Journal of Open Innovation: Technology, Market, and Complexity

MDPI

Article

Servitization: A Model for the Transformation of Products into Services through a Utility-Driven Approach

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Received: 9 November 2018; Accepted: 10 December 2018; Published: 18 December 2018

Abstract: The economies of the industrialized world have become dominated by services. Many manufacturing companies have changed from producing products to providing services. However, many companies still lag behind in this transformation. It is observed that most of the published methodologies are at an advanced level and provide minimal assistance to help managers and especially the managers of small and medium enterprises (SMEs) who are interested in easy-to-use methodologies for transforming their product range. Therefore, a model that assists the transformation of products into services is proposed, which is at a level that can be directly applied by SMEs. A utility-driven approach is followed to establish the model that consists of seven steps. In the initial steps, a product that is to be servitized is selected and broken down into its utility features and customer barriers. Furthermore, options for increasing utility and reducing barriers are presented such that the overall tangibility of the existing product is reduced. This reduction in tangibility in both physical and psychological dimensions is defined as servitization in the present study. This article presents a practical framework for the transformation of company offerings so that they are gradually adjusted to a service economy.

Keywords: servitization; service transformation; service opportunities; service innovation; product service system

1. Introduction

A paradigm transition has taken place regarding business understanding; that is, businesses are evolving from selling products into offering services [1]. Globally, in 2017, nearly 63% of the gross domestic product was derived from the service sector, according to *The World Fact Book* [2]. It has been observed that the service market is not only larger, but also more sustainable than the product market [3].

According to Druker [4], the customer considers value not in a product, but in the utility that it provides, which is the service that it delivers. This implies that, inherently, customers are not looking for products, but services, where products can be the tools to deliver those services. Many technology companies have transformed their business models from selling products to offering services. Jet engine manufacturers such as Rolls-Royce have changed their business models from selling engine units to offering thrust hours, i.e., the utility the customer is looking for. Therefore, while servitization is the natural next step for established companies to ensure sustainability, it also offers opportunities for small and medium enterprises (SMEs). It is regarded as the process of adding value to products by adding services [5].

Primarily, the terms "product" and "service" are interrelated in the understanding of servitization [6]. Several scholars distinguish services from products, based on perishability, inseparability, ownership,

and intangibility, (e.g., reference [7]). Introductory textbooks on business and economics segregate products and services with respect to intangibility; e.g., reference [8]. "Product" is a tangible commodity produced to be sold [9]. Whereas "service" is an act offered by one party to another, where the process may involve physical products, but the performance is primarily intangible and poses no ownership rights [10]. These definitions have emphasized important characteristics distinguishing products and services, yet it is difficult to differentiate them in some cases. For example, computer software is treated as a product; software is highly intangible, but companies such as Microsoft advertise their software as products (e.g., on Microsoft's website, items of software are listed under the "products" tab). Similarly, services such as the drilling service in the oil and gas industry are highly tangible. Tangible equipment is required to produce a drill, and on the surface where the service is delivered, the outcome is also tangible, i.e., the drill hole produced. Despite all the tangibility involved, drilling is regarded as a service.

A different viewpoint for understanding products and services is to separate them on a continuum, ranging from tangible-dominant to intangible-dominant, e.g., references [11,12]. Tangibility is considered in physical terms by these studies, and the possibility of segregating the aforementioned examples remains unresolved. However, if tangibility is defined not only in physical terms, but also includes a psychological dimension, the segregation of products and services on a continuum is possible [13]. For example, a piece of software will be placed towards the tangible-dominant side, since it has psychological tangibility associated with it; i.e., the user needs to operate it and perform tasks independently. This approach is based on the assumption that absolute products or services are nonexistent, but can be categorized based on features of tangible-dominance and intangible-dominance. Items that have tangible dominance are viewed as products, and items with intangible dominance are called services; see Figure 1.

The literature shows that the term, "servitization", was first used by Vandermerwe and Rada [5] as a competitive business strategy and is not a recent phenomenon. They defined servitization as an increased offering, i.e., offering services on top of products. Since then, the term has been widely endorsed by scholars and considered to create additional value for the business, e.g., [6,14–16]. Defining servitization as an increased offering is a useful approach, but it does not capitalize on the full spectrum of benefits. Therefore, in the present study, a more practical definition of servitization is proposed, which is built on the logic of product service segmentation on the tangibility scale. As products and services are defined on a continuum of tangibility, the repositioning of an item on this scale from the tangible-dominant side towards the intangible-dominant side is defined as servitization in the present study; see Figure 1. This definition has higher objectivity compared to the existing definitions and sets out a sequential methodology to achieve servitization.

From the customer's perspective, servitization reduces risk level and uncertainty. It also reduces liabilities, process knowledge requirement, competence level needs, and the requirement for various resources. Therefore, the servitization of a product or service on the continuum shall be visualized from the customers' perspective and not from the supplier's perspective, since tangibility has a psychological dimension and may be misunderstood when looked at from the supplier's perspective. For a taxi driver, taxi service is tangible when taking car ownership into consideration, but from the passenger's perspective, it is highly intangible.

As it is argued that the products and services cannot be explicitly differentiated in various cases, they are, therefore, collectively called an offering where it is difficult to characterize them further in this study.

The remaining paper is organized as follows: a literature review is provided in the proceeding section, followed by presentation of the servitization model, and conclusions are discussed in the end.

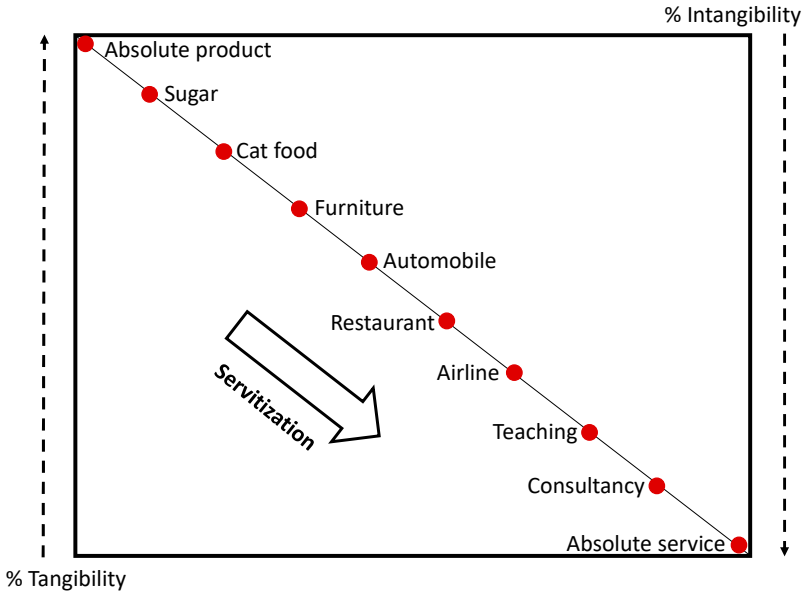

Figure 1. Products and services differentiated on a tangibility/intangibility continuum, which sets the basis for defining products and services, inferred from [13,17]. Here, servitization is defined as the repositioning of any offering on the tangibility/intangibility continuum towards the intangibility side; e.g., an automobile can be servitized by including additional services such as self-driving features.

