CUSTOMER VALUE CREATION THROUGH MULTI-PURPOSE SERVICE-ROBOT-ENABLED SOLUTIONS*

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Abstract

The megatrends' servitisation, digitalisation and robotisation are rapidly changing our business environment (e.g., Parviainen et al., 2017; Olaf & Hanser, 2019; Frank et al., 2019). The shift from selling physical goods to selling digital, robot-enabled solutions, is taking place among many companies in various business fields, giving the companies an opportunity to develop new services with new kinds of value creation possibilities for their customers.

In this study, we focus on multi-purpose service-robot-enabled solutions. The main idea is that the multi-purpose service robots can serve several companies and perform multiple activities in their functional environment, e.g., material handling, security surveillance, cleaning and guidance. The customers are buying robot-enabled solutions instead of investigating into service robots as such. The motivation behind the idea of multi-purpose robots lies in gaining a higher utilisation rate for the service robots and making the sales and use of the robots more profitable and cost-efficient for the companies selling the solutions and for the customers using the solutions.

In particular, the purpose of this study is to identify different types of benefits for the customers, from using multi-purpose service-robot-enabled solutions. In addition to the

* This study was conducted as a part of the Business Finland-funded MURO co-innovation project (murorobotics.fi).

academic need to increase understanding on the multidimensional topic, companies need to realise the manifold customer benefits in order to correctly allocate their service development activities and offer the most value-adding services to their customers, which best address the needs of the customers.

Keywords
Customer value; service robot; multi-purpose

1. Theoretical background

1.1 Professional multi-purpose service robot

The term service robot, defined by the International Organisation of Standardisation, is a robot that performs useful tasks for humans or equipment, excluding industrial automation applications (ISO 8373:2012 - Robots and robotic devices, 2021). Jörling et al. (2019) highlight that the tasks performed by the service robot can be both physical and nonphysical. When performing the tasks, several previous studies bring up the autonomous and adaptable nature of service robots (see, e.g., Jörling et al., 2019; Wirtz et al., 2018) as well as their abilities to interact and communicate with people (see, e.g., Wirtz et al., 2018; Čaić et al2019). The service robots can deliver service tasks on their own with almost any degree of cognitive complexity; but the more emotional or socially complex the tasks are, the more they have to communicate and cooperate with humans, work alongside with them and support the humans (Paluch et al., 2020; Wirtz et al., 2018).

In the field of service research, the emergence of service robots is one of the biggest evolutions (Mende, 2017). One of the first studies addressing robots in service literature appeared in 2016 (Čaić et al., 2019), and since then, there are several previous studies showing that service robots have already entered many workplaces. There are order-picking robots in warehouses, delivery robots on university campus areas (Royakkers and van Est, 2015), robots working in hospitality and tourism (Fan et al., 2016; Ivanov et al., 2019) and robots working in the healthcare sector (Green et al., 2016; Vandemeulebroucke et al., 2021). We are already living in a world where service robots can not only perform routine work activities but also accomplish activities that include cognitive capabilities, like sensing emotions or driving. The robots are seen as co-workers, and the humans continue working alongside them.

There are two types of service robots, professional and consumer service robots. The definition of a professional service robot is a service robot used for a commercial task and usually operated by a properly trained operator that is assigned to start, monitor and stop the operation of a robot or robot system. (Zielinska, 2010). According to the World Robotics 2021 - Service Robots report, presented by the International Federation of Robotics (IFR), most of the total turnover of the global market for service robots (around 60 %) comes from the professional service robots. The top 3 applications for the use of professional service robots now and in the near future are medical robots, logistic robots and field robots (World Robotics, 2021). In this study, we focus on professional, multi-purpose service robots that can navigate autonomously in their working environment, performing more than one task, e.g., material handling, security surveillance, cleaning and guidance. The service robots somehow interact, communicate and deliver services to the customers of the value network. They work alongside the humans and participate in the customer value creation at the service encounter.

1.2 Customer value creation

The concepts of customer value and value creation have gained a lot of attention in marketing and service research, since the focus of the companies´ activities has shifted from goods to services. The concept of customer value is most commonly defined as the trade-off between the

benefits and sacrifices perceived by the customer (Zeithaml, 1988; Ravald & Grönroos, 1996). Besides looking at the sacrifices and benefits, Zeithaml et al. (2020) state that customer value is multidimensional by nature and emerges in interaction with other actors. Furthermore, it is generally recognised that customer value is dependent on a certain context, such as situation and time, and it is subjective by nature (Holbrook, 2006). The services don´t have value as such, but the benefits and sacrifices are actualised during the consumption of the services in the context in which they are used (Grönroos, 2008).

