

# Formulating Service-Oriented Strategies for Servitization of Manufacturing Companies

Mar'atus Sholihah \*, Tatsuru Maezono, Yuya Mitake and Yoshiki Shimomura

Department of Systems Design, Tokyo Metropolitan University, Tokyo 191-0065, Japan; manatsutaiyou7@gmail.com (T.M.); mitake-yuya@ed.tmu.ac.jp (Y.M.); yoshiki-shimomura@tmu.ac.jp (Y.S.)

\* Correspondence: sholihah-mar'atus@ed.tmu.ac.jp

Received: 24 October 2020; Accepted: 16 November 2020; Published: 19 November 2020

**Abstract:** Servitization requires the acquisition and development of service-oriented capabilities. Research has contributed considerably to the investigation of the necessary capabilities for successful servitization and the introduction of numerous service-based capabilities. However, previous studies typically focus on proposing a general set of capabilities or processes for servitization. There is limited knowledge of how a manufacturing company can identify the necessary capabilities and plan the corresponding development actions following its servitization context. Through two phases of a case study, this research proposes a service-oriented strategy formulation method. The method supports the analysis of manufacturing companies' servitization contexts that lead to appropriate identification of the necessary capabilities for successful servitization. This method further guides the formulation of service-oriented strategies as the strategic logic in how manufacturing companies implement servitization, including the corresponding actions to develop the required capabilities. Finally, the application in a Japanese office machinery manufacturer illustrates the applicability and usability of the proposed method in facilitating the formulation of service-oriented strategies for the servitization of manufacturing companies.

**Keywords:** servitization; servitization context; capabilities; service-oriented strategy; case study

## 1. Introduction

The significant challenges in core product markets have forced manufacturing companies to shift their focus from selling products to delivering integrated product-service offerings [1,2]. It has been argued that a marketable set of products and services improves customer values [3–5], and generates new revenue streams [6]. This organizational transition describes an emerging new strategy entitled servitization [2]. Servitization can be associated with manufacturing companies repositioning themselves in the value chain. It indicates an alteration in the type and scope of companies' market offerings due to the orientation change from a product-based to a service-dominant or customer-based business model [7,8]. Consequently, a thorough and comprehensive organizational transformation is needed to generate significant financial value [9–14].

The necessary organizational changes manifest the complexity of servitization [15,16]. Servitization is a complex process [17–19], and positive outcomes cannot be guaranteed [20–22]. These undesirable outcomes, widely recognized as service paradox, are linked to poor strategic planning and implementation of servitization [23–26]. For that reason, researchers have extensively focused on the discussion of how manufacturing companies can achieve successful servitization [8,14,27–30].

Among many approaches to addressing this issue (e.g., operational management, service business development, organizational alignment), capability development is a prominent topic

believed to be a critical success factor in realizing effective servitization [14,19,28–30]. Servitization creates a significant need to invest in configuring existing resources and capability or even developing new service-oriented capabilities [8,29,31,32]. The neglect in investing these resources and capabilities risks long-term market competitiveness [14]. Therefore, research has contributed considerably to the investigation of the necessary capabilities for successful servitization [14,19,29,33]. Previous studies have introduced numerous required capabilities [29] for organizational transition [14,19] and service business development [29,33].

Research contributions in this area continue to progress, but there are still calls for a deeper understanding of how to successfully servitize manufacturing companies [30]. In particular, two research gaps still remain. First, extant studies typically focus on proposing general sets of capabilities and processes for servitization [14,19,29,33]. Nevertheless, little is known about how a manufacturing company can identify the necessary capabilities and plan the corresponding development actions [19] following its servitization context. Servitization context refers to the situation (internal and external) when the servitization (organizational change) occurs [34,35]. Considering the unique servitization context is particularly crucial to determining the requisite capability development for effective servitization appropriately. The heterogeneity of service offerings and business networks make servitization can take many different forms [36]. It implies the need for a fit and configuration among the servitization strategies, internal organization, and external environment [37].

The second research gap relates to the research orientation of previous studies on this topic. Most of the extant research approaches servitization over a descriptive lens (exploratory). Academics are mainly interested in explanatory contributions and evidence of how servitization has occurred in the object studied [8,26,28,38]. Meanwhile, practitioners invariably seek guidance concerning how to implement servitization [34]. Yet only a few have provided overviews on how servitization capabilities can be developed [14,19,26]. Even fewer have proposed a method or model to thoroughly formulate service strategies by taking into account the servitization context [8]. Although practitioners are inspired by those descriptive studies of past servitization successful cases, prescribing how to servitize, particularly in supporting the strategic plan of servitization following a contextual situation, is pivotal and desirable [34,35].

This research intends to fill in those research gaps by proposing a service-oriented strategy formulation method. This method practically facilitates manufacturing companies to analyze their servitization contexts, consequently enabling the appropriate identification of the necessary service-based capabilities and finally plan the corresponding development actions for successful servitization. In particular, the proposed method supports manufacturing companies to formulate best suited service-oriented strategies as the strategic logic to execute servitization for their specific context of transformation. In this sense, the servitization context describes the current internal capabilities of manufacturing companies and their competitive profile in the external business environment. This objective is achieved by validating and further improving a previously proposed method documented in Sholihah et al. [39] through the case study approach. The final version of the proposed method was then applied in a case study involving a Japanese office machinery manufacturer. The focus of this article is to present the validation and theory testing of the proposed method through the case study. The theory testing aims to confirm that the proposed method certainly facilitates the formulation of service-oriented strategies for companies' servitization following different organizational transition contexts.

This research offers three key contributions. First, the present study contributes to the servitization literature by further defining the factors of the servitization context. Second, the analysis of these contextual factors enables an appropriate identification of necessary capabilities and formulation of the corresponding action plans best suited to manufacturing companies' situations. Those contributions specifically respond to the first research gap and address the call for a deeper understanding of how manufacturing companies can develop necessary capabilities [19,30] tailored to the contextual conditions. In addition to those theoretical contributions, this research practically contributes to the manufacturing practitioners by prescribing the formulation of strategic logic for their servitization implementations (the second research gap) [26]. The proposed practical method

facilitates the manufacturing companies' strategic planning and effective strategy implementation of servitization by translating the necessary capabilities into the targeted action plans.

The remainder of this article is arranged as follows. The next section reviews the theoretical framework to develop research questions. It is followed by a description of the research methodology. The article continues with the presentation of the case study application results and a discussion of how the research responds to the research question. The paper concludes theoretical and managerial implications and future research opportunities.

## 2. Theoretical Framework

### 2.1. The Organizational Change from Products to Services

The literature conceptualizes the transition from products to service-based offerings through several concepts, such as “servitization” [2], “moving downstream in the value chain” [40], “transition from products to services” [27], “product-service system (PSS)” [41], and “service infusion” [42]. Among those conceptualizations, servitization and PSS are the most commonly used terms describing this phenomenon [43]. However, the two concepts have emerged from different research perspectives and communities [1,7,43]. Research on PSS focuses on the development and implementation of products and services as a bundled offering to provide high value to customers [44–47]. Meanwhile, the focus of servitization research lies in the organizational transition of manufacturing companies from selling products to delivering PSS [7,8]. Despite originating from different research domains, both research areas are intrinsically linked to each other [43,48]. Those concepts converge toward a common conclusion that manufacturing companies need to focus on selling integrated solutions or PSS [1,44]. As a starting point and for the research progression, this study adopts the definition of servitization as “the innovation of an organization’s capabilities and processes to better create mutual value through a shift from selling products to selling PSS” [1], while PSS itself is “an integrated combination of products and services that deliver value in use” [48]. Not only encompassing the PSS theme, the servitization definition also emphasizes the urgency of capability development for successful servitization implementation.

Researchers conceptualize the manifestation of servitization differently, ranging from types of offerings, development stages, and value streams positions. Following those conceptualizations, Brax and Visintin [7] categorized three different approaches to represent the organizational change. First, the end-state model center on the “servitized” and organizational settings that have followed the transition process. This model does not explore the organizational transformation from a process-oriented perspective but centers on an outcome of servitization [49–54]. The second model is the gradual transition model that represents servitization through a process-oriented approach. It describes servitization along a continuum and utilizes comparisons of pre- and post-servitization conditions to conceptualize the process [42,51]. The last model is the stepwise model that analyses the transition continuum further by identifying progressive stages of increasing servitization. Under this approach, several studies have proposed alternative servitization paths (such as Oliva and Kallenberg [27], Kinnunen and Turunen [55], and Martinez et al. [56]) representing subsequent stages and generating the basis for analyzing how the servitization process evolves.

Although there are different representations regarding how servitization evolves, there is a mutual consensus that the organizational shift is not a simple process [17–19]. In several cases, servitization does not generate the expected benefits and even leads to a service paradox [20–22]. It is a condition when substantial investment to extend a manufacturing company’s service business merely leads to an increased service offering and higher cost, but unexpectedly does not generate the corresponding higher return [21]. Manufacturing companies acknowledge the need to move into service to achieve a new competitive advantage, but anecdotal evidence indicates mixed outcomes at best [30]. Those disparate outcomes, including the service paradox cases, demonstrate that there is no predefined transition process for servitization in manufacturing companies leading to a consistent and desirable outcome [36]. Instead, the organizational changes follow the continuous change model that is neither logical nor structured but endemic, more emergent, and intuitive in nature in which

companies typically operate [8,16]. Several reported servitization cases support this notion by showing the contradicting results to the common assumption that servitizing companies experience specific phases during a service transition trajectory [36]. That evidence contests the idea that servitization happens through particular stages during a service transition path and a specific business model is suitable for service provision in a manufacturing context [27,40,57,58].

The organizational transition toward service-oriented provision can be logically different from one manufacturing company to another [8,36]. The organizational resources, capabilities, business network, value constellation, and external business environment are among the differentiators affecting the transformation processes and outcomes. Those factors, together with the heterogeneity of possible service offerings, cause the servitization process and path to vary [36]. Servitization is a context-dependent process triggered by a desire to move from the current condition to reach a distinct future state through service inclusion, described as service (oriented) strategies, with many possible pathways [15,16,34,35]. Therefore, defining and proposing the general capabilities or processes based on past cases is not sufficient to support effective servitization.

There is an urgency to extend the study of servitization using the step-wise approach in which the objective is to facilitate the progression of servitization. The preceding evidence specifically accentuates the relevancy to review the servitization of a manufacturing company not only through its process and outcome of transformation but also by considering its servitization context [34,35]. A further study to facilitate a manufacturing company's strategic planning to implement servitization is needed [26], particularly in accurately identifying the necessary service-based capabilities following its specific condition and need. The successful implementation of servitization demands a clear understanding of companies' strategic logic [26], covering the target of capabilities development plans tailored to specific servitization contexts.