Literature Review

Various scholars have presented their models, strategies, and ideas for servitizing a product. The literature abounds with studies using the servitization expression. The literature review shows that most of the studies related to servitization have emerged in the last two decades, and academicians have presented a number of different approaches. The studies include the process cycle of service development stages; for example, idea generation, design, development, testing, and launch [18]. Various other studies [19,20], have different numbers of stages, i.e., six and ten, respectively. Studies have also mentioned capabilities that trigger servitization, e.g., reference [21]. Similarly, many studies, such as those by references [15,22–24], present detailed strategy with regard to servitization as offering product-related services as the first stage (e.g., maintenance services), an installed base as the second stage (e.g., Rolls-Royce jet engines "power by the hour" service), and integrated solutions as the final stage (e.g., drilling service). These studies provide a good understanding of the various stages of servitization and formulate a theoretical base upon which the servitization discipline is being established. However, these studies are less practical [25], because the key objective of these studies is to formulate a theoretical base, contrary to the requirements of the industry. These studies are not aimed at the managers in SMEs to act as service transformation tools for them.

Specific models that are more practical and aimed at various target groups within servitization are also present. Noh et al. [26] have presented a model to develop technology-based services using function analysis and technology trees. Several studies have applied the product–service system (PSS) models in industrial applications [27–34], where visualization analysis, stakeholder management, environmental sustainability, customer integration, and modularization are set as key aspects in developing new service concepts. Sun et al. [35] have presented a model where the product needs to be designed in such a way that additional services can be added. For example, a product shall be designed for repairs so that the repair service can be provided, and the product shall be modular so that the spare parts can be added as after-sales service. Fargnoli et al. [36] have presented a framework to address customer satisfaction and environmental sustainability in a regulated market. Haber and Fargnoli [33] have presented a methodology for PSS functional integration enhancement that combines existing models in the literature to establish a unified approach. Kim et al. [37] have presented a model that includes value modeling, service activity design, service interaction, and experience

management. Similarly, Marques et al. [38] have presented a model comprised of four steps: readiness, planning, design, and post-processing. These studies present models and frameworks for servitization with specific aims and objectives and are targeted towards specific applications. They appear to be complicated and time-demanding for the user, whereas traditional SMEs are looking forward to a more practical and easy-to-use approach, hinted in references [25,33], which can be directly applied and are not too time-consuming. Designing products and services simultaneously in PSS originates challenges such as higher complexity and optimization issues [39]. Despite the challenge of increased complexity originating from existing PSS models, little insight is available in the published literature to mitigate these challenges [34]. The existing studies require survey data, customer feedback, and sophisticated software tools to implement servitization. Contrarily, the managers of SMEs need models that do not require extensive data acquisition and learning complicated tools to develop services. The published articles are valuable for managers who are highly qualified and closely linked to academia, but they are insufficient for those that operate startups and SMEs. Large companies also have the possibility of hiring consultant companies, while on the other hand, it is generally not possible for SMEs to afford consultants. The service idea generation in the existing studies is primarily addressed through techniques such as brainstorming, customer feedback, and data interpretation, which are relatively demanding, whereas room for a technique that itself presents service options is available.

Accordingly, the present study is aimed at answering the following research question: How can managers of SMEs servitize their product range without data acquisition and learning sophisticated software tools independently in a minimal time frame?

Based on this research question, the objective of the present study is to develop a systematic model that is simple yet useful and at a level that may be useful for managers of SMEs. The model shall provide practical options of servitization on the tangibility scale such that the options can be checked for a product. The present approach shall replace customer data collection, customer feedback, and complicated software tools so that servitization can be achieved in a time-effective manner.

The objectives of the present study are achieved by conceptually developing a model that is part of a larger study aimed at developing practical tools for the industry. The model is conceptualized by keeping its objectivity as the foremost feature.

2. Servitization Model

Companies are constantly competing against each other to servitize their offerings [40] and are looking for novel ways to carry out servitization [41]. Several methodologies have been published in this regard, and in the light of these existing methodologies, we are proposing a new servitization model that is shown in Figure 2. Contrary to the existing models, the present model acts as a simple, time-efficient tool, with seven steps that can servitize products, and has increased practicality. The model requires qualitative judgements from the user at several steps. Therefore, the results may vary among different users for similar problems, as the qualitative judgement is dependent on the performer's knowledge [42]. The present model is different from the existing approaches because the existing models primarily require data acquisition or customer feedback to trigger service ideas, whereas the present approach takes care of the idea generation part by presenting options. This approach may not be useful to generate state-of-the-art service ideas, but can lead to the development of service offerings by SMEs.

First, a product or service, collectively called an "offering", is selected to be servitized. Then, different customer groups of the offering are identified; this assists in understanding the utilization of that offering. Next, the offering is decomposed into its enablers and barriers: enablers are the utility that supports customers' purchase of that offering, and barriers are the hindrance that stops customers' from buying that offering. Decomposition of an offering into its enablers and barriers provides a better understanding of the offering itself. They help in assessing the reasons that make customers buy an offering and those that prevent them from doing so. Furthermore, the identified enablers and barriers are ranked in accordance with their severity for the major customer groups.

Finally, servitization options are applied to make changes to these enablers and barriers such that the tangibility of the offering is reduced. The details of each step are further discussed in the following.

