

## From Product-Centric to Service-Centric Manufacturing: A Systematic Review of Servitization Capabilities, Challenges, and Business Model Transformation.

Shovan Bhattacharya<sup>1</sup>, Dr. Rajendra Prasad Sharma<sup>2</sup>

<sup>1</sup> Research Scholar, Indian Institute of Foreign Trade (IIFT), Kolkata, West Bengal, India.

Email: shovan\_phdmp19@iift.edu

<sup>2</sup> Professor and Head, Indian Institute of Foreign Trade (IIFT), GIFT City, Gujarat, India.

Email: rpsharma@iift.edu

### Corresponding Author:

Shovan Bhattacharya

Research Scholar, Indian Institute of Foreign Trade (IIFT), Kolkata, West Bengal, India.

Email: shovan\_phdmp19@iift.edu.

### ABSTRACT

Manufacturing firms are increasingly moving from product-centric logic to service-centric and digitally enabled solution logic. This shift is commonly discussed as servitization. Recent studies show that servitization is no longer limited to after-sales support, spare parts, maintenance, and repair. It now includes data-driven services, platform-based solutions, predictive maintenance, outcome-based contracts, artificial intelligence-enabled product-service innovation, and ecosystem-based value co-creation. This review synthesizes peer-reviewed work published during the ten-year period 2016-2025. The paper examines three questions: what capabilities enable servitization, what challenges restrict the transition, and how servitization changes manufacturing business models. The review identifies six capability groups: strategic service orientation, digital and data capability, customer co-creation capability, ecosystem orchestration capability, organisational change capability, and sales and value communication capability. It also provides a list of challenges, including the servitization paradox, value-capture difficulty, digital complexity, organisational, and cultural challenges. resistance, lack of sales force alignment, data-governance risk, and poor performance measurement. The paper suggests a framework for an integrated capability challenge-business model. It argues that to achieve success in servitization it is essential that there is alignment between the value proposition, value delivery and value capture. and ecosystem governance. The paper adds to the literature by summarizing the last decade of papers. From the practical research perspective, it provides a framework to be followed and a future research agenda for management and operations, Marketing, and innovation research. The authors emphasize that the term servitization is not synonymous with digital servitization, nor is it the same as addressing the product-service system in manufacturing companies. The three key concepts are dynamic capabilities, business model transformation and advanced services...

### INTRODUCTION

Manufacturing companies from all sectors are facing the challenge of going beyond the conventional sales of physical products. Global Competition, Product Commoditization, Rising Customer Expectations, and the Proliferation of Digital Technologies have jeopardized the sustainability of product-based activities. strategies. Customers do not just want equipment or machines anymore. They increasingly demand uptime, availability, performance, productivity, energy efficiency, life cycle support, and measurable. business outcomes. Finally, this change has inspired manufacturers to attach services to their products and to Reimagine their businesses from a product-service integration perspective.

Servitization is the shift from selling products to providing services, solutions and outcomes. Within product centric model, the manufacturer is the one that is creating value

primarily in the design, The creation, quality and distribution of tangible products. In a service-centric model, the manufacturer value creation is achieved over the lifetime of the product, through the ongoing improvement of the process, and based on data. Relational exchanges and long-term support. Work published during the 2016-2020 period clarified the definitional boundaries of servitization, de servitization, digitization, supply-chain interdependency, and digital business model change (Baines et al., 2017; Kowalkowski et al., 2017; Martín-Peña et al., 2018; Raddats et al., 2019; Vendrell-Herrero et al., 2017). More recent review studies indicate that servitization research has matured from a narrow focus on service in addition to a broader discussion of capabilities, business model innovation, ecosystems, digital platforms, and performance outcomes (Khanra et al., 2021; Minaya et al., 2024; Shen et al., 2023).

Literature has also changed because servitization is now closely connected with digital transformation. Digital

technologies such as the Industrial Internet of Things, sensors, cloud platforms, analytics, artificial intelligence, digital twins, automation, and remote monitoring allow manufacturers to collect product-use data and convert it into service value. This development is known as digital servitization. It supports new offerings such as predictive maintenance, condition-based monitoring, fleet optimisation, remote diagnostics, product-as-a-service, subscription models, and outcome-based contracts. Favoretto et al. (2022) argue that digitalization fundamentally changes the transition toward services because it reshapes offerings, processes, organisational design, customer relationships, and business models. In fact, Chirumalla et al. (2023) demonstrate that Specific dynamic capabilities are needed for the transition from servitization to digital servitization. micro foundations.