## 2.2. Capabilities for Servitization

The transition from selling products toward PSS provision calls for a comprehensive organizational transformation [9–13]. Servitization requires the configuration of resources, capabilities, structures, and relationships at the organizational and network-level [7,28,33,34,36]. Delivering integrated product-service offerings demands different resources and capabilities from those used for selling pure products [34]. Consequently, moving away from products to services requires the development of service-oriented capabilities that lead to a significant departure from the current product-oriented capabilities [1,21,28].

Capabilities refer to a company's ability to perform current activities efficiently [59] or the company's ability to perform productive activities [60]. They represent the company's ability to deploy combinations of resources to achieve a targeted goal [61]. Meanwhile, resources are productive assets that the company owns [24,30], such as capital equipment, skills of employees, and finance. Within the context of servitization research, capabilities are determinants for alternative pathways toward service business development [33]. They specifically refer to "socially complex combinations of interconnected resources that are deployed to achieve the desired end goal, which can positively influence various performance measures, such as financial performance, competitive advantage, and customer loyalty" [19].

Capabilities are classified broadly into operational and dynamic. Operational capabilities, from the resource-based view [62], enable companies to perform daily activities [38] in how they earn their living. Dynamic capabilities [63] refer to companies' ability to alter their activities to address new market opportunities, focusing on how companies change their operational routines [64,65]. However, the separation of operational and dynamic capabilities is often not clearly defined [64]. Thus, Cepeda and Vera [65] conceptualized new operational capabilities as the output of dynamic capabilities. Another work classifies capabilities based on how they are developed, internally (by the company itself) or externally (outsourced to suppliers or partners) [28]. The internal development of capabilities allows the company to have full control of its operation as well as the creation of competitive advantage [66]. However, internal development tends to extend the number of capabilities that consequently prevent the company specializes in particular core capabilities. In

contrast, external capabilities development is believed to be a profitable alternative as it is time- and cost-efficient [3,67]. Yet, this alternative may cause the company to lose control over the newly developed capabilities [28]. Both classifications have been adopted as lenses to explore how manufacturing companies achieve servitization (e.g., Kindström et al. [68]; Raddats et al. [38]; Paiola et al. [28]).

A variety of authors have identified the capabilities development necessary for servitization. The contributions to this topic have emerged in two different research fields [33]. First, the authors explored the capabilities for developing new service businesses in manufacturing-based organization. For instance, Gebauer et al. [33] proposed the paths for service business development and the necessary capabilities both from dynamic and operational perspectives. Unlike the majority of research in this area, this research takes small and medium-sized suppliers as the center of investigation instead of multi-national original equipment manufacturers. In the same field, Storbacka [29] classified service solution development into four phases (develop, create demand, sell, and deliver solution) and identified 64 related capabilities or management practices for each development phase. The second contribution, meanwhile, concentrates on organizational capabilities to undergo the service transition. Such work includes Parida et al. [14], who proposed four main organizational capabilities and the key actions/activities to develop those capabilities. These organizational capabilities are business model design, network management, integrated development, and service delivery network. Moreover, Story et al. [19] identified organizational capabilities required for advanced services within a manufacturing company and its downstream network (intermediates and customers). The proposal underlined the critical capabilities needed for servitization, such as balancing the product and service innovation, customer-focused through-life service methodology, and distinct-synergistic product service cultures.

In addition to those proposals, considerable numbers of research works have identified and introduced an extensive number of necessary capabilities for servitization, such as Story et al. [19], Ulaga and Reinartz [30], and Raddats et al. [38]. Despite emerging from different approaches, the existing literature clearly emphasizes the role of the formation and configuration of service-based capabilities in gaining competitive advantage through servitization [33]. Thus, manufacturing companies need to develop the capabilities to design, sell, and deliver service-based offerings along with the organizational elements necessary for implementing those service strategies [28,33].

A long list of service-oriented capabilities has been established in the literature for successful servitization. However, only a small body of the literature has discussed the associated activities to develop those required capabilities [14,19,26,33]. A model or method enabling manufacturing companies to identify the capabilities and plan the necessary activities best-suited to their servitization context is even more sparse [8]. In contrast, particular attention has been paid to translating the service-oriented capabilities into development actions that form the logic of how the companies implement servitization.

A proposition to this call was introduced by Rabetino et al. [26] through a strategy map of servitization. The strategy map presents the strategic logic of servitization holistically by describing how the company intends to achieve the strategic target through coordinative capabilities and resources [26]. It specifically depicts key processes to execute servitization by translating the necessary service-based capabilities into actions. The proposal identified and structured the key practices to implement servitization in four strategic perspectives of the balanced scorecard, involving financial, customer, internal process, and learning and growth. Furthermore, by clarifying the linkages among key practices, companies can better comprehend the value co-creation, value co-production, and value appropriation during servitization. However, this study fails to prescribe how to formulate those key processes for capability development following different servitization contexts since the proposal merely described the key practices from the past successful servitization cases.

### 2.3. Research Questions

The overarching question of this research is: How can we formulate service-oriented strategies for servitization of manufacturing companies considering the servitization context? This research defines service-oriented strategies as a coordinated and integrated set of commitments and actions to use company capabilities to achieve desired objectives [69] and acquire a competitive advantage [70] through increasing service offers [21]. The development of service-based capabilities is one of the objectives that needs to be set and achieved by manufacturing companies for successful servitization. Therefore, service-oriented strategies refer to the strategic logic of how manufacturing companies implement servitization.

This question is addressed by responding to three sub-questions:

1. What are the elements/factors of the servitization context that should be considered when identifying the required capabilities for successful servitization?
2. How can we determine the necessary capabilities for a manufacturing company following its servitization context?
3. How can we formulate action plans to develop the required capabilities and implement servitization?

## 3. Research Method

This section consists of two subsections. Section 3.1 introduces the research approach as the methodological steps to conduct the research. Section 3.2 provides an overview of the initial version of the service-oriented strategy formulation method.

### 3.1. Research Approach

The adopted methodology of this research is a case study that plays two critical roles. First, as an explanatory research method with a conceptual nature [71], the case study facilitates the validation of the proposed method. It thus enables further improvement of the initial proposal. Second, the case study serves to test the theory [72] of the final version of the proposed method to define whether it successfully achieves its intended objective. This research utilizes a single case study that is regarded as appropriate in cases of theoretical immaturity of the research topic. This approach has been adopted by previous research in this area (such as Paula et al. [49] and Martinez et al. [32]), which suits the servitization research status. A single case study affords a thorough investigation of a specific phenomenon [49].

As part of this research project, the initial version of the proposed method, namely the service-oriented strategy formulation method, was developed and documented in Sholihah et al. [39]. It is a facet in the integral proposal of PSS strategic alignment of the work [39]. The previously published paper covers the theoretical and empirical development of the service-oriented strategy formulation method through systematic literature review and action research. However, the validity and application of the proposal in the real PSS company have not been conducted. Therefore, this article addresses these shortcoming parts of the previous publication.

The case study involved a Japanese office machinery manufacturer (Company A). Company A was selected according to three criteria. (1) It is a multinational machinery manufacturer; (2) It currently undertakes servitization and intends to improve its servitization progress; (3) It is willing to provide access to people/processes, share information, and provide constructive feedback during the case study application. In detail, the case study was performed in two phases. Figure 1 illustrates the sequential stages of the research method.

#### 3.1.1. Phase 1—The Validation of the Initial Version of Proposed Method

The first phase aims to validate the initial version of the proposed method. This research used a guideline proposed by Yin [73] to plan and conduct phase 1. The validation of the initial proposal was conducted through three activities, including the definition of data collection protocol, data collection, and data analysis. Data collection was done during an intense discussion with board

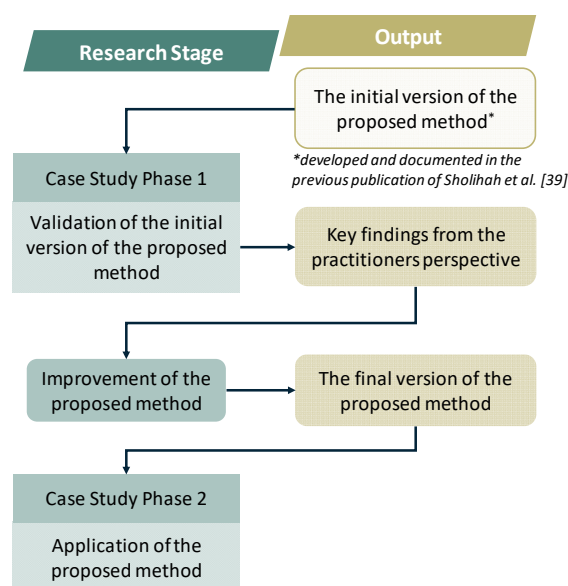
members of Company A. The board members comprise the top-middle managers from the Engineering and Design Division as well as the Product and Marketing Division. The focus of the discussion was to assess the accuracy and reliability of the proposed method in fulfilling its intended goal to support the formulation of service-oriented strategies for servitization. Based on their practical knowledge and expertise related to strategy formulation and PSS application, Company A representatives provided constructive feedback for the proposed method. The discussion was recorded and transcribed verbatim.

The data analysis focused on the identification and categorization of the provided feedback on the proposed method. Content and thematic pattern-matching analysis were used to analyze the data [73]. This data analysis yields to the categorization of the provided feedback based on several topics, including the logic of service-oriented strategy formulation, the company's internal capabilities assessment, and contextual data to support these analyses (described in Section 4.1). The key findings of this phase provide a basis to revise and further improve the initial version of the proposed method. The final version of the proposed method was then applied in the case study in phase 2.

### 3.1.2. Phase 2—The Application of the Final Version of Proposed Method

The second phase of the case study aims to perform the test of the final version of the service-oriented strategy formulation method. This research employed a guideline proposed by Dul and Hak [72] to conduct this phase that comprised of candidate cases identification and case selection, case study execution, and analysis of the results.

Company A applied the proposed method to formulate the service-oriented strategies for its servitization journey through two 3-h workshops. The workshop participants are the company representatives from the Retail Solutions Business Group. The workshop participants have actively involved in the projects related to servitization and PSS offerings. By considering their expertise and experiences in this topic, this phase intends to assess the “success” of the proposed method in facilitating the service-oriented strategies formulation method in the studied object. An open-ended questionnaire developed following the method evaluation model [74] facilitates the assessment of the proposed method. The “success” of the proposed method is justified in two dimensions: actual efficacy and the degree of intention to use [74]. The actual efficacy refers to a condition in which the proposed method improves the performance of the task. In this context, the task is formulating service-based strategies for servitization in a manufacturing company. The second dimension meanwhile represents the intention of practitioners to implement the proposed method in real practice. Those two dimensions emphasize the fundamental premise of research development in which the benefit of the proposed framework can be obtained if and only if it is applied in real practice. Section 4.3 presents the results of this phase.



