Artificial Intelligence (AI): Creates or destroys value in supplier customer relationships?

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Artificial Intelligence (AI) is a topic that is widely discussed about all around the globe. Increasingly, it gains more population in many firms because of its contribution to productivity and efficiency. However, less is said about possible drawbacks of using AI. This paper tries to deliver a better overview on both advantages and disadvantages of AI in the value creation process. In order to do so, it is necessary to find an answer to the question 'Does Artificial Intelligence (AI) create or destroy value in supplier customer relationship?' There are lot of opportunities but also challenges for firms and customers in the use of AI in their products and services. There is no universal solution to each service situation, it is more dependent on the individual customer. Ultimately, the customer has to accept the value proposition. Therefore, AI is a perfect example of a technology that is applicable to the S-D Logic framework.

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1. INTRODUCTION

The new perspective on the concept of goods and services introduced by Vargo & Lusch (2004) has received much attention from the marketing field. Before the introduction of the S-D logic, the product itself was seen as value adding to the customers. This is called the Goods Dominant Logic (G-D Logic). In the perspective of the G-D logic, the purpose of economic activity is to make and distribute units of output, in most cases tangible goods, in order to maximize profits through efficient production and distribution of goods. Value for the customer is created during the manufacturing process which implies that customers had no role in value creation. The new perspective on enterprises is that all types of businesses provide services to their customers (Skålén & Edvardsson, 2016; Vargo & Lusch, 2004). Manufacturing firms are included in the definition of service provider, as they produce goods in order to transmit their services to their customers. Besides the emphasize that firms are service providers, the involvement of customers in the value co-creation process is one foundational premise of the S-D logic (Vargo & Lusch, 2016). Looking from the SD-logic perspective, the concept of value-in-use and co-creation of value are essential (Vargo & Lusch, 2016). However, it is first necessary to clarify the meaning of 'value' before starting the discussion about value-in-use and co-creation of value. Value is connected to value-in-use in the S-D logic framework. The definition of MacDonald et al. (2011) can be used to explain value-in-use as "*a customer's outcome, purpose or objective that is achieved through service".* The meaning of service here is that the supplier's resources are used to benefit the customers. The customer is the value creator and therefore determines what value is created (Vargo & Lusch, 2004), whereas the firm is the facilitator (Svensson & Grönroos, 2008) and they should focus on identifying value generating processes of their clients. Therefore, marketers can only offer "value propositions" (Holbrook, 1999; Vargo & Lusch, 2004), which is a promise of value yet to be delivered. Moreover, a recent study strengthens the assumption that the value proposition is reciprocal co-created between customers and suppliers (Truong, Simmons, & Palmer, 2012). This is essentially in line with the premise that value is co-created between customers and firms (Lusch & Vargo, 2006) through the interaction of actors (Payne, Storbacka, & Frow, 2008). Artificial Intelligence is a technology that can support value co-creation between actors.

The advancements made in the twenty-first century in computer power and the theoretical understanding on how it can be used to solve challenging problems in computer science, have made Artificial Intelligence (AI) techniques a major topic beyond the technological field. Start-ups specializing in AI applications received US $2.4 billion in venture capital funding globally in 2015, a recent trend that is increasing every year. Big technology firms around the globe, like Microsoft, Google, IBM, to name a few, invested and are investing high amounts in R&D projects connected to AI (World Economic Forum, 2016). Artificial Intelligence can support co-creation of value and therefore increase value-in-use. However, most research in the field praises the benefits of AI for firms but concerns and risks are less mentioned. Therefore, this paper elaborates critically both the benefits and downsides of Artificial Intelligence in the process of co-creation of value. The purpose of this study is to discuss on the effects of AI applications in the interaction process in co-creation of value and to identify the major opportunities and risks in using it for the process of value co-creation. The research question is 'Does Artificial Intelligence (AI) create or destroys value in supplier customer relationship?'

The aim of this paper is to provide an answer on the effects of the use of AI in the value creation process. The topic AI is a highly discussed topic currently but how AI can support or hinder the co-creation of value is still scarce. Therefore, this conceptual paper gives more insights into the opportunities and implications behind the growing trend of AI applications in the business processes.

This paper is structured as followed. Firstly, the theoretical framework is discussed. After the theoretical framework both the factors supporting AI in the value creation process and major drawbacks are described. The conclusion of this conceptual paper will give a short summary of the findings. The paper finishes with the discussion section.

2. THEORETICAL FRAMEWORK

In order to answer the research question a broader understanding of value co-creation is required. In addition, the role of AI in the process of co-creation of value needs to be specified and explained in more detail. Value Co-creation can be defined as the exchange of service by organizations, markets and society with the ultimate goal to increase the benefit for a party (Vargo & Lusch, 2004). This implies that the different actors are exchanging information during the value co-creation process.