Despite the opportunities, servitization is still challenging. The problem is that many manufacturers are having difficulty capturing. Financial value of services. This challenge is commonly referred to as the servitization paradox, in cases where companies are making significant investments in the level of service they provide but are not seeing immediate returns. Recent research demonstrates that digitalization has a positive effect on performance, if digital. Strategic, relational, organisational and value capture capabilities support investments. (Abou-Foul et al., 2021; Chen et al., 2023). Manufacturers also face challenges of organisational the causes of this range from inertia, poor service culture, weak data governance, to sales force resistance and technology. dependency and complexity on partners and ecosystems.

In this paper, recent literature regarding servitization in manufacturing is reviewed with a particular focus on the implications for the supply chain. capabilities, challenges and business model transformation. The paper will focus on the following. review questions. What are the competencies needed for production companies to transfer from? product-centric to service-centric logic? Secondly, what are the challenges that arise during this? transformation? Third, what are the implications of servitization on the business model of the manufacturing companies? The paper addresses these questions and provides an integrated framework that can inform future Empirical studies and managerial experience.

## 2. REVIEW APPROACH

This paper is based on a structured review approach that aims to provide a transparent and defensible A compilation of servitization research that has been conducted in the past decade. The idea is not to reproduce the full history of servitisation but include peer-reviewed work from 2016-2025 that explains How manufacturers transition to a service-centric and digitally enabled approach. solution logic. The literature was chosen from peer-reviewed research in management, industrial engineering, and industrial relations. marketing, operations, technology management, innovation and manufacturing. The reviewed studies were published in leading academic journals, including the *Journal of Business Research*, *Industrial Marketing Management*, *Journal of Marketing*, *Technological Forecasting and Social Change*, *Tech novation* and *Production Planning*

& *Control*. These journals provide substantial contributions to the fields of servitization, digital transformation, operations management, marketing, technological innovation, sales management, and information technology. The inclusion of studies from these diverse research domains enables a multidisciplinary perspective on the transformation of manufacturing firms from product-oriented operations toward service-centric and digitally enabled business models. Such disciplinary diversity also supports a broader understanding of the strategic, technological, operational, and market-related factors that influence the adoption and implementation of servitization practices.

To ensure the transparency of the review method, explicit inclusion and exclusion criteria Instead of providing unqualified numbers from databases. Studies were included when they examined servitization, digital servitization, advanced services, product-service systems, service capability development, ecosystem transformation, or business model change in manufacturing or industrial markets. Studies were rejected if they were only consumer service oriented, or only technical. engineering design that does not involve managerial considerations, non-peer reviewed commentary or contexts. Not related to manufacturing transformation. The synthesis was conducted through thematic coding around three review questions: capabilities, challenges, and business model transformation.

Recent studies also show that servitization is fragmented across supply-chain, ecosystem, sales, and customer-experience streams. Earlier review and digital-servitization studies helped establish the field across management, marketing, operations, and service-management streams (Paschou et al., 2020; Raddats et al., 2019). Davies et al. (2023) review supply chains and ecosystems for servitization, while Kowalkowski et al. (2025) highlight the underdeveloped role of selling and sales management. Jang et al. (2021) further show that customer experience and customer retention are important outcomes of servitization.

The review used keywords such as servitization, digital servitization, product-service systems, advanced services, service-centric manufacturing, business model transformation, dynamic capabilities, digital capabilities, platform ecosystem, value co-creation, and manufacturing services. The inclusion period was 2016-2025. Studies were included in the study if they emphasized manufacture, Digital Service Transformation, Product-Service Transformation, industrial business markets, firms, Business model change, service-related performance. Studies were excluded where they only had to do with general services that are not manufacturing related, and consumer services that are not manufacturing related. The link from the transformation side, or merely the manufacturing automation with no service logic. This approach helps to synthesize servitization research in manufacturing over the past 10 years. Approach contributes to a decade-long synthesis of servitization research in manufacturing. industrial markets.