**Figure 1.** The sequential stage of the research method.

A previous study in the PSS research area has adopted a similar research design (e.g., Pieroni et al. 75]) in which application in actual PSS cases aims to validate and serve as theory testing of the proposed framework simultaneously. Pieroni et al. [75] applied a previously developed business model configurator for a circular economy in two Nordic manufacturing companies as a validation stage. This first cycle of applications enables the refinement of the proposed model. Subsequently, the employment of the final model in those companies proves the usefulness and usability of the proposal in supporting the design and configuration of different business model concepts based on PSS. This previous study exemplifies the effectiveness of the adopted research design to concurrently validate and conduct theory-testing of the initial theoretically developed framework.

### 3.2. The Initial Version of the Proposed Method

#### 3.2.1. Servitization Context

Servitization is a process of organizational change [8,34,35], in which it is represented as a difference in form, quality, or state over time [34] from product-oriented to a more service-based organization. It involves not only the process (how to change) and the content (the output) of transformation but also the context (the situation) in which it occurs [35]. This context represents the situation when the servitization (organizational change) happens [34,35]. As the organizational change of servitization follows the continuous change model (endemic, emergent, and intuitive in nature) [8], understanding the contextual conditions is notably essential to accurately and concretely plan the next process to achieve the desired outcomes of transformation.

In the strategic change theory, a review of organizational change calls for consideration of two aspects of the context: the inner context and the outer context [76]. The inner context refers to companies' internal factors (such as organizational structure, corporate culture, strategic direction), and the outer context represents external factors (e.g., social, political, and economic conditions) [76]. Both factors are essential deliberations in companies' strategic decision makings. Those factors are also believed to greatly affect the decision to adopt the servitization implementation within a manufacturing organization [34]. The development of new service-dominant offerings potentially leads to tensions within the organization [15], while the external environment in which companies operate affects the success of those offerings [37]. Therefore, it is crucial to comprehensively consider internal and external factors to ensure a configuration and fit among the strategy, organization, and external business environment [37].



Intention to identify the detailed component of the servitization context has been expressed by previous scholars. Several previous research papers have emphasized the relevance of taking into account the servitization context through the inclusion of one or two factors (either internal or external) of the servitization context in their works, such as organizational structure [77], culture [78], political situation [79], and GDP (economic) growth [80,81]. Interestingly, only limited research has specifically defined a comprehensive list of both internal and external factors of the servitization context. That research includes Baines et al. [34] and Bigdeli et al. [35] who characterized the elements of internal and external context based on the change management theory. They both defined internal factors as the organizational structure, culture, power, political characteristics, strategic directions, level of trust, and stage of board development (age). The external factors are defined as political, economic, social, technological, environmental, industry, and regulation of the company [34,35]. However, Bigdeli et al. [35] further added ownership structure and the overall risk to this list. Moreover, Martinez et al. [8] argued that the internal and external context analysis is a point of departure for servitization. However, this conceptualization is less detailed since the internal context is solely defined as internal readiness, while the market condition represents the external context.

This research conceptualizes the servitization context as the current internal capabilities of manufacturing companies (internal factors) and their competitive profiles in the external business environment (external factors). In detail, the internal aspect of the servitization context encompasses the assessment of the current manufacturing companies' capabilities compared to the necessary capabilities required for successful servitization. This conceptualization is consistent with the original notion of servitization as the innovation of organizational capabilities [1]. Furthermore, assessing the capability gaps leads to the recognition of the companies' current strengths and weaknesses compared to those that are needed to achieve successful servitization. Thus, it then triggers the discussion of resource and capability configuration and new capability development [29]. The external aspect of the servitization context refers to the assessment of manufacturing companies' positions in the external business environment involving analysis of industry forces, key trends, market forces, and macro-economic forces.

### Internal Context

This research adopts the resource-based view [62] to identify the required capabilities for successful servitization. This adoption takes into consideration that a company is a bundle of resources and capabilities, which, when they are combined consciously and systematically, can provide a strategic competitive advantage [62]. This research specifically focuses on the operational capabilities that support manufacturing companies to perform productive activities and earn financial consequences, instead of the mechanism by which the companies change (dynamic capabilities). This view is aligned with servitization research, where resources components are combined into resource configurations to co-create value with customers [82], supporting servitization success [19]. Several previous research on this topic also drew on the same standpoint, using the resource-based view to unfold how manufacturing companies can successfully servitize, such as Ulaga and Reinartz [30], Storbacka [29], Gebauer et al. [31], Paiola et al. [28], and Story et al. [19].

The necessary capabilities for successful servitization are organized based on the four strategic perspectives of a balanced scorecard. The balanced scorecard is a metric proposed originally as a performance measurement tool [83], but then it evolves into a strategic management mechanism embedded in a strategy map [84]. The strategic perspectives encompass financial, customer, internal process, and learning and growth. The financial perspective describes how a company achieves its financial targets. This endeavor depends on the creation of an appropriate value proposition for customer segments (customer perspective). It accordingly entails the development of the required internal processes to deliver the value proposition (internal process perspective) by aligning the company's tangible and intangible assets (learning and growth perspective). Those four perspectives enable a thorough overview of organization activities to create and deliver values by connecting desired outcomes with the drivers of those results [85].

Organizing the required capabilities through a holistic approach provides a comprehensive understanding of the company's source of synergy and value creation [85]. This arrangement bears a clear conceptualization of how those capabilities are interconnected across business activities at different organizational levels in assisting companies to implement servitization. It then creates a common and understandable point of reference to the necessary capabilities' development for servitization across functions. The adoption of the four strategic perspectives has previously been done in servitization research [26,39]. Table 1 presents the required capabilities across the organization levels and business processes for successful servitization conceptualized as internal factors for the servitization context.

**Table 1.** The required capabilities across the organization levels and business processes for successful servitization conceptualized as internal factors for the servitization context.

Strategic Perspective	(Code) Capability/Internal Factor	Definition	Conceptualization of Activities to Develop the Capability	Key Reference
Financial	(C1) Value-based pricing	Capability to set prices and revenue model based on the value of products and services rather than the cost of products/services	Understanding the value for customer; identify customer willingness to pay; evaluate competitor pricing as a reference pricing structure	[14,29,86]
Customer	(C2) Customer intimacy	Capability to understand customers' needs and deliver the matched value proposition by combining detailed customer knowledge with operational flexibility leading to customer loyalty	Have detailed customer knowledge; enhance focus on flexibility, responsiveness, and customization; develop company image as PSS provider, retain and acquire customers	[14,19,28,29]
Internal Process	(C3) Value co-creation with customer	Capability to closely and continuously work together with customers during the innovation, production, and delivery of PSS	Continuously engage with customer; co-create products and services with customers	[19,26,29,30,38]
	(C4) Close collaboration with partner	Capability to establish and maintain close collaboration with partners (stakeholders) to deliver the PSS offerings	Select the partners based on capability and strategic alignment; collaboration in areas where company has strong capability; jointly invest and manage the performance of long-term collaboration	[14,19,28,38,86]
Learning and Growth	(C5) Service-oriented personnel	Capability to recruit and train service-oriented personnel to obtain the key required skills	Hire service-oriented personnel; conduct training to improve service orientation	[26,28,29,33]
	(C6) Service-oriented ICT	Capability to acquire, analyze and store service-oriented information	Has a system to manage customer information; has a system to exchange information between supply chain actors	[14,19,26,29]
	(C7) Service-oriented performance measurement system	Capability to raise employee morale with an employee evaluation system based on service orientation	Develop an employee evaluation system oriented in service; create a service-oriented bonus system	[26,29,33]
	(C8) Product service culture	Capability to build an organizational structure with a product service culture	Create a cross-cutting team; employees accept service culture; employees understand company policy	[19,26,33]

Servitization demands manufacturing companies to determine how to charge the new services and possibly change the revenue model of existing offerings [86]. This change can be difficult, especially for product-centric companies that traditionally provide services for free to support their

product sales [14]. Therefore, value-based pricing capability is needed to change the revenue model from product-centric offerings and start charging the value-in-use of the new PSS offerings [14,29,86].

A strong customer-centricity is one of the key features of servitization [43]. Thus, manufacturing companies need to strive to excel in customer intimacy [26,85] to provide a customer-based solution [14,19,28,29], by understanding customer needs and develop suitable value proposition [19]. Excelling in customer intimacy enables a trusting relationship to build. Consequently, this deep relationship is a driver of future sales and antecedent of long-term revenue streams [19].

Internal processes define how a company creates and deliver a value proposition to customers [85]. In the servitization case, this process takes place through the value co-creation with customers and close collaboration with partners. Servitization involves altering the basis of companies' offerings, from products to more customer-based offerings. Thus, co-creating innovation with customers is particularly important to develop new offerings [19]. Meanwhile, delivering those offerings requires close and effective collaboration with partners. Such partnerships not only allow a share of the risks and responsibilities of the PSS but can also mitigate the lack of internal capabilities of companies [14].

Servitization highlights the importance of intangibles assets as a prerequisite for success [26]. Thus, the development of four capabilities in learning and growth perspective play a fundamental role in facilitating the successful servitization implementation [31]. First, designing and delivering PSS offerings demands new service-oriented skills. Obtaining the necessary service capability through service-oriented skilled employees is fundamental for implementing servitization. Second, an ICT system not only facilitates the improvement of customer and supplier relationship management [54] but also improves the internal business processes (design and delivery of PSS) by concurrently reducing cost and increasing efficiency [36,47]. Third, the availability of service-based performance measurement can support the service culture shift as well as align stakeholders' goals to develop strong customer relationships and work in a team [26]. Finally, another critical capability is the ability to develop a different but synergistic service culture [18]. This capability is argued as one of the biggest challenges of servitization considering the required changing of organizational mindset from a product- to a product-service-focus.

## External Context

Besides internal conditions, external factors from the specific environment in which a company operates have a great influence on organizational effectiveness [87]. External context refers to forces from outside the organization that shape competition within the industry (of the company) and affect the organizational decision makings. These forces include any trend or event beyond the control of the company. This research adopts the business environment framework [88] to identify the external factors denoting the external context of servitization, as presented in Table 2.