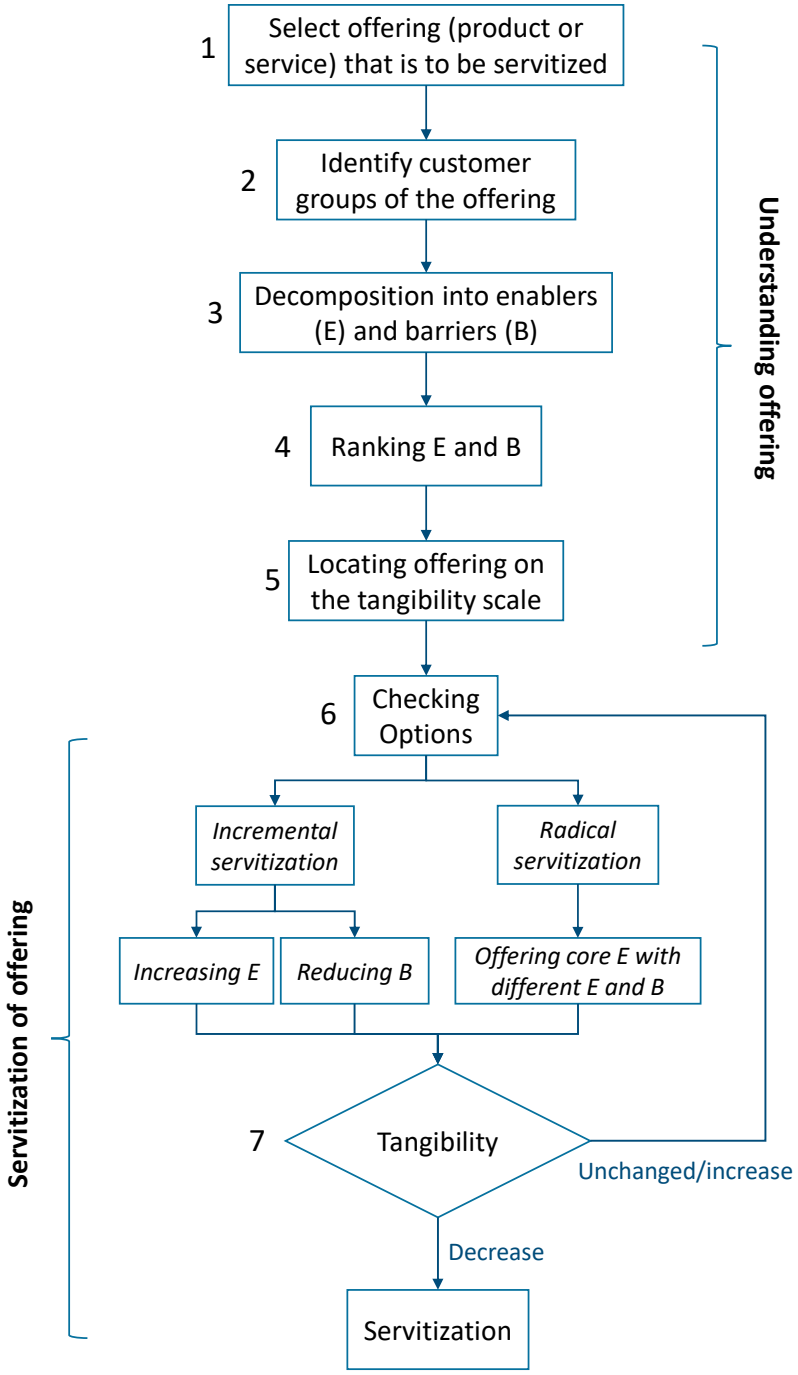

Figure 2. Servitization model.

2.1. Select Offering: Step 1

Due to recent developments in technology and the advent of new business models, almost any product or service can be servitized in the present era. The pace of technological changes has accelerated [43] and opened up new possibilities. Previously, servitization was possible in the form of value-added services for complex products [44], such as the maintenance of diesel generators. It was difficult to servitize a simple product such as a chair. However, the present technology and business trends have empowered the servitization of any product. For example, a chair can be servitized by

placing temperature sensors on it that can monitor the health of the user. Similarly, developments in business trends have also opened up opportunities for servitization: for example, leasing or sharing a chair. Likewise, existing services also have the possibility to be servitized because servitization is defined as a continuous process. Therefore, the present model can be applied to any product or service. However, the significance of the predicted service opportunities is dependent on the product or service selected.

Action item: Select a product or service that appears to have potential for servitization.

2.2. Identify Customer Groups: Step 2

The identification of customer groups is vital to determine the utility of a product or service and to understand it better. Customer groups are to be identified by the segmentation of the market [45] of the offering selected. Customer segmentation is primarily used in marketing, where the target market is identified for the product or service [46]. However, in the present case, an existing product or service is to be servitized and its major customer groups are already known. They assist in the identification of enablers and barriers in the next step.

In order to successfully implement the model presented in this study, any customer groups' segmentation can be relevant. However, a simple methodology, comprising of four parameters for the segmentation of customers in a business-to-customer and business-to-business domain, is shown in Figure 3. These parameters are demographics, monetary, geographic, and psychographic [47]. Examples of customer segments within these parameters are presented in Figure 3. For the offering selected in Step 1, customer groups can be identified from Figure 3.

Psychographic	Lifestyle, personal interests, socially responsible, quality conscious, etc.	Innovation, openness, socially responsible, etc.
Geographic	Location, mobility, etc.	Office locations, presence, etc.
Monetary	Income, home owner, assets, etc.	Revenue, net profit, assets, etc.
Demographic	Age, occupation, education, gender, etc.	Type, size, industry, employees, structure, etc.
	Business-to-customer	**Business-to-business**

Figure 3. Customer groups' segmentation overview.

Action item: Identify customer groups of the offering from Figure 3.

2.3. Decomposition into Enablers and Barriers: Step 3

Numerous scholars have discussed the dilemma of a product's utility—it is not the product itself that is important to the customer, but the utility that it provides to them; see reference [4]. Extending this concept further reveals that each product or service available in the market has enablers, i.e., the utility the customer is looking for and the reason for customers to buy that product or service, and barriers, i.e., the hindrance that stops customer from purchasing the product or service. Sheth et al. [48] have used the term "value", which appears to be analogous to "enabler" in the present study. However, the value of the product is dependent on enablers and barriers, collectively. Therefore, the present approach is a step forward from the approach of Sheth et al. [48], where enablers increase value and barriers compromise it. The tradeoff between the enablers and the barriers sets a decision basis for the customer to purchase the product or service. Consequently, in the present study, a product or service is considered an aggregate of enablers and barriers in order to understand their utilities and hindrances. Thus, it is essential to identify enablers and barriers. An overview of the identification of enablers and barriers is presented in Figure 4.

	Enablers	Barriers
Specific	**Subutility:** What is the utility that different customer groups (identified in step 2 of the model) are looking for, contrary to each other?	**Product-specific barriers:** What are the hindrances unique in different customer groups that stop customer segments from buying the offering?
Common	**Common utility:** What is the utility that most of the customer groups (identified in step 2 of the model) are looking for in the offering?	**Common barriers:** What are the hindrances related to ownership/financing, operation, and risk that stop customers from buying the offering? (select from Table 1)

Figure 4. Framework for the identification of enablers and barriers.

Enablers and barriers can be identified qualitatively from Figure 4. To identify enablers, customer segments from step 2 are used. Customer segments depict different common utilities and subutilities of a product or service. The most recursive and important utility among different customer segments will be the core enabler of the product or service. For example, the customer segments of a drill machine can be machinists, carpenters, construction companies, etc. These customer segments have a common utility: drilling a hole. These customer segments also have subutilities; for instance, machinists can use the drill machine for unscrewing bolts, whereas carpenters could use it for woodcutting. These common utilities and subutilities are the enablers of the drill machine.

On the other hand, barriers of products and services are generally found to be common. These common barriers are identified and summarized empirically in Table 1. In order to identify the barriers of a particular product or service, common barriers from Table 1 can be selected at first. The remaining barriers can be identified by brainstorming hindrances that stop certain customer segments from purchasing the product or service; see the framework suggested in Figure 4. For example, a small niche of people does not want to buy a gasoline car, since it contributes to environmental pollution. The barriers with larger customer groups generally fall into common barriers, which are listed in Table 1.