Thematic synthesis was used to structure the review. The literature was read first for the definitions and conceptual boundaries. Second, papers were categorized according to three general categories: capabilities, transformative challenges, and transformative business model. Thirdly, the themes were adopted as part of an analytical framework. Fourthly, gaps and future research directions were identified. This is an appropriate way to go about it. Recent marketing and servitization literature is conceptually rich but fragmented across marketing, domains of operations, technology, strategy and innovation. These can be synthesized by a thematic synthesis. flows into a usable structure of an article.

### 3. CONCEPTUAL BACKGROUND: PRODUCT-CENTRIC AND SERVICE-CENTRIC MANUFACTURING

The product-centric manufacturing model is based on product design, production efficiency, quality, etc., Control, supply chain execution and transactional sales. The primary source of revenue is from selling units. Customer contact can often diminish following product delivery, except for warranty, spares or services. occasional repair. The measure of performance is production volume, margin per unit, and cost. control, delivery time and market share. This model is still relevant, although it is less defensible when products are getting technologically alike and customers want to see integrated support.

The service-centric model reverses this: it is the service that has to be designed to be adaptable and flexible. Does not remove product. Rather, it places the Product embedded in a broader value system. The product is now a means to the end of providing a service, data, Customer outcomes, performance The company makes money by providing maintenance contracts, the following features are not included in the standard license: life cycle support, usage fees, subscription services, consulting, performance-based arrangements, and solutions with embedded digital technology. Value is not just added at the time of sale, but it is added over the course of the lifetime of the product. customer-use cycle. This method is particularly pertinent in industrial applications with equipment. Expensive, complex, long-lasting, and associated with customer productivity.

Some recent reviews reveal that servitization is no longer viewed solely as a linear transition from traditional services. to advanced services. It now appears as a complex change in the multidimensional aspects of strategy, technology, customer relationships, ecosystem roles, organisational routines, and business model design (Khanra et al., 2021; Minaya et al., 2024; Shen et al., 2023). The development follows in the footsteps of earlier ten-year-period studies that mapped servitization research streams and clarified how the digitization, service infusion, and product-service systems redefine manufacturing logic (Baines et al., 2017; Kowalkowski et al., 2017; Paschou et al., 2020; Raddats et al., 2019). Favoretto et al. (2022) describe digital servitization as a change in several aspects of the firm, such as the change of service, plans, direction, organisational design, environment, results measurement. This means that

servitization requires more than the creation of a service department. It requires a change in how the manufacturing firm defines value.

A useful distinction can be made among basic services, intermediate services, advanced services, and outcome-based solutions. Basic services include installation, repair, spare parts, and warranty. Intermediate services include training, preventive maintenance, technical support, and process advice. Advanced services include remote monitoring, predictive maintenance, life cycle optimisation, and data-based performance improvement. Outcome-based solutions link revenue to achieved results, such as uptime, availability, reduced energy use, or cost savings. Digital technologies make advanced and outcome-based services more feasible because they provide real-time data on asset condition, customer use, and service performance.

The movement from products to services also changes competitive advantage. A product can often be copied through reverse engineering or technology imitation. A service relationship is harder to copy because it depends on customer knowledge, relational trust, installed-base data, service routines, and ecosystem coordination. However, this advantage is not automatic. It must be supported by capabilities that allow the firm to sense customer needs, design service offerings, deliver services reliably, and capture value through appropriate pricing and contracting.

### 4. SERVITIZATION CAPABILITIES

Capabilities are central to servitization because service-centric manufacturing requires new ways of working. Successful servitization has been associated with strategic and Organisational, digital, relational and dynamic capabilities (Baines et al., 2017; Castka et al., 2024; Chirumalla et al., 2023; Ghosh et al., 2022). Dynamic capabilities refer to the ability of a firm to sense opportunities, seize them through investments and business models, and reconfigure resources as the environment changes. In servitization, these capabilities are needed because firms must move from a stable product logic to a more relational, digital, and solution-oriented logic (Chirumalla et al., 2023; Ghosh et al., 2022).

Strategic service orientation is the first capability group. It is important for senior management to establish its role, services in the overall business. When services are regarded as a cost activity or a cost centre, will not likely be a growth source. Strategic service orientation is the inclusion of clear service Customer perception of vision and service portfolio design, customer segmentation, service innovation priorities, alignment Concerning product units and service units. In addition, it features an option to choose if the company will provide support to the product, the customer process, platform services or outcomes-based solutions. Product and Service managers frequently struggle with their product strategy because they do not have a clear vision. Financial controllers, sales teams.