2.1 The role of AI in co-creation of value

The traditional view was that supplier produced goods whereas customers purchased goods and services. This is from the perspective of G-D logic. S-D logic on the other hand, propagate the idea that value is created by both suppliers and customers (Lusch & Vargo, 2006). Furthermore, customers can engage in direct dialog with suppliers during each stage of product design and delivery (Payne et al., 2008). By integrating the customer in the value creation process, the firm can elaborate on the customer's point of view and use the information for fulfilling the unique desires of the customers. However, another view is that the customer is the value creator and the firm, who is the service provider, can be invited to join the process as a co-creator (Grönroos, 2011). According to Grönroos (2011) value-in-use is determined and created by the customer and hence he disagrees with the statement that "*the customer is always a co-creator of value*". The firm on the other side, facilitate customer's value creation (Grönroos, 2011; Svensson & Grönroos, 2008). Hence, this implies that firms are not automatically co-creator of value (Grönroos, 2011). This would imply that firms have no direct influence on customers during the value-creation process. Firms get the opportunity to take part in the value creation process as co-creator through interaction with the customers (Grönroos, 2011). However, interaction alone does not automatically mean that the firm is engaged in the customer's value-creating process. The customer decides what type of interaction it prefers. With the introduction of AI applications in the recent years, the traditional human-to human interaction in the service marketing research domain is in question (Gummesson, 1991). Artificial Intelligence is intelligence exhibited by machines. During the last few decades, AI applications were

used in areas like logistics, data mining and for medical diagnosis. The increase in usage of AI applications is strongly connected to the increase in computational power (Schaller, 1997). The most important aspect of AI applications is the diminishing of human interaction on the firm side.

2.2 Interactions between customers and firms

The definition of interaction is a reciprocal action, effect or influence. Interactions between the firm and consumers facilitate co-creation of value (Vargo & Lusch, 2016). "*Dialog, access, risk-benefits, and transparency (DART) are emerging as the basis for interaction between the consumer and the firm"* (Prahalad & Ramaswamy, 2004). Dialogue is an important element in the co-creation of value. It implies that both sides are interactive and deeply engaged. In an interaction between equal actors, dialog will center interest to both parties. In order to become equal and joint problem solvers, consumers need to have the same access and transparency to information (Prahalad & Ramaswamy, 2004). Through new information and feedback channels, firms lost their benefit from exploiting the information asymmetry between them and the consumer (Prahalad & Ramaswamy, 2004). Since consumers can get information from the community of other consumers, it would be better for a meaningful dialog if the consumers receive the information directly from the firm. Besides dialog, access and transparency, risk-benefits is an important building block of interaction. By integrating consumers in the course of action and decision, they will get deeply engaged in assessing what the risks are (Prahalad & Ramaswamy, 2004). Firms that are firm centric and product centered have the opportunity to increase value creation by offering personalized co-creation experience for their customers (Prahalad & Ramaswamy, 2004). In the contrary, firms who are not product centered can enhance value creation with the concept of 'customers as innovators' (Thomke & Von Hippel, 2002). Firms provide the tools and shifts effort and risk to its customers and it saves development time and reduces risk. In the recent years, many firms concentrated on 'mass customization' process for their products. Mostly offered on the Web, customers can customize their individual product to the extent to choose from a list predetermined by the firm. However, with the 'mass customization' the individualized interactions between firm and customer is reduced. Therefore, in order to meet the customer' unique desires, firms should personalize the co-creation experience by letting the customer to decide how they want to interact with the firm facilities (Prahalad & Ramaswamy, 2004). With the rise in information and communication technologies the interaction between customers and firms have changed. Through the advances in technology the services are adding value to human life (Perera et al., 2014). The service activities are automated and the human interaction is decreasing. This can have an effect on the value proposition.

2.3 Service Systems and value creation

Artificial Intelligence is a type of service system which is "*an arrangement of resources (including people, technology, information, etc.) connected to other systems by value propositions*" (Spohrer et al., 2008). The function of a service system is to make use of its own resources and the resources of other agents in order to improve its situation and that of others. Both firm and customers are service systems as the firm provides services by applying knowledge and skills of its employees. The customer is also a service system since it also access, adapt and integrate resources. Through Artificial Intelligence, both service systems are connected. Co-creation arises because service systems are dependent on the resources of others. Therefore, service systems are connected through the proposition, acceptance and evaluation of value (Spohrer et al., 2008). Both customers and firms communicate through the technology system and offer and accept value propositions.

3. METHODOLOGY

This literature review will be built on recent scientific literature about Artificial Intelligence, value co-creation, and implications of using artificial Intelligence in value co-creation. Google scholar, Web of Science and Scopus will be used for searching related articles. The review is conducted to evaluate the positive and negative sides of Artificial Intelligence in value co-creation and therefore the search terms are related to the research purpose. The major limitation is that there is not much literature available in the S-D logic domain that is about AI applications. Therefore, this literature review will connect both S-D logic and AI literature in order to derive on a unified statement.

4. FACTORS CONTRIBUTING TO AI

In recent years many firms started to use Artificial Intelligence applications both for their process and products itself. This trend can be observed in the increase of equity deals to startups, which are specialized in Artificial Intelligence. The application areas of AI solutions are diverse including companies in healthcare, advertisement and finance. Google with their project Waymo, which is an autonomous car, IBM Watson the first AI algorithms to win the Jeopardy! Challenge, and Amazon echo the smart speaker developed by Amazon, are a few AI device examples worthwhile to mention. Bill Gates, the co-founder of Microsoft said about artificial Intelligence that "*The dream is finally arrivin*g" during Vox Media's Code Conference (Recode, 2016). A recent study by the company Narrative Science found out that 80% of executives believed that AI solutions boosted worker performance and created new jobs (Businesswire, 2015). But not only firms use AI applications, but also customers use it. Many nowadays use voice assistants on their mobile phone. A recent study found out that only 2% of iPhone Users had never used the voice assistant Siri (CreativeStrategies, 2016). These developments demonstrate that Artificial Intelligence has taken an important place in the daily life. Therefore, in this section different factors which are the drivers of Artificial Intelligence are presented. This section has seven parts that all have their own subject.