Table 1. List of common barriers among different products and services.

• High procurement cost
• Procurement lag time
• Maintenance costs
• Downtime/redundancy
• Operational costs
• Depreciation costs
• Rapid technology change
• Certificates and clearances for operation
• Skilled staff required for operation
• Liabilities (business, accidental, etc.)
• Annual premiums/taxes
• Storing and handling issues
• Reselling hassle

The concept behind the identification of the enablers and barriers is that changes in enablers and barriers can increase intangibility in an offering and can result in new service opportunities; see Figure 2, Step 6. For example, customers purchase cars as products. The customer of the car is usually looking for enablers such as transportation from one location to another, flexible transportation, high availability, status symbol, etc. Similarly, there are barriers that are linked to the purchase of the car, for example, high procurement cost, road liability, maintenance costs, driving license requirement, etc. If offered to the customer in an increasingly intangible way, the enablers may forecast service

opportunities. Similarly, if the barriers are detached from the car, new service possibilities can be revealed. For example, the high procurement cost of the car can be eliminated through car lease, which is an already existing service. In the same way, road liability and maintenance costs can also be eliminated by liability insurance and maintenance subscriptions. Enablers also assist in developing new service opportunities. For instance, traveling from one location to another can be achieved in an increased intangible way, namely via public transport, taxi services, etc., which also exist in the market. Enablers such as the flexibility and high availability of transport can be achieved by shared autonomous vehicles that could be a future service.

The existing models identify service opportunities through data collection; e.g., Fargnoli et al. [36] collects data from public tenders and surveys to establish service opportunities in the medical equipment business, whereas the present study relies on systematic qualitative prediction to lessen the effort required for servitization model implementation.

Action item: Identify the core enabler, subenablers, common barriers, and product-specific barriers of the offering using the framework presented in Figure 4.

2.4. Ranking: Step 4

The identified enablers and barriers might not all have high potential for servitization and might not be of top concern. Therefore, it is important to prioritize them in order to ensure that the ones with high market demand are addressed first. There are several techniques regarding qualitative assessment in the published literature for the prioritization of market segments and business models. Similarly, a qualitative assessment tool for enablers and barriers is proposed in Figure 5, where they shall be ranked in accordance with the severity for the consumer [49,50]. The severity of an enabler is to be judged qualitatively between "essential" and "nice to have". Those enablers that are essential for the customer and without which they are likely not to buy the offering are to be top-ranked, while those enablers that the customer is interested in, but are not necessary are ranked lower in the scale. Similarly, the priority of the barriers is also qualitatively determined between "extreme" and "moderate" barriers, reflecting how strong the barrier is from the customer's perspective. Top-ranked enablers and barriers are the preferred opportunities for servitization. This does not necessarily imply that the enablers and barriers lower on the scale should be ignored altogether.

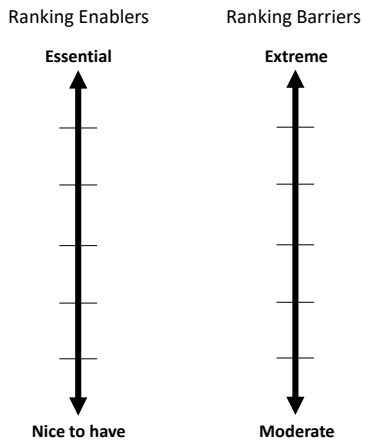

Figure 5. Ranking of enablers and barriers.

Action item: Rank the enablers and barriers identified in Step 3 qualitatively on the scale shown in Figure 5 and select the top candidates for further stages.

2.5. Locating Offering on the Tangibility Scale: Step 5

After identifying the offerings' enablers and barriers, the next step is to qualitatively judge the tangibility of that offering. This step is important in order to keep track of the performance of the

model, to answer whether the tangibility in the existing offering has reduced or not after the complete implementation of the model; see the overview of the model in Figure 2. It is to be carried out by qualitatively placing the offering on the tangibility scale shown in Figure 1. The qualitative judgement may differ between different assignees, but the purpose of this step is to evaluate the new offering predicted after going through the remaining steps of the model and assessing whether the new offering is less tangible than the existing one. So, a particular individual's qualitative judgement of the existing offering and of the predicted offering would remain consistent.

Action item: Locate the selected offering qualitatively on the tangibility scale shown in Figure 1.

2.6. Checking Options: Step 6

The first five steps of the model have the key objective of systematically understanding the selected offering. From this step onward, options for servitization are presented that can be applied to the selected offering to achieve servitization.

This step has two subcategories, i.e., incremental servitization and radical servitization. These two terms are coined in the present research to categorize servitization. These terms are analogous to incremental and radical innovation. However, instead of innovation, the focus is on reducing the tangibility of the offering, called "servitization" in this study. Incremental and radical innovation are defined as "doing better what we already do" and "doing what we did not do before", respectively [51]. Similarly, incremental servitization is referred to as a servitization approach, in which a gradual decrease in the tangibility of the offering takes place; for example, through value-added services such as maintenance services. On the contrary, radical servitization refers to the servitization approach in which the existing offering is significantly changed, such that the tangibility of the offering is substantially reduced; for example, disruption of the taxi service by Uber. It is interesting to note that servitization can also be described as an instrument for innovation. Some scholars describe servitization as the new strategy to achieve innovation; for example, reference [52]. Thus, servitization can be referred to as the subset of innovation.

Incremental and radical servitization options are further explained in the Sections 3 and 4.

Action item: Select incremental or radical servitization options presented in Sections 3 and 4.

2.7. Check Tangibility: Step 7

The last step of the model is to compare the tangibility of the offering before and after the intervention of the option or several options in Step 6. If the tangibility of the offering is reduced, successful servitization is achieved. Otherwise, the other options from Step 6 can be checked again.

Action item: Compare the tangibility of the offering with interventions to the initial offering and follow the logic shown in Figure 2.

3. Incremental Servitization

In the present study, incremental servitization is defined as the servitization approach, in which the tangibility of the product or service is gradually reduced by increasing enablers, reducing barriers, or both. Increasing enablers gradually increases the utility of the offering from the customers' perspective, and reducing barriers, on the other hand, gradually reduces hindrances preventing the customers from purchasing an offering. Therefore, it is important to investigate how an offering's enablers can be increased and barriers can be reduced in order to realize incremental servitization.

3.1. Increasing Enablers

Increasing enablers is the easiest way to servitize an offering. It is inferred that the enablers of an offering can be increased, by either

- Directly adding services, or by
- Increasing the complexity of a simple offering and simplifying the utility of a complex offering.

Directly adding services is comparable to value-added services, where additional services are added on top of an offering. They include services such as product delivery service, installation service, customer support service, operational support service, and maintenance service. These services can be directly added to a product. For example, a welding machine can be sold with two additional services: operational support service and electrode delivery service. These services add new enablers to an offering and reflect the utility of the freshly added service. In a similar fashion, the offering selected for servitization can be checked if additional services can be added. This process of offering services with products has been significantly discussed in the published literature; for theoretical details, see, for example, references [5,28,53,54].