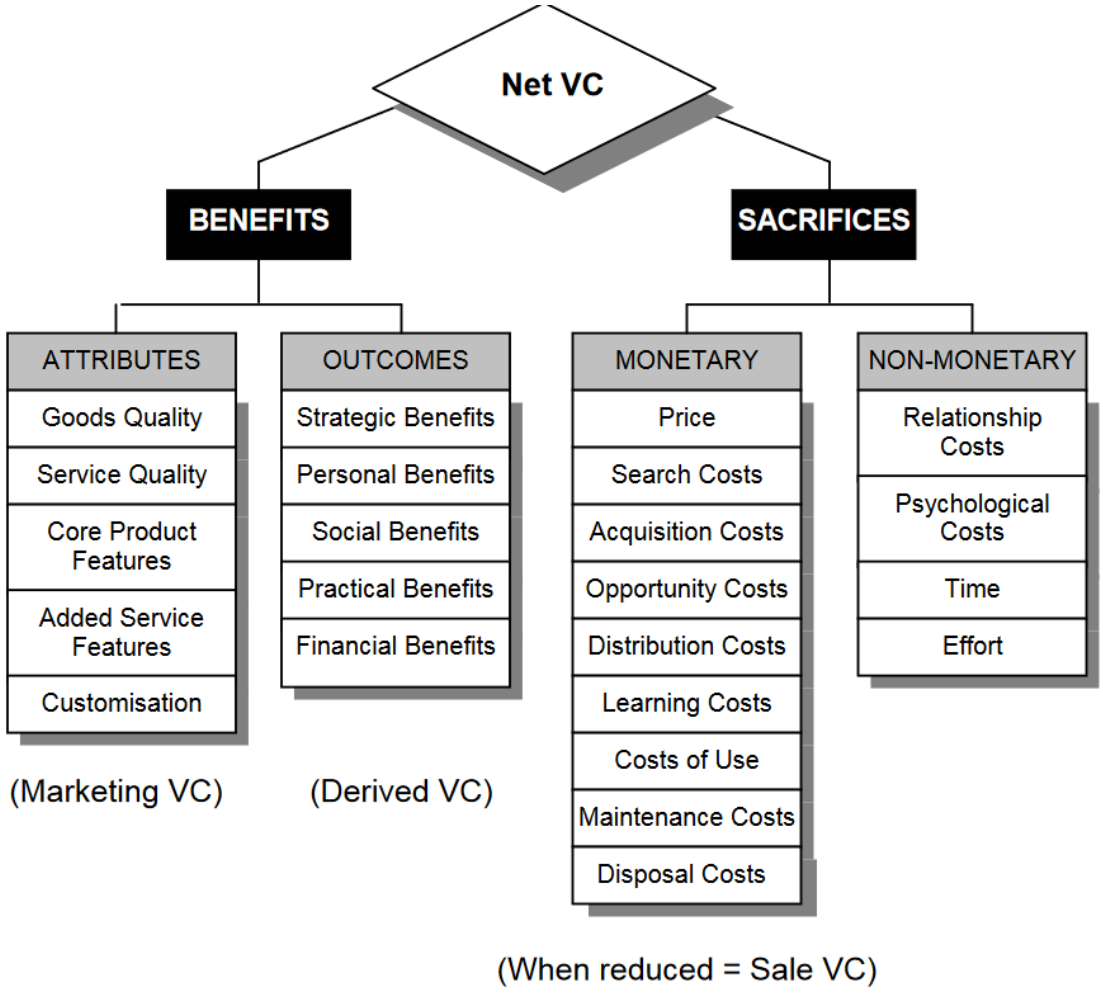
One of the most significant perspectives highlighted in the customer value discussion is the service-dominant logic (SDL), introduced by Vargo and Lusch (2004). The SDL focuses on how the customers are engaged in the value-creation process. From the service-dominant logic perspective, the customer value creation is dyadic by nature and needs the participation of both customers and suppliers (Vargo & Lusch, 2008; Kumar & Reinartz, 2016). In the value co-creation process, the supplier makes the value proposition, and the customer actualises the value by using the services (Gummesson, 2008). During the value co-creation, the companies offering services offer their resources for the value creation but do not create or deliver value independently (Vargo and Lusch, 2008).

In this study, the customer value creation happens between the companies offering multi-purpose service-robot-enabled solutions together as a network and the several customers using these solutions in the same functional environment. Value creation can thus be extended to take place in a business network and include more actors than just supplier and customer (Hakanen & Jaakkola, 2012; Kansola et al., 2012; Valjakka et al., 2013). In this study, we focus on the customer value creation that includes several suppliers and customers.