4.1 Technological factors

The rise of AI is mostly accountable to deep learning capabilities. Neural networks which is the underlying technology framework behind deep learning existed for decades. However, in the last decades changes in the technology field had an impact on the development of AI. The first factor as the driver of change in the technological field of AI is hardware. The combination of higher computer power and lower costs made it available to many firms

to build new models of neural networks and it had drastically increased both speed and accuracy of the results produced by neural networks (Goldman Sachs, 2016). At the same time, costs of performance have declined. When comparing the development of hardware prices, it is visible that through economies of scale and new ways of production processes the prices dropped drastically (Goldman Sachs, 2016). The hardware of machines can be upgraded, while biological humans cannot drastically upgrade their brains (Sotala, 2012). This implies that the capabilities of machines can increase when parts of the system are upgraded. In the contrary, the upgrade of human brains is finite. This implies that not only can the performance of computer systems be on a constant level but also that there is the possibility of improving the performance. Whereas it is not possible to increase the performance of human beings as easy as it is for machines. But not only the physical characteristics provide certain advantages to machines, also to do time-critical decision-making faster than humans (Sotala, 2012). A mind being executed on a system with superior serial power can think twice the amount of thoughts in the same time as a human being does (Sotala, 2012). The possibility of upgrading a system and improving its power can decrease the dependency of human labor, but it will not make it completely irrelevant. Better and more sophisticated machines still need humans who will maintain the system by providing new algorithms or fixing bugs.

Secondly, not only changes in hardware took place in the recent years. Another important fact is the increase in data. One important topic to discuss is IoT which stands for Internet of Things. The term Internet of Things can best be described by a "*world-wide network of interconnected objects uniquely addressable, based on standard communication protocols*" (Atzori, Iera, & Morabito, 2010). As the number of devices increases, the amount of data that is being generated in the process also increases. In addition, low cost data storage and processing technologies makes the growth in number, size and structure of data sets more convenient. As the amount and size of data increases, so does the complexity of it. In many industries AI applications are handling big data sets faster and more effectively than humans could do.

Thirdly, besides better data input the major developments in algorithms supported the deep learning process. (Wired, 2014). Algorithms are mathematical instructions and a step-by-step procedure for calculations. In recent years, a shift occurred from the algorithms are "good" or algorithms are "bad" to the way society is structured with regard to data use and data privacy (Wired, 2014). Hence, algorithms are referred to mathematical instructions which are used as a tool in technologies and it is more important to evaluate the purpose of algorithms rather than the algorithms itself.

Service is defined as "*acts performed for someone else, including providing resources that someone else will use*" (Alter, 2010). The rise of Artificial Intelligence changed the nature of value creation. With the use of AI, the way of how the acts are performed changes. Customers as a resource integrator exchange information with a machine and therefore the traditional human-to-human interaction is replaced by human-machine interaction. The machine will add value to human life by becoming a service provider (Medina-Borja, 2015). This is called smart service system which is a system "*capable of learning, dynamic adaption, and decision making based upon data received, transmitted, and/or processed to improve its response to future situation*" (Medina-Borja, 2015). One example of a smart system is the use of virtual assistance in the form of Chatbots. With Chatbots firms try to increase customer service. One point is the possibility to offer customers a 24x7 service which can be used outside office hours. In addition, the costs of using Chatbots are readily comprehensible und less than for human counterparts (Mittal, A., et al. 2016). Also, AI driven platforms are used for a new form of communication. With the increasing power of algorithms, bots can engage with humans in more and more complex tasks. Firms can control the value creation process. If a task is too complex for the Chatbot, an employee from the customer service department can enter the conversation. Also, the customer is benefiting with Chatbots with an increased value experience. The customer can get information irrespectively of the office time and even in urgent situation when there is a high demand for customer service.

The technological progress opens new possibilities to firms. It changed the nature and type of communication and interaction with customers and many firm's value proposition is realized through AI. With AI it is possible to adjust the value proposition based on real time information. Through AI software it is possible to gain precise information on changes impacting the organization (Bitvore, 2017). In addition, AI enables a proactive approach in which changes impacting the business are anticipated. Therefore, using AI properly can make the organization less disruptive, there will be less waste of money, and there will be a higher customer satisfaction. Customers can decide on which communication channel and type they prefer. Therefore, both provider and beneficiary of the service can benefit from value creation processes with AI.

4.2 The role of Big Data in value creation

According to Shivon Zilis "*Data is the new oil*" (Fortune, 2016). Hence, not the Artificial Intelligence software is the major competitive advantage of firms, but the data they store and use from their customers. David Kenny the general manager of IBM's Watson data crunching service said that there will be a market for data and therefore "*data will become a currency*" (Fortune, 2016). Data is generated from customers before value creation because it is easier to target the right customer group. The information ecosystem makes AI valuable. Data alone is not so much of a value when the transformation of raw data into valuable information can not be easily done. In addition, what makes AI so valuable for firms and customers is machine learning, the fact that AI applications will learn from data and improve over time. Customers provide their data to firms where the data will be used to specifically market products which is tailored to each customer individually. The combination of datasets from different sources will deliver valuable information for the firm and in addition eases the internal information sharing. But why is data analytics so important as customers determine how value is perceived (Vargo & Lusch, 2016)? Although the customer decides ultimately the value perception, firms can gain valuable insights from their customers before starting to offer value propositions (LaValle, Lesser, Shockley, Hopkins, & Kruschwitz, 2011). The combination of AI and big data enhances the value proposition even more. During the value-in use process firms can adjust the service on each customer. The power of using big data can be identified in the success of the online giant Amazon. By using collected data of their customers when using the Amazon site, Amazon makes recommendations to customers. These recommendations are based on the search habits and search history (Currie, 2004). With this Amazon tries