The second approach for increasing enablers is related to utilizing modern technology. We can increase the enablers of a product and its attractivity by implementing features of technological development into the products. There are a number of innovative technologies around us, but there should be a strategy to fully exploit these technologies, otherwise even innovative technologies may fail. The framework to utilize technologies in order to increase the enablers of an offering is shown in Figure 6. It has two dimensions: increasing the complexity of a simple product and simplifying the utility of a complex product through the utilization of technology; the options to increase the enablers of an offering are presented in Figure 6. The complexity of a simple product can be increased by applying options such as hardware that can process data, sensors that can monitor different parameters, connecting the product over the Internet, and interpreting data with smart algorithms. For example, the enablers of a simple product such as a chair can be increased by making that product complex by installing computer hardware, sensors, and algorithms, so that it can monitor the user's body temperature, keep track of the user's weight, and predict health susceptibilities. With these interventions, the complexity of the chair has been amplified, increasing its enablers and thus servitizing it. In this way, the enablers of a simple offering can be increased by increasing the complexity of that offering. However, this approach works primarily for simpler products.

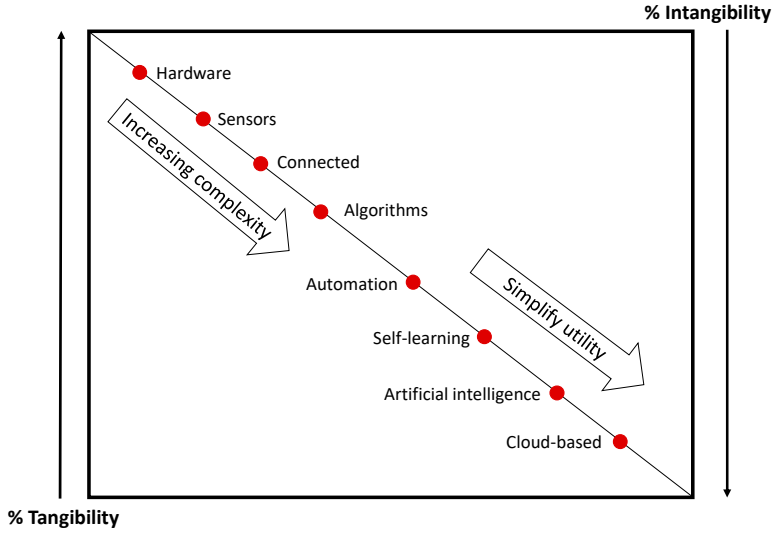

Figure 6. Options for increasing the enablers of an offering, by increasing the complexity of a simple offering and simplifying the utility of a complex offering, on a tangibility scale.

Similarly, for complex products, further increasing complexity becomes challenging. However, in this case, enablers can be increased by simplifying the utility of that offering. Utility simplification implies that the utilization of the offering is to be made easier for the consumer. Several options for utility simplification are mentioned in Figure 6; they include the automation of processes, self-learning products, artificial intelligence, and cloud-based architecture. To understand these options, consider the example of a lawn mower, which is a complex product and can have increased enablers if its utility is simplified. The utility of a lawn mower can be simplified: by automating it, so that it can cut

grass automatically; by making it self-learning, so that it can adapt to the ground terrain; by including artificial intelligence features, so that it can stop operation in rainy weather conditions; and by having a cloud-based architecture, so that the user can control or monitor performance from anywhere.

A case study of servitization of a lawn mower is presented in reference [33], where services opportunities such as maintenance, financing, life extension, and the recycling of materials are successfully predicted. However, the servitization model lacks the anticipation of service opportunities related to increasing complexity and simplifying utility as mentioned above.

The options for increasing complexity and simplifying utility are sorted on the tangibility scale, in accordance with the tangibility change they can bring to the offering when applied. There can also be other technological options that can be included in Figure 6; however, the ones listed are the most significant and general enough that they can be applied to any product or service.

As mentioned previously, servitization is a continuous process. Therefore, it is possible to apply all the options mentioned in Figure 6 to a particular offering. If the product is simple in the first place, it can be made complex, and after that, its utility can be simplified.

3.2. Reducing Barriers

The next phase in the servitization model is to reduce barriers. Unlike enablers, the barriers of most offerings are common, as mentioned earlier. The common barriers listed in Table 1 can be categorized into ownership/financing barriers, operation barriers, and risk barriers. However, there are barriers that are unique to each offering and are known as product-specific barriers. They are observed to be less important in the servitization process. The ownership/financing category covers high procurement cost, procurement lag time, operational cost, depreciation cost, and annual premiums/tax barriers. Similarly, the operation category covers maintenance cost, certificates and clearances for operation, skilled staff required for the operation, and storing and handling barriers. The risk category covers liabilities from products and rapid technological change barriers.

These four categories of barriers have overlapping features and are subsets of each other. They are systematically arranged in Figure 7, where the size of the circle depicts the tangibility associated with each category. Ownership/financing has the highest tangibility among the others.

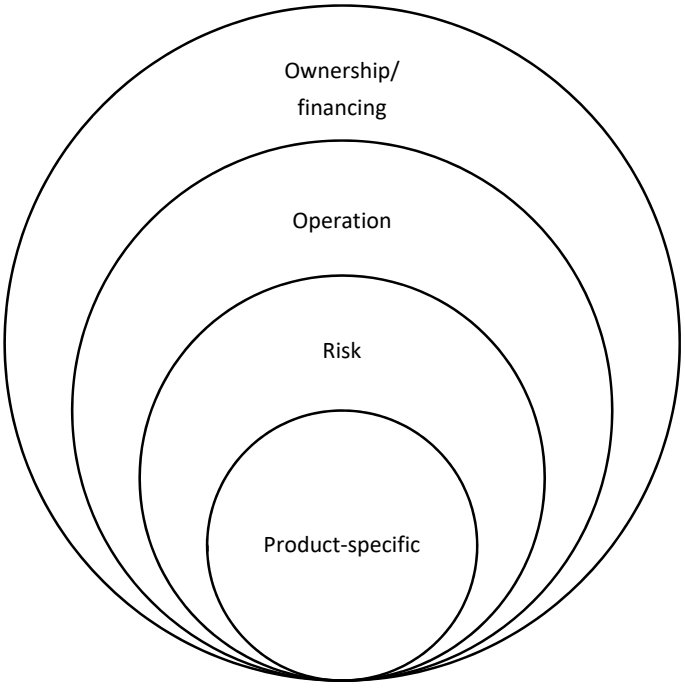

Figure 7. Types of barriers in accordance with the servitization potential and interdependence. The size of the circle depicts the tangibility associated with each category.

The barriers identified and ranked in Steps 3 and 4 of the model can be reduced by checking options for various categories of barriers in this section. Each category of barriers is addressed separately as follows.