1.2 Customer value framework

The early studies of Zeithaml (1988), on the concept of customer-perceived value through an exploratory study, grouped the consumer definitions of value into four groups. These are 1) Value is low price, 2) Value is whatever I want in a product, 3) Value is the quality I get for the price I pay and 4) Value is what I get for what I give. On the other hand, value means that the benefits are seen as greater than the sacrifices in terms of, e.g., money and time. Woodall (2003) used the same benefits vs. sacrifices viewpoint on value creation from the business point of view, and he pointed out primary forms of values for the customers (VCs) and their relations that are shown in Figure 1.

Figure 1. Primary forms of values for the customers (VCs) and their relations.



Source: Woodall, 2003

When thinking about the value for the customers from using multi-purpose service-robot-enabled solutions, we found that an important viewpoint of sustainability is missing from the customer value frameworks of Zeithaml and Woodall. When forming the sustainability benefits, we base our findings on the three interconnected pillars of social sustainability, economic sustainability and environmental sustainability, introduced by Barbier (1987).

Our findings formulate a new framework for summarising different types of customer benefits when using multi-purpose service-robot-enabled solutions instead of investing in service robots. The new framework for summarising the customer benefits, as well as the main benefits that multi-purpose service-robot-enabled solutions can offer to the customers, are shown in the results.

2. Methodology

2.1 Research approach

We study the customer value creation through multi-purpose service-robot-enabled solutions by using an empirical, multiple-case study approach. The qualitative and explorative case research approach was chosen as the best option for researching the multidimensional topic of customer value creation through multi-purpose service-robot-enabled solutions, since it is considered appropriate to gain theoretical and empirical insight into the topic that is previously under investigated (Gummesson, 2000) and where the variables are complex and multiple (Yin, 2003).

2.2 Case selection

The case companies (n=7) involved in this study were selected because they all share the same interest in developing and offering multi-purpose service-robot-enabled solutions to the customers. The motivation behind this service development work lies in reaching a higher utilisation rate for the service robots, developing their service business models and accessing new business opportunities and creating value for the customers, other interest groups and society through the multi-purpose service-robot-enabled solutions. The future target is to offer multi-purpose service-robot-enabled services as a value network for the customers with a one-stop-shop principle.

2.3 Data collection and analysis

The empirical data includes 13 interviews conducted in seven robotics, software and service companies and three common company workshops, where these seven companies attended. The semi-structured interviews were conducted using Microsoft Teams during June 2021-August 2021. The workshops were held remotely during October 2021 - December 2021. We use two data collection methods in order to ensure the validity of the research findings. In the literature, using multiple data sources is also seen as one of the key elements in solving the problem of generalisation and testing the theories in order to ensure the reliability and validity of the case research (Yin, 2003).

The main research question, “What are the main customer benefits of the multi-purpose service-robot-enabled solutions in the chosen operational environments?”, guided the data collection and analysis. The findings have been presented and discussed with the researchers and company representatives. Based on the research data, a new framework for summarising the customer benefits was formulated. The main benefits that multi-purpose service-robot-enabled solutions can offer to the customers in the chosen operational environments were collected and grouped in a table that is presented in the results section.

3. Results

The main research question (RQ1) of this study was "What are the main customer benefits of the multi-purpose service-robot-enabled solutions?". Based on the interviews and workshops, we found that the customer benefits are manifold, need grouping, and current theoretical customer value frameworks are not suitable without moderation to address the multiple benefits that the multi-purpose robot-enabled solutions can offer to the customers.

Based on the customer value frameworks of Zeithaml (1988) and Woodall (2003), and the sustainability viewpoint presented by Barbier (1987), we formulated a new framework for grouping the main benefits that multi-purpose service-robot-enabled solutions can offer to the customers. We found out that the important viewpoint of sustainability was missing from the previous value frameworks, and the multi-purpose service-robot-enabled solutions offer many sustainability benefits for the customers. As buying multi-purpose service-robot-enabled solutions, instead of investing in service robots, requires a new business model and business renewal from the customers, the customers must see the possible business benefits in order to be willing to change their business behaviour. Besides these two types of benefits for the customers of the multi-purpose service-robot-enabled solutions, the companies naturally seek financial benefits, want the solutions to function as planned (functional benefits) and want a positive customer experience when dealing with the supplier (emotional benefits). The summary and grouping of the main benefits that multi-purpose service-robot-enabled solutions can offer to the customers are presented in Table 1.

Table 1. The main benefits multi-purpose service-robot-enabled solutions can offer to the customers.