to best meet their customer's needs (Deng, Miao, Wang, & Lei, 2011). Moreover, through value-in-use the service can be improved. Through the use of AI applications, the quality of interaction can increase. When there is an interaction between two or more parties, there always is a relationship present (Ballantyne & Varey, 2006). Not the relationship is manageable but the quality is. Relationships that are beneficial to all parties provide structural support and this in turn supports further value-creating activities (Ballantyne & Varey, 2006). Furthermore, customer responsiveness will increase because of greater customer insights. A study of Forrestor shows that 42% of B2C marketers see big data analytics as an enabler to increase customer lifetime value and loyalty (Forrester, 2014). This is possible as with big data analytics the marketers have the ability to define and guide customer development. With big data analytics firms can understand stated and unstated customer needs faster and with higher accuracy (Forrester, 2015). Value must be understood in the context of the beneficiary's world (Vargo & Lusch, 2008). Through big data firms aim for efficiency, since customers can get the service faster and with higher precession. AI applications which functions as the value transmitter accounts for ease of use of the service (Gummerus & Pihlström, 2011).

In addition, with AI firms are able to connect to the final customer and are able to give better assistance and assistance on the right time to the customer. In the data their might be relations that when known it can be used for attracting new customers. AI enables easy extraction of data and cloud storage of data (AiCloud, 2017). This enables easier data analysis. When the data is easier extracted and stored it is also easier to share the data internally. The data generates insights which are useful for product development and sales. When a firm knows what their customers appreciate about the new products or services they can use those information in their value proposition.

4.2 Efficiency through automation

With the rise of AI the interest in automation of work increased. Through the industrial revolution, human work was accompanied with machines to increase productivity and efficiency. We are now witnessing a new level of automation of work. The current state is differentiating between routine and nonroutine work (David, 2013). Many advocates in favor of the use of artificial intelligence claim that with AI applications tasks can be automated and certain tasks can be done with higher precision and productivity by machines than by humans (Accenture, 2016). By decreasing the number of labor hours needed to create a unit of output, labor productivity will generally increase.

The fact that AI driven machines can work 24 hours a day without a break and that without productivity fluctuations, this is an advantage in the value creation process. The implications of automation besides the social factors is that automation requires high coordination with human team members. Team members rely on the "*existence of a reasonable level of mutual predictability*" (Klien, Woods, Bradshaw, Hoffman, & Feltovich, 2004). For this shared knowledge and close coordination is necessary. Therefore, automation through AI can increase the value creation process when all actors in the process are closely coordinated. It can make the interaction easier and at the end lead to increased customer experience.

4.3 Hype cycle of AI

The early achievements in the field of AI generated great optimism (Hopgood, 2003). Although the current state of AI attracts great attention from many sides because of its advantages and therefore creates funding opportunities for future research, the hype may cause too high expectations which can end again in an AI winter (Hendler, 2008). In recent years through the involvement of many renowned and big firms in AI connected to the large amount of funding caused an increase in expectations. This can also been noticed by the high amount of new inventions in recent years. The events are represented in the hype-expectation cycle of Gartner.

Fig 1: Hype Cycle for Emerging Technologies, 2016 (Gartner)

Retrieved from: http://www.gartner.com/newsroom/id/3412017

It is visible that major changes in technology in the recent years were a trigger for higher expectations. The success stories about intelligent agents like IBM Watson and the current up-to-date research about driverless cars even further raised and inflated the expectations. The question here is whether AI will continue the hype cycle? As a consequence, the next stage would be that implementations fail to deliver based on the high expectations and firms now investing in AI will shake out or fail. According to Gartner, we are now at the peak of inflated expectations. Only a few technologies will become relevant for the mass market and there are serious implications for businesses who follow the "AI hype" without taking into account the implications of using AI in their processes. The hype cycle of Gartner's main note is that the short-term effects of new technologies are overestimated and the long-term effects are underestimated. Hence, it is also important to consider the drawbacks of using AI in the value creation process in order to have a differential view (Gartner, 2016).

4.4 Unfriendly AI

Besides the opportunities, it is important to elaborate on the challenges and obstacles when using AI. Overcoming the challenges and obstacles better than the opponent can lead to a better value proposition and in turn lead to better value–in-use for the customer. Moreover, knowing the challenges and obstacles are key for firms to anticipate on them and to make sure that they are managed in their value proposition. In recent years, many

experts have expressed their concerns about the use of AI applications. Stephen Hawking, Elon Musk and other Artificial Intelligence experts signed an open letter on Artificial Intelligence. The aim is to call for research on the societal impacts of AI (Future of Life Institute, 2015). Not only the effects on the economic situation of society is intensively discussed, but also the effect on human behavior and interaction. In 2015, the bot Eugene Goostman won the Turing Challenge. It was the first time that a bot has won the challenge, where human raters use text input to chat with an unknown entity. In that year, human raters thought that Eugene Goostman is a human being (TIME, 2014). This event was a milestone in the human-computer interaction field and it provides many opportunities for firms to reduce costs in customer service and sales. However, "Unfriendly AI" is a term often mentioned when discussing about drawbacks of an increased AI driven world. A superior agent that can outperform humans could be a threat to the status quo (Bostrom, 2014). The question arising is, if AI can outperform humans in terms of intelligence, why should they share our values? Also, marketing experts discuss about the use of AI in the value-creation process (Maglio, 2017). Who is the provider in the example of an autonomous car? Is it the car maker or the algorithm that communicates with the beneficiary? How can value be co-created among humans and AI?

