligence data ownership question must be solved. Data and the amount of data is the core of artificial intelligence and in Business Process Outsourcing data is owned by customer and service provider just handles the data. Artificial intelligence changes this, because in this case service provider must use their customers data to teach artificial intelligence. This question is one of the first things to be solved when planning the use of artificial intelligence.

8 Conclusion

This chapter presents the conclusion of the study. Firstly, we go through targets of the study, research question and add up main findings of the study. Secondly possible limitations of the study are presented. Thirdly, possible topics for future research are presented.

8.1 Summary of the study

This study researched how artificial intelligence could be exploited in payroll outsourcing service. Research question of the study was "How artificial intelligence can be exploited in modular payroll outsourcing service?". Research included literature review about artificial intelligence, business process outsourcing and service modularity and empirical research combining themes handled in literature review.

Literature review of the study consisted three different themes and it strived to define main concepts and theories of these three themes. Previous studies and literature about topics varied quite a lot. Artificial intelligence and its means are studied more and more in various fields, whereas literature about service modularity is still rather limited. Literature review revealed that service modularity theories cannot directly be implemented to business process outsourcing and especially to payroll outsourcing. Outsourcing is more cooperation than traditional customer relationship between two or more parties and payroll outsourcing is also strictly regulated in Finland. These factors make it bit different than many other business fields. Adding artificial intelligence to this framework makes it even more complicated. Empirical part of the study reflected the findings of the literature review and target was to get understanding of how artificial intelligence could be taken into use in payroll and which preconditions must be considered.

Empirical part of the study was done by using semi-structured theme interviews for ten participants. Interviewed person worked on different positions

and in different business units, so that there would be several viewpoints to the topic. 8 Of the interviewed persons worked on service provider side and 2 worked on customer side. Even though interviewed persons worked on different sides, they all were still part of the same service process and co-operated daily basis.

There were four main implications to research identified in the study. First implication for research was the growth of social requirements considering artificial intelligence and research around it. Social pressure to study artificial intelligence and find targets of application for it is growing fast, even though organizations might completely lack understanding about artificial intelligence. Clear communication and common goals are vital for succeeded implementation of artificial intelligence. Second implication for research was the contradiction between standardization and customization. Service process and modules in it should be carefully clarified and then build service process with ideal combination of customization and standardization. Third implication for research was that service modularity cannot directly be implemented to all business fields, because there are several special characteristics in different fields which require modifications to existing models. Fourth implication was that in Business Process Outsourcing data flow and data ownership is more complex, because service provider is dependent on data delivered by the customer. Use of artificial intelligence is even more challenging in these cases due to data ownership contradictions.

This study found four implications to practice. First implication was that organizations should soon start to investigate existing artificial intelligence solutions and take them into test, because productivity and service quality can be improved quite fast with these solutions. Chatbot is one very concrete example which could be taken into use on studied firm and on other organizations. Second implication was that different service packages with same core process for different sized firms and different fields are usable ways to improve productivity. Third implication for practice is to knowledge of the service process and technology. Often, they are different persons who are familiar with the process and who are familiar with the technology, so knowledge sharing in these cases is very important. Fourth implication for practice is communication and the importance of open communication so that projects are accepted and overlapping projects and misuse of resources can be avoided with open communication. There was also a fifth implication which is an implication to practice and research and it is data ownership for the use artificial intelligence in business process outsourcing context. Data ownership in this kind of environment must be carefully planned in practice.

8.2 Limitations of the study

This study was conducted to a one specific payroll outsourcing firm as a commission so interviewed persons were from this same firm, except two who were from a customer firm. Total amount of interviewees was 10, which is a legitimate number of interviewees for quantitative study (Tuomi & Sarajärvi, 2009). Although total amount of interviewees was legitimate, especially the number of interviewed customers could have been bigger. Now customers were from a same firm, so different customers might have had dissenting opinions. Also, the fact this study was done by interviewing person from only one service provider limits the generalization of the results for comprises all the other firms operating the same field. Other firms operating on the field of payroll outsourcing might have different service process and used technologies might also be different than in the studied organization. Limited sampling is a significant limitation for generalizing results, but on the other hand studied organizations gained results which can be implemented to their practical work.

Interviewed person were from different business units so there were quite significant differences on the answers. Person were working closely with new technologies had obviously deeper understanding about the technology and person who were working on customer interface had deeper understanding about the service process. So made answers quite diverse and variable emphasized, but again this was also one target for the study, to get diverse perspectives about artificial intelligence and service modularity.

Interviewer worked on a firm that was being studied and he know some of the persons who were interviewed. This made organizing the interviews lot easier, although it might have had effect to given answers in the interviews. Interviewed person might have given answers which please interviewer and might have not been entirely honest about what they think for example high managers, because results are shown to firm's management group. Interviews were anonymous and there are no names, age, titles or gender mentioned in results, but the results might still be partly different.