3.2.1. Ownership/Financing Barriers

The key aspects that a customer considers while purchasing an offering are its ownership and financing. This category of barriers has the highest tangibility associated with it. Therefore, in order to servitize an offering, it is vital that it is addressed. In their study, Olivia and Kallenberg [15] analyzed different companies which were shifting from products to services and discovered that the transition involved no technological difference, but a different business model. In the present study, it is inferred that the major difference in that business model is the ownership and financing method. For example, a car is a product if owned by a user, but becomes a service if rented. This involves only a difference in ownership and financing. From the service perspective, ownership and financing are primarily analogous to each other, as the type of financing scheme directly affects the ownership of the product. The proposed methodology to reduce these barriers consists of two stages:

(1) Reducing ownership duration;
(2) Transferring or diversifying ownership.

The first stage concerns how the duration of ownership of the product can be reduced. In order to achieve this, several options are presented in Figure 8. These options are sorted on the tangibility scale in accordance with their potential to servitize an offering. The potential to servitize an offering is higher for the options lower on the scale and they can eliminate more barriers. However, some options may not be relevant for every offering. Therefore, options need to be gradually checked from the top of the scale to the bottom. For example, consider a car as an offering, whose ownership duration is to be reduced, which will reduce its barriers and thus servitize it. From Figure 8, it can be observed that the loan option is high up on the scale and has an ownership duration of almost a lifespan. It can reduce some of the car's barriers, such as high procurement cost, which is the key barrier to purchase for most customers. Similarly, the lease option is lower on the tangibility scale, next to the loan option, and can reduce the ownership duration of the car from lifespan to years, which will eliminate barriers such as reselling hassle for the customer. Furthermore, the renting option can reduce the ownership duration to only days and weeks, which eliminates several other barriers such as maintenance costs and rapid technological changes. This is because renting the car will mean it will be owned for a shorter period of time, thus servitizing the car.

The second stage is to reduce barriers through transferring and diversifying the ownership of the offering, and the relevant options are presented in Figure 8. The first option is pay per use, which has the possibility of improving the utilization of a particular product because the product will be used by several users. Therefore, pay per use can transfer and diversify the ownership of any product. It is suitable for products that have less utilization, such as bikes, tractors, diving equipment, and lawn mowers, for example, and it can eliminate barriers such as annual premiums and storage requirements.

Similarly, the subscription option is the next on the scale; this is where the customer subscribes to an offering against an agreed periodic fee. This option can be applied to products such as smart phones, which are subject to barriers such as rapid technological change and high depreciation rates. This option is suitable for electronics or for larger products such as cars; for example, Mercedes is testing a car subscription model in the United States [55]. It is also a very relevant option for servitizing less-tangible products, such as movies and songs, through subscription to a database instead of individual sells. The crowdfunding option is suitable for various offerings, especially those that are capital-intensive. In this option, a group of people jointly finance an offering. For example, people in a common neighborhood can crowdfund a training facility.

The last option in Figure 8 is the freemium option, which is suitable for offerings that are to be used by a large customer base. Freemium models are abundantly applied to offerings that are low in

tangibility, for example, mobile and web applications. However, in the future, the freemium option could be applied to more tangible items such as smart phones against user data exchange. Freemium models for cars with self-driving and sharing features also seem possible.

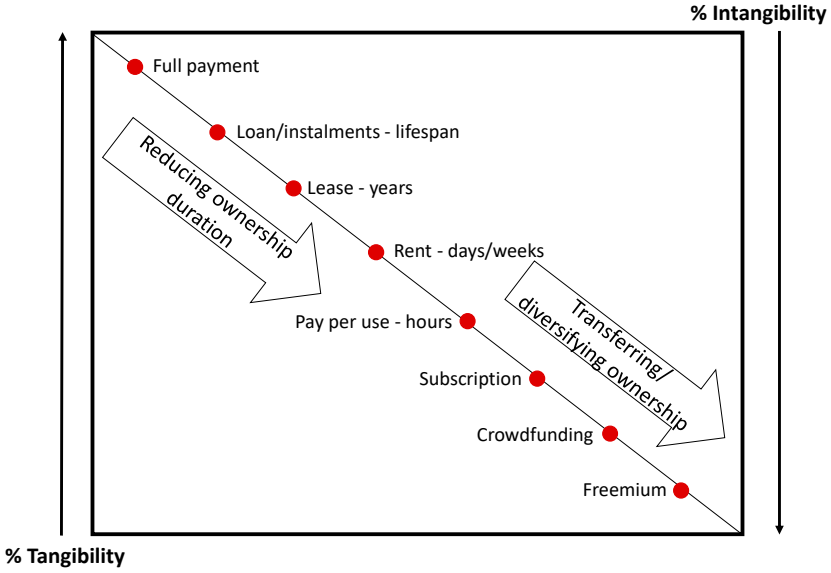

Figure 8. Options for ownership/financing barrier reduction.

3.2.2. Operation Barriers

Aspects related to the operation of products are the next type of barriers. These barriers can be lowered by reducing manual operation and by transferring parts of the operation to suppliers. The operation of a product is here meant to cover the aspects of storage, operating, maintenance, certificates for operation, and so on; thus, the physical handling of the product. Options for lowering these barriers are shown in Figure 9.

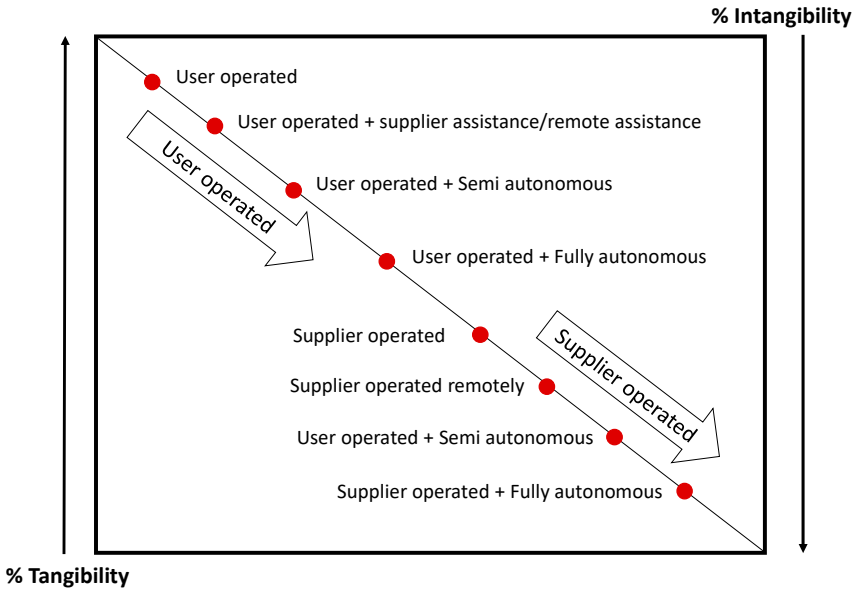

Figure 9. Options for operation barrier reduction.