According to Vargo and Lusch (2004) "*the firm cannot deliver value but only offer value propositions*". In addition, value emerges when actors apply their capabilities so that all participants are better off in the end (Vargo & Lusch, 2008). In the example of the autonomous car, the beneficiary is better off since his need of moving from A to B was fulfilled. The provider, in this case the autonomous car is not better off at any sense. The example of the autonomous car reveals two issues about AI in the service dominant logic. The first is about the role of the firm. Since "*value is cocreated by multiple actors, always including the beneficiary*" (Vargo & Lusch, 2016), including the exchange of information through active interaction (Maglio, 2017), the use of AI in the value creation process can hinder smooth communication. In addition, with more developed applications of AI, the amount of control will decrease. With more sophisticated AI applications, the firm will lose one of its most precious tools to influence their customers, which is direct interaction.

The second issue is that companies who adopt AI as a source of value creation will have limited accessibility over how value will be experienced by customers. "*Value is always uniquely and phenomenologically determined by the beneficiary*" (Vargo & Lusch, 2016) and an unfriendly AI who works against the interest of the provider can cause serious damage on the relationship between firms and customers. Machines are neither perfect nor can they get trained to avoid mistakes entirely. This with the fear that machines could outperform human being in all aspects one day, fuels the skepticism about the current positive hype of AI applications (Bostrom, 2014).

4.5 Customer acceptance of AI

Although through the technological changes more firms make use of AI in their value proposition, more concerns arise with regards to the secure use of AI. One very important topic is data security. The huge amount of data that is being generated by Smart devices pose serious concerns about data privacy. Andras Cser, vice president and principal analyst at Forrester Research said that "*AI requires a ton of data, so the privacy implications are bigger and* "*there is potential for a lot more personally identifiable data being collected*" (Provazza, 2017). With AI it is easier to correlate data and it removes privacy. Transparency on what data will be collected and for which purpose would help to establish an honest and strong relationship with customers. According to a recent survey, data security is one of the most important topics for customers (Morey & Schoop, 2015). Customers who feel that their data is misused state that they will not interact with firms. People are not willed to have their personal information used for profiling when they are not explicitly told about the procedures before data collection (Culnan & Armstrong, 1999). In addition, people that had prior experience with targeted marketing are more willed than people who lack the experience. Therefore, firms have to communicate that the data is anonymous and how the data is stored. Another problem is how to show the data on clear interfaces in order to achieve high usability. Since AI driven products require data and in addition produces data during value-in-use, customer could refuse to accept the value proposition. This is the main issue that many firms wanting to use AI applications face. How can a firm persuade the customer to accept the AI application? This is very important because one essential axiom of the SD-logic is that "*value is always uniquely and phenomenologically determined by the beneficiary*" (Vargo & Lusch, 2016). Hence, the customer must accept the use of AI applications during the value creation process. Gartner predicts that in the coming years customers will manage 85% of their value creation process without interacting with a human (Gartner, 2015). Therefore, it is necessary for firms to rethink about how to ensure that data usage is transparent to their customers. By making the exchange transparent, firms can build a long-time trust relationship with their customers and thus improve the quality of information and resource exchange (Morey & Schoop, 2015).

4.6 AI and quality of data

Artificial Intelligence is a data driven technology. As such it relies on data input. Hence, the quality of the performance is dependent on the quality of data. The objective of AI is to use the retrieved data and transform it into useful data, by using algorithms and data models. Data collected from customers are mostly referred to "Real-world data" which is impure (Zhang, Zhang, & Yang, 2003). Real-world data may be incomplete, noisy and inconsistent (Zhang et al., 2003). When data preparation fails, or is done incorrectly, firms get with high probability false information which in turn can harm both firm and customers. Working with false data can have serious implications in value co-creation. Offering poor service because of poor data collection and analysis can lead to customer dissatisfaction and increased costs (Redman, 1998). Customers expect to receive the kind of service which they need and desire (Redman, 1998). Any deviations can lead to a worse relation between customers and firm and even to long term loss of customers.

5. Using AI in human interaction during value co-creation:

AI is the technology behind many new inventions. Applications of AI are operant resources and as such are the fundamental source of strategic benefit (Vargo & Lush 2016). Firms that use Artificial Intelligence for their processes and products as transmitters of value will have a competitive advantage in the market. This is because of the learning effect in a dynamic and evolving competitive market, in which many firms who use AI technologies are (Dickson 1992). The recent hype about AI products puts more pressure on firms in investing in AI. Using AI can increase the quality of the value creation process. However, this trend also has several implications as elaborated in this paper before. Firms will use human interaction only in exceptional cases, mostly restricted to before and after service fulfilment. The service itself which is "the basis of exchange" (Vargo & Lusch, 2004) is delivered by a machine. Therefore, firms are in a dilemma. They can decide on using AI to improve the performance but at the expense of less influence on customers. The fear of using AI in the process is still prevalent. One research found out that 34% of the respondents are afraid of the concept of AI (TechProResearch, 2015).

The combination of using AI applications in human-to-human interaction will have several advantages than the separate use. First, the positive factors of AI in the value creation process. The ability to analyze large data sets more efficiently and faster than humans. The firms stay flexible in emergency cases when the algorithm is not working as intended. In addition, the company still have control on how the value proposition is offered. By looking at the current state, we can see that many businesses already use Artificial Intelligence for their processes. Employees have full control if the algorithms do wrong actions. A lot of investments are done in the research of Artificial General Intelligence, a machine that can have higher general intelligence than humans. Despite the potential benefits of Artificial General Intelligence, I believe that it is better to stick to the combination of humans with Artificial Intelligence. The ideal situation is to make the allocation of work dependent on the task and also to integrate the customer before the use of the AI service. As good interaction is one of the main source of competitive edge.