Artificial intelligence was studied mainly on high-level as a term. Closer look to different technologies of artificial intelligence and how these means could be used should be studied closer. This closer look would have required different persons to be interviewed and the scope of the study would have been different. This chosen high-level was found to be adequate.

Analyses of the study are interpretations made by the researcher and the most important findings are also defined the researcher, so they are not scientifically fully exact, because some other researcher might highlight other findings.

8.3 Future research

This final part of the study represents possible topics for future studies. Studied context, artificial intelligence in payroll outsourcing using service modularity is quite unique field of research and there are no previous studies which combine these topics. Artificial intelligence and Business Process Outsourcing are studied a lot, but service modularity is not being studied that much and it makes this study a unique. Artificial intelligence is very topical now and it is also very popular subject of study. It is justified to mention that artificial intelligence will have significant effect to nearly all fields of life in the future and that is why it is important to study carefully. Service modularity is also very useful theory in several context and it should be studied more to find possible targets of applications for it.

First possible topic for future research is to widen the scope if studied organizations and interviewed persons. This study concentrated on one organization whereas there could be also other organizations involved to get wider understanding of what is the use level of artificial intelligence in field of payroll outsourcing. Results of this study cannot be generalized due to homogeneity of sampling. Also, wider views from customer side could be embedded to this future research. It is obvious that interviewed persons and their work positions have significant impact to results, meaning the balance between technical oriented and process-oriented persons. So, it is important to find right interviewees to match with the study view.

Second possible topic for future research is to study service modularity on wider scope. Service modularity is relatively little studied theory and it is not very well known outside of academic context. This study also revealed that studied organization has modular service process and process can be identified as modular service process. Thought organization does not identify its processes as modular and this is most likely due to lack knowledge about service modularity.

Third possible topic for future research could be about how to find right balance between various customer demands and standardized processes. It came evident customization and standardization have key role in firm's performance, but this theory lacks frameworks for how define what is the proper balance. Of course, all organizations have different strategies, products or services they follow and offer, but still deeper study in this topic and especially in the field of payroll outsourcing could be interesting.

Fourth possible topic for future research could also be to study or test some of artificial intelligences techniques, for example natural language recognition, in real life context and inside this studied organization. Other targets of application could also be interesting to study more.

In addition to this, a study about data ownership and GDPRs affect to use of artificial intelligence in outsourcing business is very topical topic to study.

Following hypothesis are presented based on this study and these hypotheses would be interesting to study more.

H1: Service modularization enhances firms' performance

H2: Customization vs standardization have significant effect to firm's performance

H3: Artificial intelligence can significantly improve the balance between customization and standardization

Artificial intelligence and use of it was the starting point for this study, but findings regarding service modularity were also interesting. Artificial intelligence is a mean and more of a practical level function whereas service modularity is strategic level tool and from this point of view artificial intelligence is a tool for service modularity and better performance. The balance between customization and standardization turned out to be maybe the most important finding of this study, combining artificial intelligence techniques to this. This study did not concentrate that much to technical details or technical solutions, rather than mapping suitable ground and basis for the implication and use of artificial intelligence. Hopefully this study will inspire researchers to study this topic more and encourages practitioners to implement findings to their processes and to be curious about all the things that need to be studied.

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APPENDIX 1: QUESTIONS

Basic Information

1. Age
2. Gender
3. Title
4. How long you have worked in current organization?
5. How long you have worked in current position?

Artificial Intelligence

1. What are the biggest near future challenges in payroll?
 - 1.1. High-level question for mapping future challenges in context area.
2. How do you experience the usability of artificial intelligence in payroll?
 - 2.1. To clarify general applicability of artificial intelligence to context area.
3. What possible challenges the use artificial intelligence might cause?
 - 3.1. Finding out challenges and problems in context area enables wide understanding to application area.
4. Which concrete can be gained by using artificial intelligence in payroll?
 - 4.1. Try to find out applicability of artificial intelligence to individual parts of service process.
5. Have there been discussion about artificial intelligence in your team?
 - 5.1. Detection of present state enables possible new targets of application.
6. Software robot is being used in service process. What are your experiences from it and how its usability could be improved?
 - 6.1. Software robot have lot of similarities with artificial intelligence, so experiences from it are valuable when planning implementation of artificial intelligence.

Service Modularity

1. How would you describe interaction between service provider and customers?
 - 1.1. Interaction between customer and service provider has a key role in functionality of service process.
2. How much there is manual work in service process?
 - 2.1. Manual work phases are potential places to use artificial intelligence.
3. How many identifiable separate phases payroll outsourcing have?
 - 3.1. To find out modules in service process.
4. How data transfer between theses phases functions?
 - 4.1. Interaction between modules has key role in service modularity.
5. How much there is customization in service process to different customers?
 - 5.1. Service process customization and personalization are basic principles in service modularity.