Digital and Data Capability is the second capability group. Digital servitization depends on the capacity to gather, manipulate, safeguard, analyse and market information.

Sensors, IoT platforms, Tools that rely on analytics and artificial intelligence can enhance product monitoring and service delivery. But technology is not sufficient. Businesses require data architecture, data quality and data integration, among other things. The areas of management, cybersecurity policies, analytics capabilities and customer consent mechanisms. Chen et al. (2023), data-driven digital capabilities can be used to assist services that provide support for the product. and services to assist the client. This distinction is relevant because the highest level of service can be seen when data is used to not only operate the equipment, but to enhance the equipment's performance. customer's business process.

Third capability group: Customer co-creation capability. Servitization requires deep Knowledge of a customer's business. Services are typically created and utilized in interaction with the customer. The manufacturers, therefore, should learn how to use the equipment from their customers, what kind of issues they have, what results they are interested in, and what they use to assess performance. To conceptualize value co-creation capabilities as a key condition for digital, we build on the work by and Slepnirov (2023). servitization. Another benefit of customer co-creation is that it facilitates customization, trust, experimentation, and joint creation. solution development. If manufacturers do not collaborate with their customers, then they can create a service that fails to meet customer needs. Look technically capable but are unable to solve real user problems.

Ecosystem orchestration capability is the fourth capability group. You cannot always have an advanced service. be manufactured and sold directly by the manufacturer. Digital Servitization might include software business owners, cloud customers are all part of the value chain. customers. As Digital Servitization is an ecosystem formation process, Kolagar et al. (2022) demonstrate that it needs to be completed. orchestration, and expansion. Along the same lines, Kapoor et al. (2022) talk about servitization through a platform approach. ecosystem perspective. This means that manufacturers need to become capable of coordinating. Many actors, roles, data management, benefit sharing, intellectual property

protection. and ensure quality of services throughout the ecosystem.

Organisational change capability is the fifth capability group. The tensions within servitization. Product teams can be dedicated to engineering excellence and service teams to customers. With experience and prolonged use. Sales teams might favor product sales as they are simpler. There are two methods of pricing and rewarding. Finance teams may reject subscription or outcome-based revenue for a number of reasons: The returns are deferred and risk is co-shared. Human resource systems may not have service-oriented Training, incentives or career paths. Chirumalla et al. (2025) demonstrate that the key factors for manufacturing digital transformation include leadership, organisational culture, technological Readiness, skills, and strategic alignment. Thus, servitization ability is also a people and change-management capability.

One of the sixth capability groups is sales and value communication capability. Servitized offerings are Selling is more difficult for products. Businesses need to understand the concepts behind Lifecycle Value, Risk Reductions, and Productivity, and salespeople need to be able to articulate these terms and concepts. For improvement, and outcome benefits. They also have to face consumers who make price comparisons. Product prices are used to fill prices for products. Kowalkowski et al. (2025) show that the theme of selling, and sales management is one of the less developed ones in relation to servitization. To be successful manufacturers, they must be able to sell. incentives, account management processes, consultative selling skills, and tools to quantify. customer value.

As a whole, these capability groups illustrate that servitization is a systemic transformation. A firm may possess good technology and low service culture. It might have good customer relationships but weak value-capture systems. Can be pretty on the internet but lousy on the ground. According to the literature, performance is better when capabilities are matched and not when they are mismatched or developed in isolation.

**Table 2. Key capability groups for service-centric manufacturing**

| Capability group                   | Meaning in servitization                                                                | Representative support                                                  |
|------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Strategic service orientation      | Defines the role of services, target customers, service portfolio, and transition path. | Baines et al. (2017); Khanra et al. (2021); Minaya et al. (2024)        |
| Digital and data capability        | Uses IoT, analytics, AI, and data governance to enable advanced services.               | Vendrell-Herrero et al. (2017); Chen et al. (2023); Münch et al. (2022) |
| Customer co-creation capability    | Develops services through customer interaction and value-in-use understanding.          | Struwe and Slepnirov (2023)                                             |
| Ecosystem orchestration capability | Coordinates partners, platforms, suppliers, dealers, and customers.                     | Kohtamäki et al. (2019); Kolagar et al. (2022); Kapoor et al. (2022)    |

|                                          |                                                                                    |                                                     |
|------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------|
| Organizational change capability         | Aligns culture, people, structures, incentives, and leadership with service logic. | Chirumalla et al. (2023, 2025); Ghosh et al. (2022) |
| Sales and value communication capability | Communicates lifecycle value and supports service selling.                         | Kowalkowski et al. (2025)                           |