**Table 2.** The external factor for the servitization context (adopted from [88]).

(Code) External Factor	Description
(E1) Industry forces	Analysis of five competitive forces that shape competition within an industry, including competitor, new entrants, substitute product or service, bargaining power of suppliers, and bargaining power of buyers
(E2) Key trends	Foresight analysis that includes possible trends that possibly influence the business condition in the future, including technology, regulatory, societal and cultural, socioeconomic trend, and market issues
(E3) Market forces	Analysis of market attractiveness and dynamics in the business industry, including market segments, needs and demands, switching costs, and revenue attractiveness
(E4) Macroeconomic forces	Analysis of large-scale economic that may affect the business condition, including global market conditions, capital markets, commodities, and other resources, and economic infrastructure

The business environment framework divides the external context into four environment areas encompassing industry forces, key trends, market forces, and macro-economic forces. Industry forces commonly referred to as Porter's Five Forces indicates five competitive forces that shape competition within an industry. Understanding the competitive forces and their latent causes not only explains the roots of an industry's current profitability but also provides a foundation to anticipate the competition and profitability over time [89]. Key trends imply possible changes in technology, regulatory, societal-cultural, and socioeconomic that may affect the business condition in the future. Analyzing those trends enables the company to foresight potential factors that could threaten or positively influence the company. Market forces are the economic factors that influence the demand for, price of, and availability of a commodity. Meanwhile, macro-economic forces are large-scale economies that may affect the business condition involving global market conditions, capital markets, commodities and other resources, and economic infrastructure.

### Servitization Context Analysis and Contextual Data

The assessment indexes are identified from internal factors (capabilities) and external factors (coded as 'Q') to facilitate the context analysis of a manufacturing company servitization. These indexes measure the current condition of manufacturing companies compared to the required capabilities for successful servitization as well as their competitive profile in the external business environment. Table 3 provides an example of the identified assessment indexes of internal and external factors.

**Table 3.** The initial version of assessment index and contextual data for internal and external factors of the servitization context (partial).

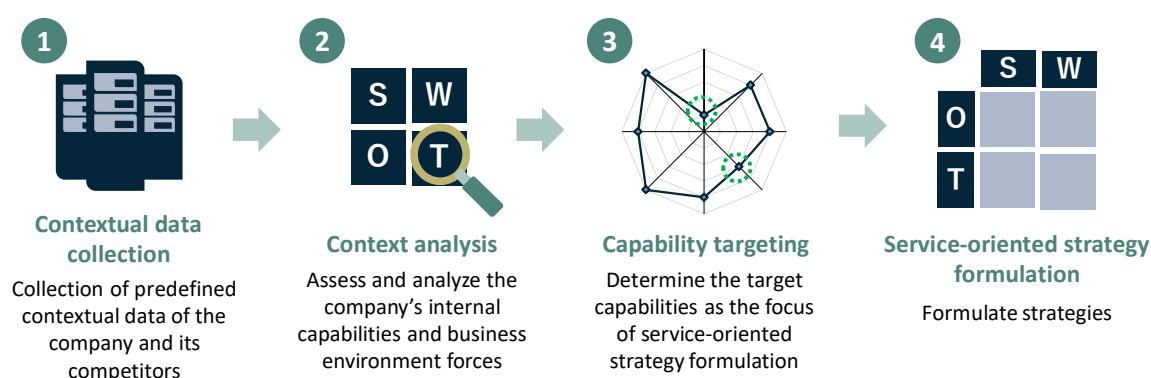
(Code) Internal/External Factor	Assessment Index	Contextual Data
(C2) Customer intimacy	Q4. Value proposition	4. Company's offering (bundle of product and service)
	Q5. Relationship with customer	5. Type of customer relationship programs
	Q6. Company image	6. Brand image
	Q7. Customer satisfaction	7. Customer satisfaction index
	Q8. Customer acquisition	8. Number of new customers
(C6) Service-oriented ICT	Q13. Knowledge management	13. Type and information of knowledge management system
	Q14. CRM system	14. CRM system
(C7) Service-oriented performance measurement system	Q15. Service oriented bonus structure	15. Company performance measurement system
(E1) Industry forces	Q18. Competitor	17. Number of current competitor and their strong points
	Q19. New entrants	18. Number of current competitor and their strong points

Q20. Substitute product or service	19. Possible substitute product/service
Q21. Bargaining power of suppliers	20. Type or strategy of partner relationship programs
Q22. Bargaining power of buyers	Refer to Q4 and Q7

As an illustration, manufacturing companies, who excel in (C2) Customer intimacy and have a comprehensive understanding of customer needs, can thus deliver a suitable (Q4) value proposition leading to (Q7) Customer satisfaction. By developing and maintaining a close (Q5) Relationship with customers, companies establish a strong (Q6) Image as a PSS provider in which it is an antecedent for (Q8) New customer acquisition. In addition to the assessment indexes, Table 3 also introduces the corresponding contextual data of each assessment index. This inputted data aims to ensure the analysis can be executed in a data-driven assessment manner.

### 3.2.2. The Initial Version of Service-Oriented Strategy Formulation Method

The service-oriented strategy formulation method [39] developed based on the general strategy formulation from the strategic management field that was modified to merit the servitization characteristics [90]. Figure 2 illustrates how the proposed method supports the formulation of service-oriented strategies for servitization of a manufacturing company through four steps.



**Figure 2.** Initial version of the service-oriented strategy formulation method (adapted from [39]).

Step 1 is the contextual data collection of the company, customers, and potential competitors following the predefined required contextual data, as illustrated in Table 3. The alternative data sources are the internal company database, customer survey, competitor annual reports, external consultant reports, or general business forecasting reports. This step provides the evidence-based considerations for analysis. These data present primary data regarding company conditions not only from the internal perspective but also from the business environment profile. The output of this step is the company's contextual data.

Step 2 is the context analysis in which the company evaluates its position from internal and external perspectives. The internal capability analysis relies upon the comparison of the company's current condition with the required capabilities for servitization (Table 1). Meanwhile, the business environment analysis reviews the company condition based on (E1) Industry forces, (E2) Key trends, (E3) Market forces, and (E4) Macroeconomic forces of the industry [22,23] as illustrated in Table 2. In detail, there are 35 assessment indexes coded as Q covering 17 evaluation of capability analysis and 18 evaluation of business environment forces. These indexes measure the company's performance of the identified capabilities for servitization (capability analysis) and its current position in business competitions (external forces analysis). The company needs to score its performance of each index using the Likert Scale from 1 to 5. To support the company to define the assessment score, a guideline

that describes the condition of the maximum score (5) and the minimum score (1) for each index is available. Moreover, each index correlates to the contextual data collected in Step 1. Therefore, the company can perform evident-based assessments based on those data to ensure a focus and reliable assessment.

The output of Step 2 is the assessment results presented in a score recapitulation table and radar chart. This output provides the identification of the company's strengths, weaknesses, opportunities, and threats (SWOT) following the assessment score of each internal and external factor. If an internal factor has a cumulative score of more than 3, this point presents the strength of the company. However, if the score is equal or less than 3, it represents the company's weakness. The business environment analysis also applies the same mechanism to determine opportunities and threats. The identification of strengths, weaknesses, opportunities, and threats in this proposal is different from the original SWOT analysis in which the analyst can loosely list strengths, weaknesses, opportunities, and threats of the company [91]. This modification of SWOT analysis to the structured assessment aims to restrain fuzzy and unfocused discussion. This mechanism affords the company to assess its condition compared to the required capabilities and business environmental scanning (as reflected in a set of indexes) for servitization. As a result, the future formulated strategies can be targeted to the improvement of the shortcoming capabilities by carefully considering the external business spectrum. Moreover, the radar diagram presents a clear visualization of the current condition compared to the desired capabilities for servitization.

Step 3 is the capability targeting as the focus of service-oriented strategy formulation. This step allows the company to set its priority on what capability intends to be improved. Considering the company's limited resources (time, finance, and labor), setting a specific target is crucial to ensure the formulated strategies remain rational and achievable.

Step 4 is the formulation of service-oriented strategies for servitization. The SWOT matrix [90] is adopted to facilitate the strategy formulation. The company can formulate a strategy by simultaneously considering more than two components listed in the SWOT matrix. For instance, the company utilizes its current strength to improve its weakness and prevent external threats. The proposed method was developed upon the requisite capabilities for servitization. Therefore, the formulated strategies are in the consistent tract with capability development for servitization. A spreadsheet-based supporting tool was also introduced [39] to improve the applicability of the proposal.

#### 4. Case Study Application and Result

Company A is a Japan-based manufacturer with main business focus in the development, manufacture, sale, and maintenance of office machinery. It has long engaged in the domestic and global markets with an excellent product quality image in the retail solution and the printing solution businesses. Both business groups provide integrated product-services with a wide range of varieties to meet its business-to-business customers. The retail solution group's main focuses are point-of-sale (POS) systems, multifunction devices, and auto-identification (ID) systems. The printing solutions group targets multifunction devices, auto-ID systems, inkjet heads, and other related products.

Although it has a strong image as an excellent machinery producer, Company A has long been attracted to the PSS concept. The potential financial benefits of PSS significantly trigger the servitization of this company. In particular, the top management regards servitization as a means to retain its customers to secure the long-term revenue stream. Its deliberate endeavor to provide PSS is well reflected through the provision of services beyond conventional maintenance, such as engineering manufacturing services and digital signage solutions. Consequently, Company A has built an ability to produce and deliver solutions effectively (PSS design capability) by considering customers' needs during the extended product life cycle.

However, several considerations have led this company to strive for significant yet rational improvement of its servitization planning and implementation. One of the biggest challenges faced by Company A is the product-oriented perspective remains as the dominant mindset behind the company's innovation. This perspective prevents more proactive development of service-dominant

offerings that have high potential market benefits in the tight Japan manufacturing market. The current service transition focuses on the efforts to restrain customer loyalty and maintain its market share. In other words, Company A has not yet regarded servitization as the company's strategic decision. Instead, it mainly considers the transition towards services as a strategy to maintain its position in the business market, in which the provision of additional services can improve product sales. The absence of a common understanding, synergy, and alignment across the organizational functions and businesses regarding servitization intent restrain the successful implementation of servitization. Therefore, despite having a strong PSS design capability, Company A acknowledges the lack of cultural readiness and organizational capability for servitization. Due to these challenges, Company A has a particular intention to adopt the proposed method for the benefit of potential improvement of its servitization planning and implementation.