One foundation of AI is the concept of "intelligent agents". An intelligent agent is a "*system situated within and a part of an environment that senses that environment and acts on it, over time, in pursuit of its own agenda and so as to effect what it senses in the future"* (Franklin & Graesser, 1997). There are diverse types of properties which satisfy the definition of an intelligent agent (see Fig.2, Appendix). The tasks must be defined thoroughly so that the cooperation between human and machine prevails the best results. Humans are at the highest level of being an agent (Franklin & Graesser, 1997). Therefore, it is essential that the processes of the interaction which are manageable by a machine and complex processes which are only manageable by humans are allocated rightly. Figure 2. shows one example of an agent classification. By classifying the properties of the agent the distribution of roles are clear. The roles should be defined in the way that match the abilities of the agent. Hence, there should be a discussion about how and in which ways machine can assist humans in the value creation process.

Control over value experience does not exclude the use of AI. One example is the use of virtual assistance in the form of Chatbots. With Chatbots firms try to increase customer service. One point is the possibility to offer customers a 24 hours a day service which can be used outside office hours. In addition, the costs of using Chatbots are readily comprehensible and less than for human counterparts (Juniper Research, 2017). The AI driven chatbot service is continuous which means that the firm stays in contact with the customer the whole time delivering customer specific offerings. For instance, the firm can monitor the customer journey and give real time feedback. The initial costs of offering value propositions to potential customers can disappear and the better performance of the products can lead to higher customer satisfaction and cost savings. AI in combination with human resources enables co-creation. Firms can work closer with customers when they share information and when firms get at the same time more customer specific information. Chatbots are used for basic tasks and communication. Human resources can be used for processes which are too complex for machines or in emergency cases when the customer decides it. Also, the customer is benefiting with Chatbots with an increased value experience. The customer can get information irrespectively of the office time and even in urgent situation when there is a high demand for customer service. Moreover, the majority of customers prefer the simple and straightforward approach in the value creation process (Spenner & Freeman, 2012).

The decision to offer the customer which way of communication they prefer will have an important effect on the value creation process. Customers are more willed to accept the value proposition offer when they can decide the type of communication since the customer is becoming increasingly autonomous (BT & Avaya, 2015). Hence, it is important to note that all effects of AI on the traditional marketing practices should be present in the current and future discussion. One important point to note in the pro and contra discussion about AI is the role of customers as they are the beneficiary that ultimately determines value (Vargo & Lusch, 2016). At the end, it is the customer that will determine the type of interaction.

5. CONCLUSION

An examination of the current literature has revealed that AI can help in the value co-creation process. Increasingly, firms are now using AI in their business processes. This caused a general high expectation about the power of AI in the creation of value. AI enabled services can lead to higher productivity by eliminating human labor from direct value co-creation. This was supported by the technological advances which made AI more sophisticated beyond data collection and analysis. Furthermore, the increase in IoT devices and the corresponding increase in generation of data further fueled the use of AI applications. The unstructured data sets do not deliver valuable information but it is the process to structure data sets and deduce possible connections from the available data. AI can help both firms and customers by using the generated information for the value co-creation process. AI also finds increasing popularity in the customer service section. This is due to the possibility to automate processes, including interactions with customers, and thus saving resources.

However, it is also important to consider possible challenges in using AI in the value creation process. First, firms using AI in the value creation process will have a weaker influence on how value is perceived by customers. The risk is that customer loyalty diminishes through "silent value proposition". In addition, the topic of data privacy and security is a concerning issue for customers. Non-transparency, misuse of data and aggressive target marketing mostly results in rejection. As Vargo and Lusch

mentioned, value is always uniquely and phenomenologically determined by the customer. Therefore, the customer ultimately decides to accept the use of AI in the value creation process. Additionally, since AI relies on the data collected and generated through value-in-use, the quality of the service is at stake through a fully AI automated customer interaction. If the system is not working properly this can pose serious damage on the firm's reputation. Customers expect the value creation process to be simple, easy and without disorders. Most importantly, they expect to be taken care in a problem-situation.

Hence, besides the recent hype of AI in the market, it is important to thoroughly analyze the situation. The combination of human resources and AI applications have two major advantages. First, firms can stay at control in the value creation process. Second, the advantages of AI in terms of productivity are realized. Both points imply that the provider and beneficiary can profit through the value creation process when using a mix of human and machine interaction. Therefore, at the end both parties are better off, one essential aim of service exchange.

6. DISCUSSION

One of the biggest limitations to this research is the scarce amount of literature in this field. The topic of AI is not entirely new to the academic world but in the SD-logic field it is only recently gaining wider recognition. Therefore, it is difficult to find sources that discuss the use of Artificial Intelligence specifically with regards to value creation. This conceptual paper tried to give a general view on the role of AI in the value creation process. No actual figures can be found. As Maglio noted, the change in the nature of service through the use of AI opens up whole new research questions concerning the nature of value co-creation. Little research addresses the question on which processes in value creation AI will improve overall system performance and in which it is a better idea to stick to human resources. Therefore, it would be gratifying to investigate this by exploratory studies.