## 5. CHALLENGES IN SERVITIZATION

The first major challenge is the "servitization paradox". This is when firms invest in services but do not get the anticipated financial returns. New hires, training, spare parts are required for services. Digital infrastructure, contracts, customer support and monitoring systems. These Investments increase expenses prior to consistent revenues. Abou-Foul et al. (2021) show that the relationship between digitalization, servitization and financial performance is complicated. The benefits of digitalization on performance will vary depending on how digital and service strategies are combined. In other words, servitization is a process that needs to be managed in a staged manner. Instead of a short-term solution for income.

The second is value capture. Manufacturers may provide value to customers but not do so. Take a decent amount of that value. Predictive maintenance can minimise customer expenses, such as when it lowers the oil change frequency on a motor vehicle. Downtime, but customers may not be willing to pay for a service if it has not failed. While outcome-based contracts can help to align value, they also result in greater risk being placed on the manufacturer. Weak contract design, pricing, and performance metrics can result in high costs for the manufacturer without sufficient returns. So, the models for capturing value must be carefully crafted, along with the service-levels, Agreements, data-based performance measurement, and risk-sharing arrangements.

The third challenge is digital complexity. Digital servitization is frequently accompanied by sensors, platforms, connectivity, software updates, analytics, cyber protection and integration with customer systems. It is possible that the firm will have to deal with several technologies as well as vendors. It must also be able to guarantee that data are Timely, accurate and usable. Many of these skills have been outlined by Münch et al. (2022) for digital. True digital servitization is, in fact, a socio-technical systems process according to servitization from a socio-technical systems perspective. not simply a technology project. It is a social and technical change.

Organisational resistance is the fourth challenge. A manufacturer with a track record of success. It is not always easy to take a service mentality to product engineering. There may be conflicting opinions among managers on Whether services are a part of product units or separate. Employees may lack service skills. Long cycle consultative selling may be resisted by sales teams. Service teams may not have: Service teams may not have: Has influence in strategic decisions. Such issues lead to silos. Favoretto et al. (2022) show that, in the transition, digitalization has an impact on organisational design and

development, organisation culture and collaboration. toward services.

The fifth challenge is acceptance from the customer. Not every customer is looking for your advanced services. Some Customers want to have ownership and do their own maintenance. Others may not be interested in sharing operational data. It is also possible that customers aren't sure if the manufacturer grasp their process. deeply enough. Digital services must be built with trust as a core component, as they are associated with monitoring, data sharing, and alterations to work practices. Customer acceptance is thus based on perceived value, data transparency, privacy protection, relational trust and service reliability.

The sixth challenge is being dependent on the ecosystem. By enabling digital servitization, the number of actors increases. involved in value creation. This generates opportunities and dependency. A manufacturer might rely on software partners to power the platform and dealers for frontline support. Services, for service, and data access customers. If there is any doubt about what to do, service delivery can become inconsistent. As per Kolagar et al. (2022), a core need for digital servitization is to transform the ecosystem. But orchestration of ecosystems is challenging as firms need to synchronize, Different actors with varying goals, capacities and expectations of revenue generation.

Measurement is the seventh challenge. Traditional manufacturing measures might not reflect service. value. Product sales, inventory turnovers and production efficiency are still considered important but do not understand and monitor customer uptime, service response, life cycle value, customer retention, renewal rate, Profitability of contracts, or solution performance. This poses a dilemma for managers and researchers. In the long term, servitization performance can only be evaluated by short-term sales or profitability, or the lack of it. value of customer relationships may be underestimated. Recent literature thus suggests: Multidisciplinary measure of performance that encompasses financial, operational, relational, digital, and sustainability outcomes.