#### *4.1. Result of Case Study, Phase 1*

The case study conducted in phase 1 affords the identification of potential improvements in the initial version of the proposed method. The transcribed verbatim from the discussion with Company A's board members was extracted to find important insights from the lens of PSS practitioners. This research categorizes Company A's feedback based on topic similarity to facilitate a structured discussion. There are three main insightful findings obtained from this phase that advocate the modification and improvement of the initial proposal.

During the discussion, Company A's representatives positively recognized the premise and approach of this research. They acknowledged the importance of understanding the company's current context to draw innovative and rational future action plans. Specifically, they believed to understand its position in the business and industry competition spectrum through the internal capability and business environment analysis. The General Manager mentioned "We are familiar with SWOT analysis or PEST analysis to understand our business position internally and externally. The proposal, especially the external environment, has the same point of view as us".

However, Company A's board members highlighted that the proposed method lacks clear visualization in how the proposed method contributes to more favorable servitization planning. In particular, the board members find it difficult to visualize the connection lines among capability analysis and business environment analysis with the formulated strategy that ensures concrete and rational servitization planning: "It is called the "strategy formulation method", but I don't know the measurement/evaluation can lead to strategy formulation. I feel that the premise is not clear at such a point." They emphasized that strategy formulation is high-level decision making, that in some cases involving intangible business instincts from the decision-makers. Therefore, if the proposed method can explicitly visualize the connection of the context analysis with better servitization planning, it can more convince the high-level management to conduct the proposed method and formulate strategy in a more apparent-based manner.

Looking into detailed assessments, Company A acknowledged the relevance of each assessment index in business environment analysis and did not provide any modification recommendations. Specifically, they identified the four components of business environment analysis comprehensive and favorable to portray the business and industry competitiveness. However, they recommended several modifications of the assessment indexes in internal capability analysis involving the capability related to (C2) Customer intimacy, (C6) Service-oriented ICT and (C7) Service-oriented performance measurement system.

Customer Intimacy represents the company's capability to understand its customer needs and deliver the matched offering of those needs to acquire a close customer relationship [8,14,19]. The initial assessment indexes to evaluate this capability encompass (Q4) Value proposition, (Q5) Relationship with customers, (Q6) Company image, (Q7) Customer satisfaction, and (Q8) Customer acquisition. Company A found that value proposition is a promise of value to be co-created and delivered to the customer. In this sense, it is a means to achieve trust, loyalty, and long-term relationship with customers. However, it is not by itself a result of a particular action. "It is difficult to evaluate how well the provided value matches the needs of customers... in the case when the

company's revenue is high from a product/service (value proposition) even if it actually doesn't match customer needs". Therefore, it cannot evaluate and express how good company capability of Customer Intimacy. Instead, Company A underlined the importance of understanding the company's achievement to restrain its current customers as an integral part of Customer Intimacy. Emphasizing the urgency to obtain new customers alone is a delicate decision in the business spectrum: "I understand the importance of new customers as a point of view, but putting too much emphasis on it is delicate. If you neglect existing customers (while) there may be a viewpoint of maintenance rate (as potential revenue from service provision)". Therefore, having close and long-term relationships with customers is desirable.

Another recommendation in this category was to use a Knowledge Management System rather than (Q13) Knowledge management to assess (C6) Service-oriented ICT capability: "Every company has it (knowledge management), but the system is up to the company, such as paper, spreadsheet, or ICT system. But ICT is a good axis". Knowledge Management System specifically refers to an IT-based system developed to support the organizational processes of knowledge creation, storage, transfer, and application. Whereas Knowledge Management does not necessarily utilize IT to manage the knowledge and information of an organization. Therefore, it is necessary to emphasize the use of IT-based systems in managing the company's knowledge. Despite acknowledging the importance formalize and externalize the service-oriented skills within the organization, the board members reveal a practical difficulty faced by the company to manage the knowledge, especially the tacit knowledge related to service capability such as in the sales department. "It's difficult to judge whether a company has a knowledge management system. For example, there are significant differences between sales and technical development for how they manage knowledge. Such technical development departments, like our hardware system engineering, can formalize their knowledge by qualifications and patents. But the knowledge of sales departments is not systematically distributed and difficult to externalize and formalize. So, the evaluation results will vary depending on the department to be analyzed and the scope of the analysis".

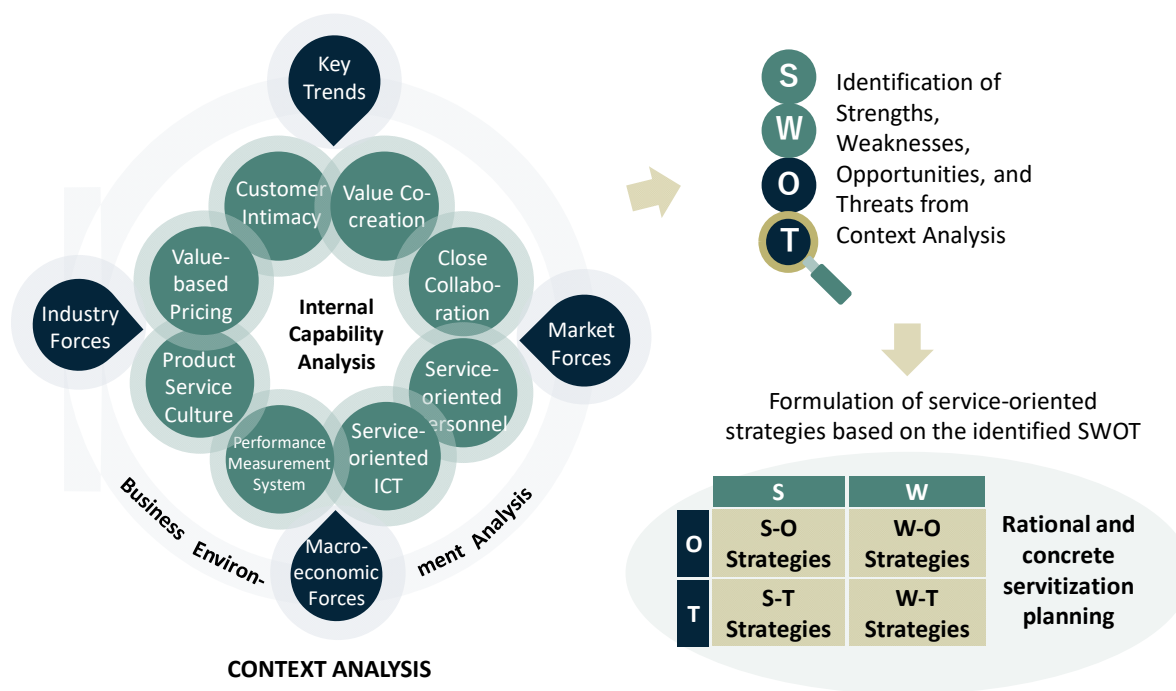
Moreover, Company A also advised that (Q15) Service-oriented bonus structure is unable to assess the company's capability related to (C7) Service-oriented performance management. A bonus structure is only a partial component of a company's performance management: "We acknowledge the necessity of a suitable evaluation system for servitization because it is not proper to evaluate an employee by only the sales of the service". We are thus unable to analyze comprehensively how the company manages its performance. Therefore, Company A advocated the use of the Service-Oriented Performance Management System as the assessment index of this capability.

Consequently, this research needed to alter the corresponding contextual data, following the feedback to the assessment indexes. Besides, the board members additionally recommended a new contextual data to support assessment index of (Q17) Organization alignment, namely PSS and servitization policies. The supporting tool also received modifications following the revision of the initial proposal. Section 4.2 presents detailed modification and improvement of the initially proposed method.

#### *4.2. The Final Version of Service-Oriented Strategy Formulation Method*

To address the feedback from the case study in phase 1, the initial version of the proposed method received several modifications and improvements. The initial proposal promotes the formulation of service-oriented strategies through a sequential step approach. This approach provides a detailed step-by-step procedure. However, the practitioner perceived it is hard to comprehend how each analysis contributes to the formulation of a more concrete plan to achieve successful servitization implementation. As a response to this shortcoming, a conceptual model presented in Figure 3 introduces a conceptualization of the major premise of the proposal.





**Figure 3.** Conceptualization of service-oriented strategy formulation.

This conceptualization illustrates how capability analysis and business environment analysis connect and contribute to the formulation of rational and concrete service-oriented strategies. By conducting internal capability analysis, the company can structurally identify its strengths and weaknesses by comparing its current in-house capabilities with the necessary capabilities for successful servitization. The business environment analysis meanwhile points out its competitiveness profile leading to the identification of business opportunities and threats. Those two analyses constitute the servitization context analysis. Furthermore, by scoring the assessment indexes for internal and external factors using the Likert Scale, the proposed method facilitates the quantifying of the company's qualitative conditions. These analyses afford to an evidence-based input for the formulation of service-oriented strategies following the company's specific servitization context. As a result, servitization planning is conducted based on the evidence-based assessment. This sequential procedure reflects and enables rational and concrete planning. The conceptualization (Figure 3) introduces the proposition and the intended objective of the proposed method. It thus complements the detailed step-by-step procedure presented in Figure 2.

Furthermore, the initial proposal also obtained alterations to respond to the feedback on the detailed assessment index and corresponding contextual data. Tables 4 and 5 present the final components of internal capability and business environmental analysis, including the assessment indexes and contextual data. For example, the assessment index for (C2) Customer intimacy was modified. The value proposition was eliminated and replaced by customer retention as recommended by Company A's board members.

**Table 4.** The final version of internal capability analysis including its element, assessment index and contextual data.

Capability	Assessment Index	Contextual Data
C1. Value-based pricing strategy	Q1. Revenue from product sales	1. Total revenue from product sales
	Q2. Additional revenue from service	2. Total revenue from service provisions
	Q3. Revenue from new customers	3. Total revenue from new customers
C2. Customer intimacy	Q4. Relationship with customers	4. Type of customer relationship programs
	Q5. Company image	5. Brand/company image
	Q6. Customer satisfaction	6. Customer satisfaction index
	Q7. Customer acquisition	7. Number of new customers
	Q8. Customer retention *	8. Customer retention rate *
C3. Value co-creation with customer	Q9. Product/service innovation	9. New product/service development, patents or trademarks co-created with customer
C4. Close collaboration with partner	Q10. Close collaboration with partners	10. Type or strategy of partner relationship programs
C5. Service-oriented personnel	Q11. Service capability	Refer to Q6
	Q12. Training	11. Number, type and syllabus of training
C6. Service-oriented ICT	Q13. Knowledge management system *	12. Type and information of knowledge management system
	Q14. Customer relationship management (CRM) system	13. CRM system
C7. Service-oriented performance measurement system	Q15. Service-oriented performance measurement system *	14. Company performance measurement system
C8. Product service culture	Q16. Cross-functional team	15. Number and information of cross functional project
	Q17. Organization alignment	16. PSS and servitization policies *

\* The modified or new element added based on the case study, phase 1.