Reducing the operation barrier is closely linked to increasing enablers by increasing the technological complexity. By adding hardware and sensors and connecting the product, opportunities open up for suppliers to remotely support the product. It can be monitored and often debugged from

afar. Examples range from software support to complex offshore oil drilling operations. In the early days of the computer, all program failures had to be brought up with the internal IT department, which showed up in the office and made (often futile) attempts at correcting the failure. With increasing processing power and a new level of connectedness, we can now get assistance directly from either the internal IT department or the supplier and they can fix problems remotely, as we see it happening on the screen.

Many heavy industrial products require highly skilled personnel for the operation of the equipment. Others require certificates and clearances for operation. By adding more sensors and being able to monitor operations from afar, the required inputs, skill set, and training are reduced. In offshore operations, an expert engineer can sit at headquarters onshore and monitor simultaneous operations at many offshore locations. This reduces the need to have an expert on board at all these locations. The necessary skill set can be held by one person, and operation offshore can be reduced from interpreting input and deciding what to do to just doing.

The next step will be to make many of these expert judgements automatic. For many situations, algorithms are now becoming better than humans at making the optimal decisions. This leads to more tasks and the handling of the product becoming autonomous: both the physical operation and the decision as to what physical operation to carry out.

As we go from user operation via supplier support to automation, we also enter the choice of transferring the responsibility for the operation to a supplier. Also, after such a transfer, there can be steps leading to automation, and all the steps may not be on a straight line of decreasing tangibility. There are, however, opportunities to increase servitization, both from developing the product along the lines of sensors, connectivity, and autonomization and from the transfer of parts of the operation to suppliers.

There are opportunities for many products to increase the level of services in this way, but at the same time, this requires the company to pay attention to the developments happening in several technological areas.

3.2.3. Risk Barriers

Risk barriers vary according to the offering and are typically linked to product breakdown, liabilities, technology change, depreciation rate, etc. These risks hinder various customers from buying an offering. They can, however, often be lowered in a similar fashion to that of the previous barriers, by reducing risk and then, potentially, further transferring risk. Various options for reducing risk barriers are presented in Figure 10.

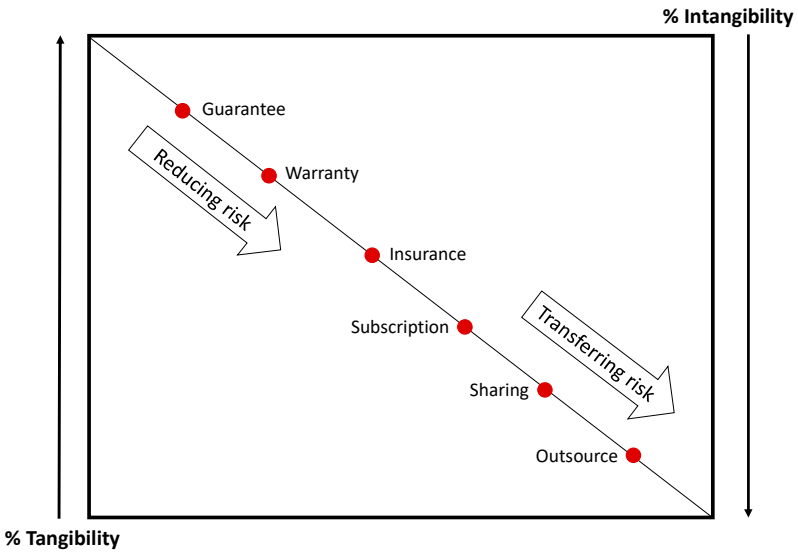

Figure 10. Options for risk barrier reduction.

Breakdown Risk

As an example, for a customer, a potential risk would be the breakdown of the product shortly after purchase. This risk can be reduced by including a guarantee or a warranty with the product. These are less-tangible features, and through their inclusion in the offering, the total tangibility of the offering is reduced and the risk for the customer is also reduced. Hence, the barrier that potentially prevents the customer from buying is reduced through this increase in intangibility.

Liability

Similarly, insurance can reduce liability risks. Insurance can be related to many aspects of a product or service. Potential negative events and their financial consequences can be protected against for a fee. Including different types of insurance in the offering of a product or service can be either a direct reduction in the potential risk exposure or the transfer of risk to a third party, collectively lowering the tangibility of the offering.

Risk Related to Technological Change

In many areas, the rate of technological development is very high and potential customers are worried about the risk of the product they may be interested in buying becoming obsolete or outdated shortly after purchase. Risk associated with rapid technological change can be lowered by subscription options. This has already been discussed in the ownership/financing barriers section, as these barrier categories have some overlapping features, demonstrated in Figure 7.

Depreciation Risk

Depreciation risk can be lowered through product sharing. Products such as a shared car would have increased utilization and, therefore, reduced investment and depreciation.

Outsourcing can also be another way to take away major risks. It can be done in relation to producing a product and in that way, reduce risks associated with quality and production capacity, for instance. It can also be done in relation to the execution or provision of a service.

Many different options exist for decreasing the risk barriers. A combination of these options can be applied to a product or service to reduce these barriers.

3.2.4. Product-Specific Barriers

Most barriers of varying importance are covered in the aforementioned categories. However, there are barriers that cannot be covered through a generalized approach. These barriers have to be addressed independently in order to eliminate them. They are probably less significant for servitization and are also difficult to address. For example, few customers are less willing to buy an automobile due to environmental concerns. This barrier is specific to combustion engine automobiles. Therefore, it is difficult to eliminate it through a generalized approach.

4. Radical Servitization

Radical servitization is described as a phenomenon where the core enabler of an offering stays the same, but the peripheral enablers and barriers are significantly changed. This implies that the offering must be radically changed, such that the core purpose of that offering prevails, but the process of providing that offering radically changes.

In incremental servitization, enablers are increased and barriers are removed relatively incrementally; therefore, the tangibility scales of servitization options appear to be continuous. On the contrary, in radical servitization, enablers and barriers are changed considerably; hence, the tangibility scale is a stepwise descent. Various options of radical servitization that have practically transformed numerous offerings in the market and can transform other offerings are illustrated in Figure 11. They

can radically servitize an offering and are not limited to those shown in Figure 11. However, the most important ones are assembled in Figure 11.