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7. REFERENCES

AiCloud (2017). Retrieved from: https://www.asus.com/aicloud/

Accenture (2016). Why Artificial Intelligence is the future of growth. Retrieved from: https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf

Alter, S. (2010). Viewing systems as services: a fresh approach in the IS field.

Atzori, L., Iera, A., & Morabito, G. (2010). The Internet of Things: A survey. Computer Networks, 54(15), 2787-2805.

Ballantyne, D., & Varey, R. J. (2006). Creating value-in-use through marketing interaction: the exchange logic of relating, communicating and knowing. Marketing Theory, 6(3), 335-348.

Bitvore (2017). Bitvore Precision Intelligence. Retrieved from: https://bitvore.com/

Bostrom, N. (2014). Superintelligence: Paths, dangers, strategies: OUP Oxford.

BT and Avaya (2015). Autonomous Customer 2015 Global. Retrieved from: https://www.avaya.com/en/documents/autonomouscustomer2015-global-essential.pdf?t=0

Businesswire (2015). 80 Percent of Business and Tech Leaders Say Artificial Intelligence Creates Jobs, Increases Productivity. Retrieved from: http://www.businesswire.com/news/home/20150611005252/en/80-Percent-Business-Tech-Leaders-Artificial-Intelligence#.VXoWjU_BzGc

CreativeStrategies (2016). Voice Assistant Anyone? Yes please, but not in public! Retrieved from: http://creativestrategies.com/voice-assistant-anyone-yes-please-but-not-in-public/

Culnan, M., & Armstrong, P. (1999). Information Privacy Concerns, Procedural Fairness, and Impersonal Trust: An Empirical Investigation. Organization Science, 10(1), 104-115.

Currie, W. (2004). Value creation from e-business models: Butterworth-Heinemann.

David, H. (2013). The" task approach" to labor markets: an overview (No. w18711). National Bureau of Economic Research.

Deng, H., Miao, D., Wang, F. L., & Lei, J. (2011). Emerging Research in Artificial Intelligence and ComputationaI Intelligence: International Conference, AICI 2011, Taiyuan, China, September 23-25, 2011. Proceedings (Vol. 237): Springer.

Dickson, Peter R. (1992), "Toward a General Theory of Competitive Rationality," Journal of Marketing, 56 (January), 69–83

Forrester (2014). Marketing's Big Leap Forward. Overcome The Urgent Challenge To Improve Customer Experience And Marketing Performance. Retrieved from: https://app.compendium.com/uploads/user/4f91a3ee-6ace-42a7-be93-3b21f3a1635f/7c7092b4-1fc8-48d9-8bd4-bcf49cfc6c97/File/b09103706cbc150358adc5fa67a3dd07/1394484576218.pdf

Forrester (2015). How Analytics Drives Customer Life-Cycle Management. Retrieved from: https://www.sas.com/content/dam/SAS/en_us/doc/analystreport/forrester-analytics-drives-customer-life-cycle-management-108033.pdf

Fortune (2016). Why Data Is The New Oil. Retrieved from: http://fortune.com/2016/07/11/data-oil-brainstorm-tech/

Franklin, S., & Graesser, A. (1997). Is it an Agent, or just a Program?: A Taxonomy for Autonomous Agents. Intelligent agents III agent theories, architectures, and languages, 21-35.

Future of Life Institute (2015). An Open Letter. RESEARCH PRIORITIES FOR ROBUST AND BENEFICIAL ARTIFICIAL INTELLIGENCE. Retrieved from: https://futureoflife.org/ai-open-letter

Gartner (2015). Gartner Customer 360 Summit 2011. CRM Strategies and Technologies to Understand, Grow and Manage Customer Experiences. Retrieved from: https://www.gartner.com/imagesrv/summits/docs/na/customer-360/C360_2011_brochure_FINAL.pdf

Gartner (2016). Gartner's 2016 Hype Cycle for Emerging Technologies Identifies Three Key Trends That Organizations Must Track to Gain Competitive Advantage. Retrieved from: http://www.gartner.com/newsroom/id/3412017

Goldman Sachs (2016). The real consequences of artificial intelligence. Retrieved from: https://de.scribd.com/document/341347760/AI-REPORT-GOLDMAN-SACHS-FT-Artificial-Intelligence

Grönroos, C. (2011). Value co-creation in service logic: A critical analysis. Marketing Theory, 11(3), 279-301.

Gummerus, J., & Pihlström, M. (2011). Context and mobile services' value-in-use. Journal of Retailing and Consumer Services, 18(6), 521-533.

Gummesson, E. (1991). Marketing-orientation revisited: the crucial role of the part-time marketer. European journal of Marketing, 25(2), 60-75.

Hendler, J. (2008). Avoiding another AI winter. IEEE Intelligent Systems, 23(2), 2-4.

Holbrook, M. B. (1999). Consumer value: a framework for analysis and research: Psychology Press.

Hopgood, A. A. (2003). Artificial intelligence: hype or reality? Computer, 36(5), 24-28.

Juniper Research (2017). CHATBOTS, A GAME CHANGER FOR BANKING & HEALTHCARE, SAVING $8 BILLION ANNUALLY BY 2022. Retrieved from: https://www.juniperresearch.com/press/press-releases/chatbots-a-game-changer-for-banking-healthcare

Klien, G., Woods, D. D., Bradshaw, J. M., Hoffman, R. R., & Feltovich, P. J. (2004). Ten challenges for making automation a" team player" in joint human-agent activity. IEEE Intelligent Systems, 19(6), 91-95.