**Table 5.** The final version of business environment analysis including its element, assessment index and contextual data.

Element	Assessment Index	Contextual Data
E1. Industry forces	Q18. Competitors	17. Number of current competitors and their strong point
	Q19. New entrants	18. Number of new entrants and their strong point
	Q20. Substitute products or services	19. Possible substitute products/services
	Q21. Bargaining power of suppliers	20. Type or strategy of partner relationship programs
	Q22. Bargaining power of buyers	Refer to Q4, Q6, Q8
E2. Key trends	Q23. Technology trends	21. Technology trends

Element	Assessment Index	Contextual Data
E3. Market forces	Q24. Regulatory trends	22. Regulatory trends
	Q25. Societal and cultural trends	23. Societal and cultural trends
	Q26. Socioeconomic trends	24. Socioeconomic trends
	Q27. Market issues	25. Market issues
	Q28. Market segments	26. Market analysis
	Q29. Needs and demands	Refer to Q28
E4. Macroeconomic forces	Q30. Switching costs	Refer to Q4, Q6, Q8
	Q31. Revenue attractiveness	Refer to Q4, Q6, Q8
	Q32. Global market conditions	27. Global market condition
	Q33. Capital markets	28. Capital markets
	Q34. Commodities and other resources	29. Commodities and other resources
	Q35. Economic infrastructure	30. Economic infrastructure

The asterisk symbols in Table 4 interpret the modifications of the assessment indexes and contextual data of the proposed method. Based on this modification, this research conceptualizes the servitization context as the internal and external context. The internal context represents the manufacturing companies' current position concerning the eight required capabilities for effective servitization, as presented in Table 4. Meanwhile, the external context depicts the companies' current position in the external business environment involving four main forces (Table 5). In detail, the analysis of the servitization context requires a thorough assessment by scoring the final 35 assessment indexes supported by 30 associated contextual data. This quantitative-based analysis of the servitization context of manufacturing companies leads to the formulation of service-oriented strategy formulation more accurately. The following is a summary of the final version of the proposed method. The supporting tool was also updated following these modifications. The case study in phase 2 then applied this final version of the proposed method.

#### 4.2.1. Step 1 Contextual Data Collection

Based on the associated data of each assessment index (Tables 4 and 5), Step 1 covers the collection of the required contextual data. Companies can obtain the required data by investigating the internal database, customer survey, market survey, competitors' annual report, and other data sources. The amount of collected data is likely to be enormous considering there are 30 different required data types. Consequently, it may lead to the considerable requirement of resources, including time and labor, to extract and connect specific data to a specific assessment index. Therefore, this research introduces a tool called Contextual Data Input (Figure 4) consisting of a form and a database to input the required data to improve the effectiveness and efficiency of the data collection process.

No	CONTEXT	Our company (Click)	Competitor A (Click)	Competitor B (Click)
1	Total revenue from product sales	<div>Our company</div> <div>1. What is the total revenue from product sales?</div> <div></div> <div>Next Fin</div>		
2	Total revenue from service provisions			
3	Total revenue from new customers			
4	Types of customer relationship programs			
5	Brand/company image			
6	Customer satisfaction index			
7	Number of new customers			
8	Customer retention's rate			
9	New product/service development, patents or trademarks co-created with customer			
10	Type or strategy of parter relationship program			

Figure 4. Contextual Data Input (partial illustration).

The Contextual Data Collection Tool is a structured database in which analysts can put specific data that will be correlated to a specific assessment index in the following step. This inputted data support Context Analysis (Step 2) as the evident-based consideration. This step does not only collect the company's data, the supporting tool also covers the contextual data collection for pre-defined company's competitors for the benefit of business environment analysis. This tool enables the analyst to automatically recall specific data or information in the following steps.

#### 4.2.2. Step 2 Context Analysis

Step 2 is the context analysis in which the company comprehensively analyzes its servitization context covering internal context (internal capabilities for servitization) and external context (business environment forces). This step determines the company's current condition in the sense of whether it possesses the required capabilities for servitization and how strong its position in business competition. For this purpose, this research introduces a supporting tool "Company Evaluation Sheet" (Figure 5) that facilitates the evaluation of each assessment index.

Capability	Assessment Index	Description of the Maximum Score (5)	Description of the Minumun Score (1)
C1 Value-based pricing strategy	Q1 Revenue from product sales	Our revenue stream from product sales is sustainable	Our revenue sustainability from product sales is questionable
	Q2 Additional revenue from service provisions	We get significant revenue because of provision in our service	
	Q3 New revenue from the new customers	We get significant revenue from the new customers	

Please set a score

Q1 Revenue from product sales

Description of Score 5  
Our revenue stream from the product sales is sustainable

Description of Score 1  
Our revenue sustainability from product sales is questionable

Reference Data

My company

Competitor 2

1  
2  
3  
4  
5

Next OK

Figure 5. Context Assessment Sheet (partial illustration).

During the scoring of an assessment index, this tool summons the correlated contextual data inputted in the previous step as an evidence-based consideration. This mechanism helps analysts to perform the data-driven assessment by eliminating the burden to search corresponding supporting data. Besides, the Company Evaluation Sheet also displays the related data of competitors. This information adds a perspective of business competitiveness preventing irrational or biased scoring.

Furthermore, this research utilizes the Likert Score (1–5) to score the assessment indexes. The technical definition of the maximum score (5) and the minimum score (1) are available to support the analysis. As an illustration, in assessing (Q1) Revenue from product sales as one of the indexes for (C1) Value-based pricing capability, the analyst can provide the maximum score (5) if the company's revenue stream from the product sales is sustainable and otherwise if the revenue sustainability from product sales is questionable the given score is the minimum score (1). Finally, the tool automatically integrates the result of internal capability and business environment analysis. The output of Step 2 is a recapitulation table and a capability radar chart, as illustrated in Figure 6.

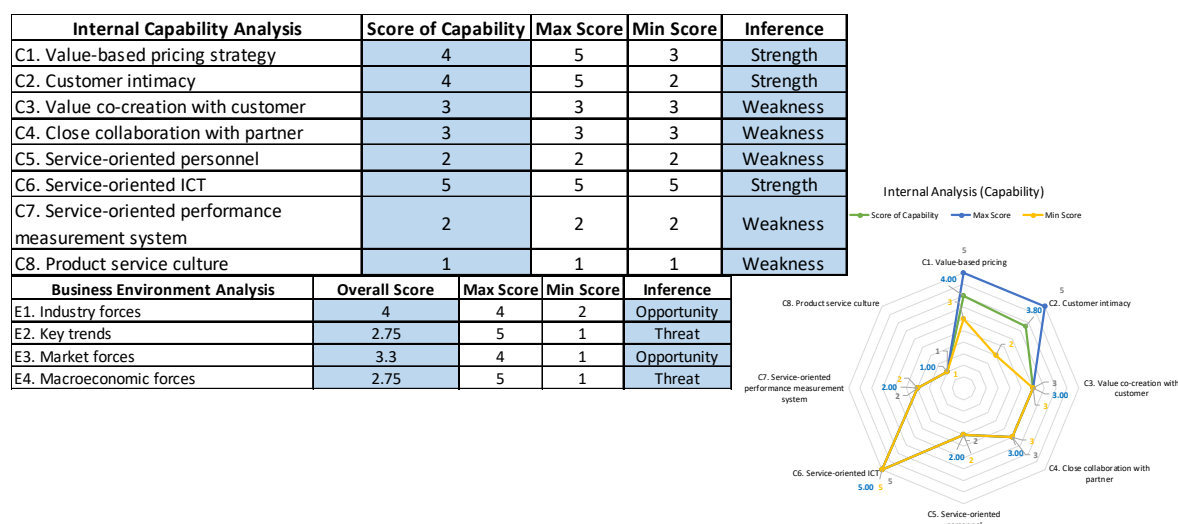


Figure 6. An illustration output of the context analysis (dummy data).

The capability radar chart (Figure 6) presents the capability profile of the company compared to the required capability for successful servitization. In addition, the recapitulation table provides the detailed scores of each capability and business environment element. A capability score is the average score of the corresponding assessment indexes of capability. For instance, the score of capability (C1) Value-based pricing strategy is obtained by averaging the given scores of (Q1) Revenue from product sales, (Q2) Additional revenue from service, and (Q3) New revenue from new customers. The company can determine its strength and weakness by inferring each capability's score. If a capability score is more than 3, this capability is a strong point of the company (strength). However, if the score is equal or less than 3, it represents the company's weakness. The same mechanism is applied in business environment analysis to identify the company's opportunities and threats.

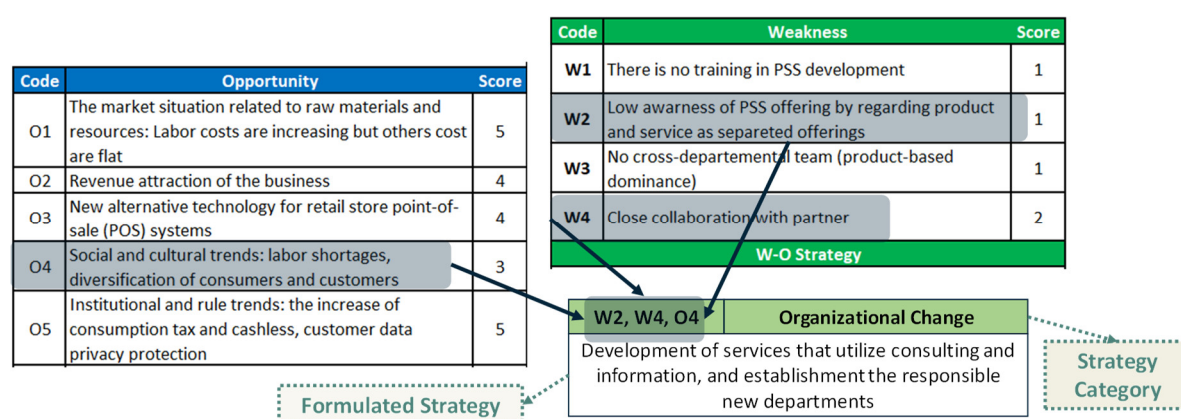
#### 4.2.3. Step 3 Capability Targeting

Step 3 affords the possibility to determine the target capabilities as the focus of service-oriented strategy formulation. This step is relevant for the company with limited resources so that it can prioritize the improvement target of particular capabilities in a specific period. This step is crucial to ensure the company formulates rational and achievable service-oriented strategies. Step 3 specifically prevents the company from over-planning by neglecting the resource limitation and commitment. However, the company can omit Step 3 if it has sufficient resources and commitment to improving overall capabilities for progressive servitization.