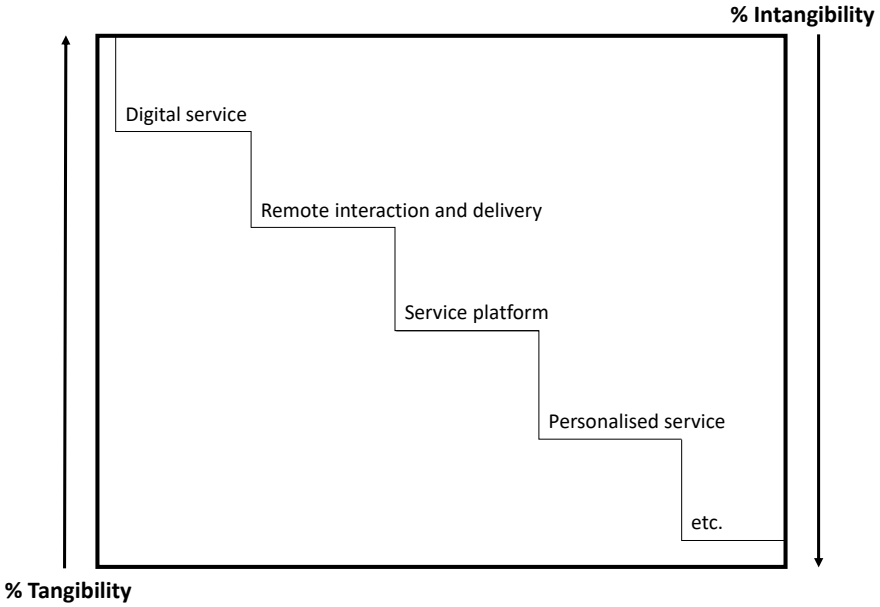

Figure 11. Radical servitization strategy.

These days, digitalization is the most important aspect of business, as stated by a number of studies. It is inferred that digitalization can also contribute towards the servitization of an offering. The direct effect of digitalization is that it reduces the tangibility of an offering by digitizing some of the features. For example, digital parking solutions can servitize manual parking spaces, where the number plates of the vehicles can be scanned by cameras and parking fees can be digitally charged to the owners. This transformation brings a step change in the tangibility of the parking space, and the service level for the users also drastically increases. A similar approach can be applied to any offering in order to come up with servitization ideas.

Similarly, remote interaction and delivery is also an option for radical servitization. As the name suggests, the interaction and service delivery can take place remotely. For example, we can purchase goods through digital platforms and they are delivered at our doorstep. Services such as health services can be radically servitized by remotely interacting with medical practitioners such as remote doctors and through the delivery of medicines to the doorstep. This transformation is also a step change towards servitization and can be applied in a similar fashion to various existing offerings.

The service platform is a service delivery architecture, where matchmaking between people from the open market, providing service and accessing service, takes place. Service platforms can also radically servitize existing offerings: for example, the hotel service being replaced by the service platform "AirBnB". Likewise, personalization of the offering is also important for servitization, where the offering is transformed in accordance with the customer's desire: for example, personalized web pages based on customers' browsing history and the personalization of physical products such as garments and cars.

These options need to be inspected for the offering which is to be servitized, and one or several of them may be relevant to the offering and may substantially reduce the tangibility of the offering.

5. Discussion and Conclusions

Rapidly shrinking product lifecycles and an increasing demand from business leaders for sustainable substitutes for highly competitive products provide the impetus to study the servitization of products. Various servitization models have been published that lay the foundation of the servitization

discipline. Through the literature review, it has been found that the existing approaches are at an advanced level that neglects the requirement of SMEs for practical approaches [25,33]. The existing studies require users to have a deep understanding of the servitization discipline and be able to gather sales data, collect customer feedback, apply sophisticated software tools and complicated methodologies, and so forth to achieve successful servitization. It is difficult for business owners of SMEs to invest that many resources in developing services. They are looking for a simplified approach that can be independently applied and provide useful insights about the servitization of their product range. A model for the servitization of products and services specifically addressing the needs of the managers of SMEs is developed that is at a practical level and can be applied to a range of products. The model differs from existing studies because of its ease-of-use. It consists of seven steps where the managers of SMEs can follow these steps chronologically and generate a service idea. No additional effort such as data collection or customer feedback is required. The present approach is also time-efficient, since it requires qualitative judgements from the user. The existing methodologies lets the user generate service ideas mainly by comprehensively evaluating data, although different methods are applied to do so. In contrast, the present approach presents established servitization options to the user to select from instead of idea generation, which significantly reduces the time required to apply this model. However, the time efficiency is gained against the tradeoff that this model provides less contribution in developing entirely unique services.

The model comprises seven sequential steps. The initial steps let the user understand the offering to be servitized through the breakdown of the offering into its utility features, which is in accordance with Drucker's [4] perspective on services. Subsequently, two major dimensions of servitization, namely incremental and radical servitization, are explored. Incremental servitization can be achieved by directly adding services to products, which is in agreement with the viewpoint of PSS literature, increasing the utility of the offering through technological developments and by lowering the customers' purchasing hindrances by changing the ownership, operation, and risk aspects of the offering. The perspective of achieving servitization through analyzing options of increasing utility and lowering hindrances of a product is a state-of-the-art contribution of the present study. This approach is analogous to the case study of Haber and Fargnoli [33], where "critical-to-quality elements" are used. However, "critical-to-quality elements" are collected through a customer survey in that study, which makes the servitization model more demanding. Similarly, Noh et al. [26] have suggested technology trees and functional analysis to generate service ideas. However, it requires input from technology engineers. In contrast, the present approach is independent of any data collection requirements. Various options for achieving the radical servitization of an offering are also presented in the model.

Theoretical contributions include understanding services and the servitization discipline in a comprehensive manner. A new definition of servitization with respect to the tangibility scale is proposed and is classified into incremental and radical servitization. Furthermore, a model is presented for the reduction of the tangibility of an offering and examining an offering through the lens of enablers and barriers such that the utility features of the offering are better understood. The existing studies primarily emphasis on generating service ideas through brainstorming, customer feedback, and data analysis, whereas in the present study, servitization options are presented as an alternate idea generation methodology.

For industry, the present model can act as a tool to derive service ideas that can eventually lead to the transformation of their product spectrum. The model presents options to achieve servitization on the tangibility scale such that it is intuitive and easy to implement for the industry managers. The model is developed specifically to address the need of SMEs and will be applied further in various industry segments to validate its practicality. However, the efficiency of the model, when applied in the industry, needs to be investigated. Furthermore, the quality of the service ideas generated, realization potential of these ideas, and changes in the business model of the company in order to implement these ideas also need to be studied.

The present study is conceptual in nature and has not been verified; however, further research will include verifying this study by implementing it in the industry. The study presents service options, and therefore the ideas generated in the present model are limited by the presented service options, which may compromise radically new ideas. Another aspect that has become clear during the work on this model is that the potential for servitization is closely linked to the developments occurring in technology and the inclusion of these in the products underlying the services. The more sensors, processing power, and connectivity included in a product, the greater the potential there is for servitizing the product. Therefore, studying servitization together with the developments in technology and the effect of these service options on the business model of the companies are the future research directions.

Author Contributions: Conceptualization, M.A.T and K.E.B.; methodology, M.A.T and K.E.B.; writing—original draft preparation, M.A.T; writing—review and editing, M.A.T and K.E.B.; supervision, K.E.B.

Funding: This research received no external funding.

Acknowledgments: The authors would like to thank reviewers and Tore Markeset for constructive feedback that led to improvement of this of this paper.

Conflicts of Interest: The authors declare no conflict of interest.

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