LaValle, S., Lesser, E., Shockley, R., Hopkins, M. S., & Kruschwitz, N. (2011). Big data, analytics and the path from insights to value. MIT sloan management review, 52(2), 21.

Lusch, R. F., & Vargo, S. L. (2006). Service-dominant logic: what it is, what it is not, what it might be. The Service Dominant Logic of Marketing–Dialog, Debate and Directions, ME Sharpe Inc., NY, 43-56.

Macdonald, E. A., Wilson, H., Martinez, V., & Toossi, A. (2011). Assessing value-in-use: A conceptual framework and exploratory story. *Industrial Marketing Management*, 671-682.

Maglio, P. P. (2017). Editorial Column—New Directions in Service Science: Value Cocreation in the Age of Autonomous Service Systems: INFORMS.

Medina-Borja, A. (2015). Editorial Column—Smart Things as Service Providers: A Call for Convergence of Disciplines to Build a Research Agenda for the Service Systems of the Future. Service Science, 7(1), ii-v.

Mittal, A. , Agrawal, A. , Chouksey, A. , Shriwas, R. , Agrawal, S. (2016). A Comparative Study of Chatbots and Humans. International Journal of Advanced Research in Computer and Communication EngineeringVol. 5, Issue 3, March 2016

Morey, T., Forbath, T., & Schoop, A. (2015). Customer data: Designing for transparency and trust. Harvard Business Review, 93(5), 96-105.

Payne, A. F., Storbacka, K., & Frow, P. (2008). Managing the co-creation of value. Journal of the Academy of Marketing Science, 36(1), 83-96.

Perera C, Zaslavsky A, Christen P, Georgakopoulos D (2014) Sensing as a service model for smart cities supported by Internet of things. Trans. Emerging Telecomm. Tech. 25(1):81–93.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. Journal of interactive marketing, 18(3), 5-14.

Provazza, A. (2017). Artificial intelligence data privacy issues on the rise. Search Mobile Computing. Retrieved from: http://searchmobilecomputing.techtarget.com/news/450419686/Artificial-intelligence-data-privacy-issues-on-the-rise

Recode (2016). Full video: Bill and Melinda Gates at Code 2016. Retrieved from: https://www.recode.net/2016/6/7/11832584/bill-melinda-gates-foundation-full-video-code

Redman, T. C. (1998). The impact of poor data quality on the typical enterprise. Communications of the ACM, 41(2), 79-82.

Schaller, R. R. (1997). Moore's law: past, present and future. IEEE spectrum, 34(6), 52-59.

Skålén, P., & Edvardsson, B. (2016). Transforming from the goods to the service-dominant logic. Marketing Theory, 16(1), 101-121.

Sotala, K. (2012). Advantages of artificial intelligences, uploads, and digital minds. International Journal of Machine Consciousness, 4(01), 275-291.

Spenner, P., Freeman, K. (2012). To Keep Your Customers, Keep It Simple. Harvard Business Review. Retrieved from: https://hbr.org/2012/05/to-keep-your-customers-keep-it-simple

Spohrer, J., Vargo, S. L., Caswell, N. and Maglio, P. P. (2008) The service system is the basic abstraction of service science. In Proceedings of the 41st Annual Hawaii International Conference on System Science, January, p. 104.

Svensson, G., & Grönroos, C. (2008). Service logic revisited: who creates value? And who co-creates? European business review, 20(4), 298-314.

TechProResearch (2015). Artificial Intelligence and IT: The good, the bad and the scary. Retrieved from: http://www.techproresearch.com/downloads/artificial-intelligence-and-it-the-good-the-bad-and-the-scary/

Thomke, S., & Von Hippel, E. (2002). Customers as innovators: a new way to create value. Harvard business review, 80(4), 74-85.

TIME (2014). Interview with Eugene Goostman, the Fake Kid Who Passed the Turing Test. Retrieved from: http://time.com/2847900/eugene-goostman-turing-test/

Truong, Y., Simmons, G., & Palmer, M. (2012). Reciprocal value propositions in practice: Constraints in digital markets. Industrial Marketing Management, 41(1), 197-206.

Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. Journal of Marketing, 68(1), 1-17.

Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: continuing the evolution. Journal of the Academy of Marketing Science, 36(1), 1-10.

Vargo, S. L., & Lusch, R. F. (2016). Institutions and axioms: an extension and update of service-dominant logic. Journal of the Academy of Marketing Science, 44(1), 5-23.

Wired (2014). Artificial Intelligence: How Algorithms Make Systems Smart. Retrieved from: https://www.wired.com/insights/2014/09/artificial-intelligence-algorithms-2/

World Economic Forum (2016). Assessing the Risk of Artificial Intelligence. Retrieved from: http://reports.weforum.org/global-risks-2017/part-3-emerging-technologies/3-2-assessing-the-risk-of-artificial-intelligence/

Zhang, S., Zhang, C., & Yang, Q. (2003). Data preparation for data mining. Applied Artificial Intelligence, 17(5-6), 375-381.

Appendix:

Property	Other names	Meaning
Reactive	(sensing and acting)	Responds in a timely fashion to changes in the environment
Autonomous		Exercises control over its own actions
Goal-oriented	Pro-active purposeful	Does not simply act in response to the environment
Temporally continuous		Is a continuously running process
Communicative	Socially able	Communicates with other agents, perhaps including people
Learning	adaptive	Changes its behavior based on its previous experience
Mobile		Able to transport itself from one machine to another
Flexible		Actions are not scripted
character		Believable "personality" and emotional state

Figure 2: Classification of Agents. (Franklin & Graesser, 1997)