#### 4.2.4. Step 4 Service-Oriented Strategy Formulation

Step 4 represents the service-oriented strategies for servitization by using the SWOT matrix [90]. The recapitulation table from Step 2 provides identified strengths and weaknesses from the internal capability analysis as well as opportunities and threats from the business environment analysis. The recapitulation table (Figure 6) lists the summarized SWOT elements of the company. This list is then transferred to the designated column in the SWOT matrix. The company is allowed to provide a more detailed statement in the SWOT matrix that complements the summary statement in the recapitulation table. For instance, the company has opportunities from industry forces, as shown in the example of recapitulation table (Figure 6). If the company regards this information lack of detail, the company can mention more detailed information such as by using the correlated assessment indexes from industry forces. Therefore, (Q18) Competitors, (Q19) New entrants, (Q20) Product/service substitutes, (Q21) Bargaining power of suppliers, and (Q22) Bargaining power of buyers can replace the (E1) Industry forces as the company's opportunities.

SWOT Matrix is a strategy formulation tool that combines the company's internal factors (strengths and weaknesses) with business environment forces (opportunities and threats). Figure 7 depicts an illustration example how to formulate a service-oriented strategy by using SWOT Matrix. The company formulates a strategy by simultaneously considering more than two SWOT elements listed in the SWOT matrix, for example, the company utilizes its current strength combined with a business opportunity to improve its weak point. This process ensures the company can formulate rational and concrete service-oriented strategies since the formulation relies upon the actual and real company's condition compared to the required servitization capabilities as well as the business competitiveness.



**Figure 7.** An illustration example how to formulate a service-oriented strategy by using the case study, phase 2 data (partial strengths, weaknesses, opportunities, and threats (SWOT) Matrix).

#### 4.3. Result of Case Study, Phase 2

This research applied the final version of the proposed method in Retail Solutions Business Group of Company A. The application of the proposal deliberately conducted in only one business group of Company A to ensure a focused planning and actual implementation of the formulated strategies. As a precondition, Company A identified one major competitor within the Japan office manufacturing industry. The competitor holds the second highest market rate in Japanese retail solutions and have involved in the same business for over 20 years.

The team from Retail Solutions Business Group followed the step by step procedure to formulate service-oriented strategies. They utilized the internal company database, customer survey, and competitors' annual reports to collect the required contextual data. The detailed contextual data cannot be presented in this article due to the data confidential. Company A deliberately omitted Step 3—Capability Targeting by considering its intention and commitment to improve servitization planning. Figure 8 presents the illustration of the case application of the proposed method in Company A. Company A was able to formulate the service-oriented strategies through this application, as shown in the SWOT Matrix in Figure 9. The representative from Retail Solutions Business Group proposed these formulated service-oriented strategies to Company A's board members to be further discussed and ratified as the company's new action plans for the benefit of its servitization.



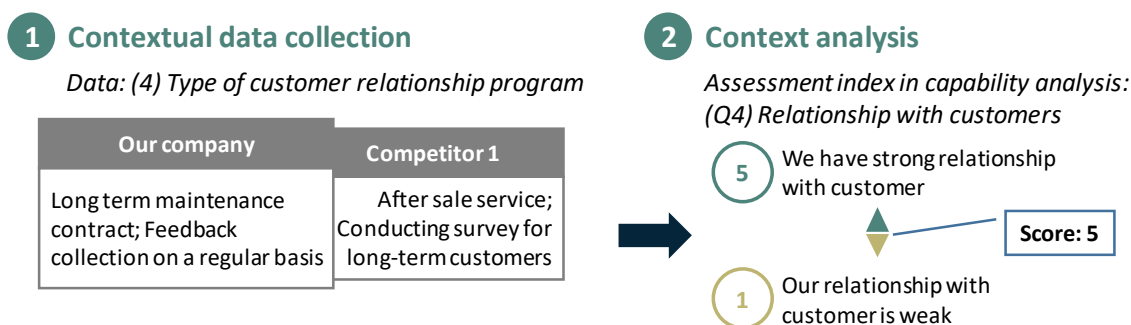


Figure 8. Illustration of the case application for Step 1 and Step 2.

Upon the completion of the strategy formulation, Company A representatives responded to the open-ended questions to evaluate the success of the proposed method. The questionnaire, in particular, investigated their perceived usefulness of the proposal in two following issues: (1) The proposed method supports the comprehensive analysis of the company servitization context; (2) The proposed method facilitates the formulation of a service-oriented strategy for the benefit of servitization planning. Besides, the questionnaire also questioned their degree of intention to apply the proposed method in real practice. The success of a proposed model is defined in two dimensions, first whether it can achieve the intended objectives perceived by the users and second, whether it is intended to be adopted in real practice [74].

Code	Strength	Score	Code	Weakness	Score
S1	High customization level as a means to achieve customer intimacy	3	W1	There is no training in PSS development	1
S2	Value co-creation with customers	3	W2	Low awareness of PSS offering by regarding product and service as separated offerings	1
S3	Service-oriented ICT	4	W3	No cross-departmental team (product-based dominance)	1
S4	High revenue from product sales and maintenance services	5	W4	Close collaboration with partner	2

Code	Opportunity	Score	S-O Strategy		W-O Strategy	
O1	The market situation related to raw materials and resources: Labor costs are increasing but others cost are flat	5	S4, O4	Innovation	W1, W2, O4	Human Resource
O2	Revenue attraction of the business	4	Use revenue as development costs to develop new PSS business model that solves social problems such as shortage of human resources		Improve the human resources with the capability to develop and provide consulting services using information and system, recruit new human resources with service-capability	
O3	New alternative technology for retail store point-of-sale (POS) systems	4			Providing information-based services such as system-based consulting and value-added product services	
O4	Social and cultural trends: labor shortages, diversification of consumers and customers	3	S1, O7	Innovation	W2, W4, O4	Innovation
O5	Institutional and rule trends: the increase of consumption tax and cashless, customer data privacy protection	5	Leveraging the biggest competitor with higher market share to co-design with customers		Development of services that utilize consulting and information, and establishment the responsible new departments	
O6	Buyer negotiation skills	4			"Escape from hardware" is promoted as an organizational policy. Develop a system that can coexist with alternative products (tablets and PCs)	
O7	Strong position from business competitors (high market share)	3				

Code	Threat	Score	S-T Strategy		W-T Strategy	
T1	Economic infrastructure: There is no positive change	2	S4, T3, T7	Customer Perspective	S4, T6	Operations Management
T2	The capital market situation	1	Enhance customer relationship management		Working with partners responding to market issues	
T3	Global Market Situation: Global dependency on the Chinese economy (Downward Trend), UK exits from the EU	1	S4, T8, T6	Innovation	S1, T4	Innovation
T4	Needs: labor shortage resolution, labor cost reduction	2	Use revenue as development costs to develop PSS that solves social problems such as shortage of human resources		Agile development with customers based on demonstration experiments	
T5	Market segment growth: Market segment growth: point-of-sale (POS) markets are decreasing as the number of population is fall	1			Improve the company specialization in products and build a partnership with a company with strong service capability to run the PSS business model.	
T6	Market issues: unmanned stores, RFID, Amazon, etc.	2				
T7	Economic Trends: Calming down depends on China's recession	1	S1, T4	Operation Management	S1, S4, T4, T8	Innovation
T8	Technical trends: Image recognition (recognition of products and people), sensing (information acquisition), AI	2	Review the fee system (pay only for what you use)		Co-creation of a innovative product-service called Point of X	
T9	Seller negotiation skills	2				
T10	The increase of product/service substitutions for retail stores	2				
T11	The increase of product/service substitutions for new retailers	2				

Figure 9. Result of the case application.

The practitioners provided positive responses to the proposed method and its application. They emphasized that the proposed method affords the comprehensive analysis of the company's contextual condition under the servitization direction. The detailed component of contextual

assessment allowed a comprehensive evaluation of the company's internal and external contextual analysis. Specifically, the proposal yielded favorable output despite the minimum practitioners' specialized knowledge in organizational capability and business environment scanning. It finally resulted in a focus and rationale identification of the company's strengths, weaknesses, opportunities, and threats.

Moreover, the practitioners also perceived the proposed method practicality to support the formulation of service-oriented strategies. They declared that the formulation strategic goals were feasible following the contextual analysis result of the company. The formulated strategies by the proposed method fully considered the actual situation of the company. Therefore, these strategies would lead to more concrete servitization implementation. A representative from Engineering and Design Division emphasized "Analysis is possible without expertise in servitization. This method allowed us to formulate strategic objectives based on the results of the analysis of the context of corporate". Furthermore, the practitioner explicitly expressed the intention to use the proposed method in the real practice, in which it presented the second dimension of the proposed method success. "The strategic objectives formulated by this method take into account the actual situation of enterprises in the POS system and can be practically used as a policy for the implementation of the service".

## 5. Discussion

Service-based capability development is regarded as a key success factor for effective servitization [14,19,28–30]. Research in this area has focused on the identification of necessary capabilities or processes for effective servitization. Nevertheless, the majority of the literature proposed general capabilities or processes [14,19,29,33], while capability requirements of manufacturing companies may vary following different servitization contexts. Moreover, despite considerable contributions in this area, little is known about how a manufacturing company can plan its servitization implementation. Specifically, a prescriptive-based method supporting how the company executes servitization and develops necessary service-oriented capabilities remains sparse [34,35].

This study sought to overcome those shortcomings by proposing a service-oriented strategy formulation method. The proposed method enables manufacturing companies to analyze their servitization context so that the identification of necessary service-based capabilities can be conducted appropriately. The proposal also supports the formulation of the strategic logic of servitization, describing the corresponding development actions to acquire the required capabilities. The initially proposed method documented in a previous publication [39] was reviewed by PSS practitioners (the case study, phase 1), securitizing its accuracy and reliability to support the intended objective of the proposal. Based on this result, the initially proposed method received modifications and improvements, resulting in the final version of the service-oriented formulation method applied in the case study, phase 2. This application has tested the practicality of the proposal to facilitate the formulation of service-oriented strategies that ensure concrete and relational servitization planning. The following subsections address the possessed research questions in detail.