Business benefits	• Creation of new robot-aided services • Expansion of the service offering and customer base with multi-purpose service-robot-enabled solutions • Business growth • Reallocation of resources to such functions that produce higher business value for the companies, as the robots take over the monotonous tasks • Image and marketing values by profiling as an innovative, forerunner company that is renewing their business
Financial benefits	• Reduced risk in making false/unprofitable investments on expensive robots (CAPEX) and the possibility to buy service-robot-enabled solutions (OPEX) instead • Access to robots and new technologies with lower costs when buying services instead of "robots as machines" • Enhanced productivity and cost savings when multi-purpose service robots perform multiple tasks fast and error-free • Higher ROI when the utilisation rate gets higher with multiple applications • Increased cost-efficiency of the operations
Functional benefits	• The robots perform multiple tasks fast and error-free and function 24/7/365 (taking into account charging time) • The robots meet technical and safety requirements, i.e., function as they should, and the companies offering multi-purpose service-robot-enabled solutions take care of this

	• The services are kept up and running, and the operations are optimised all the time due to the automated fleet management and customer support
Emotional benefits	• Reliability, credibility, easiness and time savings when buying a total solution from one big company • Positive customer experience when multi-purpose service robots provide services smoothly and are attractive and fun • Credibility and trust in terms of customer support • Flexibility in modifying the multi-purpose service robot fleet according to the customer and site needs • User-friendliness through only one user interface and fleet management software in use instead of several • Higher employee satisfaction and motivation when the employees can focus on more value-adding and meaningful work and let the robots do dull, dirty and dangerous tasks.
Sustainability benefits	• Support the health, safety and motivation of the employees when MUROs take over monotonous, repetitive and even hazardous tasks • More resource efficient to do multiple tasks with one robot than perform one task per robot and use several robots • The robots are maintained remotely instead of travelling to the site • Reduction in carbon emissions once the robots are rechargeable, electrically operated and use solar power or other renewable energy sources • The service robots can, on top of their main activities, take part in the recycling activities of the companies

4. Discussion and conclusions

The aim of the research was to study, what kind of value for the customer accrues by using multi-purpose service-robot-enabled solutions instead of investing in service robots. We adopted a qualitative, multiple-case-study approach to examine the topic, and our case study included 13 interviews, conducted in seven robotics, software and service companies, and three common company workshops, where these seven companies attended. Based on the customer value frameworks of Zeithaml (1988) and Woodall (2003), and the sustainability viewpoint presented by Barbier (1987), we formulated a new framework for grouping the main benefits that multi-purpose service-robot-enabled solutions can offer to the customers.

In our framework, the main benefits that multi-purpose service-robot-enabled solutions can offer to the customers are divided into five groups. These are 1) Business benefits, 2) Financial benefits, 3) Functional benefits, 4) Emotional benefits and 5) Sustainability benefits. The shift at the customer-end of buying multi-purpose service-robot-enabled solutions, instead of investing in service robots, requires a new business model and business renewal; therefore, the business benefits, in terms of, e.g., new business opportunities, growth possibilities and service creation options, are very important for the customers to realise. All companies naturally seek low costs and high profits, and therefore the financial benefits, such as cost savings, are a must for a company. The multi-purpose robot-enabled solutions should also function as planned; therefore, the functional benefits, in terms of, e.g., the services to be kept up and running and

the operations to be optimised all the time, are important. All business decisions are made by humans, and therefore the emotional benefits, like the customer experience and feelings, like trust and easiness, also need to be realised. Last but not least, there are multiple ways the multi-purpose service-robot-enabled solutions enhance the sustainability of the customers. The sustainability benefits are related, e.g., to the health, safety and motivation of the employees and the emission savings of the companies.

The study contributes to existing knowledge about customer value creation by providing new understanding on the customer value creation through multi-purpose service-robot-enabled solutions. Multi-purpose service-robot-enabled solutions is a new and under-investigated perspective in the service development and customer value creation literatures and this paper contributes to this gap.

The study provides practical insights on customer value creation through multi-purpose service-robot-enabled solutions. The primary managerial contribution of this study is to help the managers understand the manifold customer benefits from the multi-purpose service-robot-enabled solutions. From the managerial perspective, the summary and grouping of the main benefits help the companies in their service development work and in communicating the value of their solutions to the customers. The summary of the central customer benefits can be utilised as a practical tool when forming customer value propositions.

The present study has certain research limitations to be taken into account. The phenomenon of customer value creation through multi-purpose service robot solutions is very complex, and this study approached this phenomenon from a rather narrow empirical perspective. So far, our findings are based on the views gained from the companies that could together offer the multi-purpose service-robot-enabled solutions to the customers with one-stop-shop principle in the future. In order to widen the perspective, the customers should also be involved in the discussions, and this work is planned to be done in the future. Naturally, the views of the companies involved in this study are based on their discussions with the customers and their customer understanding in order to address the needs of the customers.

We point out the methodological limitation of the present research: the selected case study methodology brings out limitations as far as the generalisation of the results is concerned. However, by understanding these particular cases more in depth, we might eventually learn something about the greater phenomenon.

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