### 5.1. Servitization Context as Driver and Determinant

Servitization is a context-dependent process in which a manufacturing company intends to move from the current condition (product-centric) to reach a distinct future state through service infusion [16]. This 'current condition' conceptualized as servitization context represents the company's internal and external factors affecting the decision makings within the organization, including why and how to implement servitization [34,35]. This research clarified the servitization context as the current internal capabilities of the manufacturing company (internal context) and its competitive profile in the external business environment (external context). In detail, the internal context consists of eight internal factors representing the necessary capabilities for successful servitization (Table 1). In contrast, the external context comprehensively encloses four elements of



the external business environment [88], including industry forces, key trends, market forces, and macro-economic forces.

The characterization of internal factors as the necessary capability for successful servitization is consistent with the fundamental notion of servitization as the innovation of organizational capabilities from current product-centric capabilities to service-based capabilities [1]. Therefore, it is appropriate to conceptualize the company's internal servitization context as its current capabilities compared to a trajectory of required capabilities for successful servitization. This research, moreover, translated the internal and external factors into assessment indexes and identified the corresponding contextual data to support the assessment of those indexes. This further detailing affords a structured analysis and evidence-based assessment of the servitization context. This research was built on the works of Baines et al. [34] and Bigdeli et al. [35] by providing a more comprehensive explanation of the servitization context. Specifically, this study further defined the elements of the servitization context and put the servitization context analysis into practice.

Extent literature regards the servitization context as a driver of why a manufacturing company embarks on the servitization journey and who influences this management decision [35]. It is a rationale to a question of what was the situation when the change occurred or when should the change take place? [34]. However, this research revealed that the company's contextual condition affects the transformation towards services not only as a driver but also as a determinant of success. Servitization context is a point of departure in which determines the alternative pathways in how manufacturing companies implement servitization intent, as represented by the formulated service-oriented strategies. The internal context, as the current internal capabilities of the company, implies the organization's strengths and weaknesses. Meanwhile, the company's position in the external business environment provides a spectrum of industry opportunities and threats. This comprehensive overview of internal and external context enables the company to consciously exploit its internal strengths and business opportunities while concurrently strive to improve organizational weaknesses and mitigate the foresight business threats. By its means, manufacturing companies can formulate service-oriented strategies for servitization more concretely and accurately. Therefore, this research extends the existing assumption that the servitization context is merely a rationale behind a manufacturing company's decision to carry out servitization. More than that, the servitization context is also a determinant of success in how a manufacturing company constitutes the strategic logic of servitization implementation.

## 5.2. Necessary Capabilities for Servitization Considering Contextual Situation

Servitization demands the development of new service-oriented capabilities [28,33] as developing and delivering product-service offerings require different resource-capability configuration from those used for selling pure products [34]. Research contributions in capability development of servitization thus continue to progress. In particular, previous studies have introduced an extensive list of necessary capabilities for successful servitization.

This research identifies and organizes the necessary capability for servitization in the extant literature based on the four strategic perspectives of a balanced scorecard. This arrangement provides a holistic understanding of the required capabilities for servitization across business activities at different organizational levels. This holistic view aims to promote a common and understandable point of reference to the organizational transition itself and necessary capability development across functions. On the contrary, the extant literature typically identified and introduced servitization capabilities based on function-specific practices [26], such as capabilities for service components (e.g., product life-cycle services, process support services) [28,30] or capabilities for particular business activities (such as business model design, network management) [14,19,29,38]. Albeit providing detailed capabilities in specific practices, those previous studies lack a clear conceptualization of how the identified capabilities are interconnected across functions in assisting companies to achieve servitization.

Furthermore, the majority of previous research in this area merely focuses on introducing the general capabilities for servitization, neglecting the fact that the capability requirement may vary

considering the different servitization context. This research meanwhile has proposed the servitization context analysis (Step 2 from the proposed method) to identify the necessary capabilities for servitization more appropriately. This appropriate identification depends upon a thorough assessment of the company's current internal capabilities (internal context) using 17 assessment indexes (Table 4) based on the identified necessary capabilities for successful servitization. The index scoring mechanism supported by contextual data further facilitates an accountable and evidence-based analysis resulting in a visualized company internal condition as presented in a radar chart. This quantitative-based capability assessment yields an appropriate and apparent identification of the servitization capability gap for manufacturing companies.

This study has adopted the resource-based view and focused on operational capability for servitization. However, the process and the expected outcome of the proposed method in striving for new operational capabilities in services represent the elements of dynamic capabilities, as disaggregated into sensing, seizing, and reconfiguration. Step 1 and Step 2 of the proposed method enable manufacturing companies to 'sensing' the opportunities of the emerging service market through the internal and external context analysis. It then involves 'seizing' these opportunities and converting them into strategic responses by formulating service-oriented strategies (Step 3 and Step 4). Finally, the companies' 'reconfiguring' operational capabilities due to the emerging new service-oriented capabilities are assessed. In this sense, this research agrees with the work of Gebauer et al. [33] that dynamic and operational capabilities co-evolve over time. Managing this co-evolution is likely to be the key to success along the transformation pathways [33].

The result of the case study, phase 2 shows another underlying aspect of capability development. Based on the formulated service-oriented strategies (Figure 9), Company A favors establishing a collaboration with external partners with strong service capabilities to run the PSS business model. This empirical evidence describes a different possible approach to develop the necessary capabilities in the move from products to services. As emphasized by Paiola et al. [28], manufacturing companies may internally develop the required capabilities or establish close collaboration with external partners whose strong service-oriented capabilities are beneficial for the companies. Relying on the external development of capabilities (such as by outsourcing to partners) is feasible and desirable as it enables manufacturing companies to specialize in their core competence.

### 5.3. Service-Oriented Strategies as Strategic Logic of Servitization

The result of case study, phase 2 revealed that a manufacturing company possibly has a great intention to carry out servitization (such as for customer retention strategy in the case of Company A). However, the company completely lacks a clear conceptualization of how it aims to implement servitization. Meanwhile, effective servitization demands a clear understanding of organizational strategic logic. This logic represents by what manner the company intends to achieve the targets of servitization through coordinative capabilities and resources [26].

Based on the case study in phase 2, the proposed method has successfully guided the manufacturing company to establish concrete and rational action plans to implement servitization. The proposed method enabled the formulation of service-oriented strategies as the strategic logic of servitization in Company A by comprehensively understanding the company's position internally and externally. This research specifically prescribes how a manufacturing company can implement servitization and develop the necessary capabilities for servitization by:

- Facilitating the identification and collection of required data that portray the company's internal capabilities, competitiveness profile, and other business environmental forces (Step 1)
- Enabling the assessment of servitization context through internal capabilities and business environment analysis in detail and practicable by providing the structured assessment based on the modification of SWOT analysis (Step 2)
- Supporting the appropriate identification of the necessary capabilities for servitization following the manufacturing company's specific context (Step 2 and Figure 6)

- Supporting the formulation of service-oriented strategies for servitization, which represents the strategic logic and capabilities development plan, by providing the assessment results using the SWOT Matrix (Step 4)
- Facilitating effective and efficient contextual analysis and service-oriented formulation by introducing the supporting tool (Figures 4 and 5)

In contrast, previous studies mainly focus on the explanatory description of how servitization has occurred and succeed in certain past cases [38].

Moreover, the proposed method facilitates the progression of the servitization of a manufacturing company through rational planning. The method affords a systematic approach for the company to progress the realization of its servitization concretely through:

- Deploying the servitization into more manageable strategies;
- Promoting rational servitization implementation as the service-oriented strategies are formulated upon the manufacturer's specific conditions;
- Facilitating the achievement of internal alignment of its servitization intent between the strategic and operational levels of the company.

Furthermore, the formulated service-oriented strategies can be linked and mapped into a strategy map of servitization. This research thus extends the work of Rabetino et al. [26] by prescribing the formulation of key practices central to servitization implementation at different organizational levels as the input of the establishment of a strategy map of servitization.

## 6. Conclusions

The present study was conducted to support the strategic planning of manufacturing companies' servitization, including how the companies develop the required capabilities for successful servitization. The contribution of this study is threefold. First, this research explicates the servitization context of a manufacturing company by defining the factors of inner and outer context more comprehensively. This characterization was based on the necessary capabilities for successful servitization (internal context) and four dimensions of the external business environment (external context). In contrast, the previous conceptualization of the servitization context directly adopts the general change in management theory [34,35].

Second, this research contributes to the extant literature by involving context analysis in the formulation of service-oriented strategies for servitization. The resulting method facilitates manufacturing companies' strategic planning for concrete and rational servitization implementation. The literature, for the most part, proposes general guidelines or capabilities by neglecting the compatibility with servitization context. In contrast, this research responds to the call for a deeper understanding of how a manufacturing company can develop necessary capabilities [19,30] following its servitization context.

Third, as a managerial contribution, this research practically facilitates the formulation of strategic logic for servitization implementation. By looking beyond the urgency to develop new service-oriented capabilities and simultaneously considering the servitization context, this research proposes a practical method facilitating the development of service-oriented strategies. This method supports manufacturing companies' strategic planning and effective strategy implementation of servitization. Although previous studies have introduced numerous necessary capabilities for servitization [29], they lack a detailed prescriptive approach for practical application in other servitization cases.

Despite contributing to filling the research gaps, several limitations call for further investigations. This research merely introduces a means to improve the servitization planning, leaving the realization and implementation of the formulated service-oriented strategies under the company's control. Successful servitization requires not only rational planning but also the concrete implementation of those plans. This fact opens further research opportunities focusing on the progress monitoring of the realization of servitization planning.

Another limitation of this research is the requirement of a skilled and experienced analyst in strategy formulation to ensure the formulated strategies are favorable for the company. As highlighted by the board members of Company A, strategy formulation is high-level decision making. It involves intangible business instincts from the decision-makers that are shaped through long term business experiences and expertise. The proposed method provides a means to support this process. However, the skilled and experienced analysts are essential to ensure that the formulated strategies are favorable for the company's shareholders and stakeholders. Finally, this research only provided the case application in a single PSS company in Japan. Future empirical work is required to further test the service-oriented strategy formulation method in a broader group of servitization manufacturers in different contexts and industry sectors.

**Author Contributions:** Conceptualization, M.S., T.M., Y.M. and Y.S.; Data curation, M.S., T.M. and Y.M.; Formal analysis, M.S. and T.M.; Investigation, M.S. and T.M.; Methodology, M.S. and T.M.; Project administration, Y.M.; Resources, Y.M. and Y.S.; Supervision, Y.S.; Validation, M.S., T.M., Y.M. and Y.S.; Visualization, M.S. and T.M.; Writing—original draft, M.S.; Writing—review & editing, M.S., Y.M. and Y.S. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Acknowledgments:** The authors would like to thank the participation of Company A for its engaged collaboration, opportunity, and cooperation that made this research project happen.

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

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