## 6. BUSINESS MODEL TRANSFORMATION

Servitization changes the business model of manufacturing firms. A business model explains how a firm creates, delivers, and captures value. In product-centric manufacturing, value creation is based on product design and production. Value delivery occurs through sales channels and logistics. Value capture occurs through product price and volume. In service-centric manufacturing, these elements change significantly because the firm must redesign its offering logic, revenue

logic, customer relationship logic, and ecosystem logic (Frank et al., 2019; Kohtamäki et al., 2019; Martín-Peña et al., 2018; Sjödin et al., 2023).

The value proposition expands and widens. Rather than guaranteeing a machine or product specification, the firm guarantees performance, up-time, reliability, cost of ownership, process control, and so forth. For improvement, safety, sustainability or business continuity. This is a change of focus away from product. maps feature to outcomes for customers. A major equipment company, like a heavy equipment manufacturer, might relocate from selling machines to offering equipment availability, remote diagnostics, operator training, and fuel efficiency optimisation. The customer is not just purchasing a machine; the customer is purchasing continuity. Improved productivity and reduced business risk.

There are also changes in delivery value. Field service networks and remote monitoring is required for the delivery service. Spare parts planning, digital platforms, customer success teams and analytics capabilities. It also calls for coordination of product engineering with service operations. Product design must take into account maintainability, connectivity, modularity, and serviceability. If a product is not the more complex and expensive life cycle support is, the more it is designed for service. This connection is further reinforced by digital servitization as digital elements need to be integrated into the product-service design. the beginning.

Value capture is made more complicated. Traditional product sales bring in revenue when the product is sold. Sales, recurring revenue, subscription revenue, pay-per-use revenue are all examples of revenue that can be generated from servitized models. Rewards-based revenue (also known as contract-based revenue). These models can enhance revenue They must be both stable and have new financial logic. The manufacturer might be riskier and may have to wait longer for returns. Abou-Foul et al. (2021) point out the need to be familiar with How digitalisation and servitisation relate to financial performance. Chen et al. (2023) show that digital capabilities, indirectly, can contribute to the improvement of competitiveness in the context of service strategies. Earlier digital-servitization research also shows that business model change is dependent on the alignment Weighing digital technologies, ecosystem partners and service revenue mechanisms (Frank et al., 2019;

Kohtamäki et al., 2019; Paschou et al., 2020). These results indicate that a value capture Relying on the service logic as well as digital capability.

Governance is also impacted by the transformation of the business model. In a product-centric model, the Manufacturers also have control over the production and frequently distribute to specific outlets. In a digital service ecosystem, value can be co-created with platform partners, customers, suppliers and service intermediaries. Governance should establish data ownership, access and responsibility. service failure, payment of partners, and ensuring customer outcomes. Kohtamäki et al. Wang et al. (2019) indicate that the digital servitization business models require a coordination of the ecosystem. Platform ecosystems offer a helpful perspective on servitisation as Kapoor et al. (2022) state. They describe the coordination of several actors around a service platform by manufacturing companies.

Another recent strand of literature is how servitization is associated with sustainability and circularity. When manufacturers Although they are still responsible for the performance throughout the product's life, they may have the incentive to design More durable, repairable and efficient products. Digital monitoring can decrease waste and optimise energy efficiency and promote circular business models. As mentioned by Sjödin et al. (2023), there is a connection between AI and the Internet of Things (IoT). The three key ideas are circular business model innovation and digital servitization. Ghobakhloo et al. (2024) also demonstrate human-centric, sustainable, and resilient production is gaining importance in that. Move from Industry 4.0 to Industry 5.0. It means that future research on servitization should be based on this. Not be restricted to growth of revenue. It should also consider aspects of environmental and social value.

Transformation of the business model should be seen as a process that unfolds in steps and is aligned. A The first step and manufacturer can take is to start with basic after-sales services, followed by preventive services, and then digital monitoring, and lastly advanced services and finally outcomes-based solutions. However, this Not all paths are straight. Certain companies might be using digital platforms prematurely. Others may focus on digital services; you should consider consulting services. The optimal way is influenced by the complexity of the product, customer Readiness, installed base, digital maturity, market competition and ecosystem support.

**Table 3. The transition from product-centric manufacturing to service-centric manufacturing takes place. It is the shift of business model: from product-centric manufacturing to service-centric manufacturing.**

| Business model element | Product-centric logic                                         | Service-centric logic                                                                        |
|------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Value proposition      | Product quality, technical features, price, and delivery.     | Customer outcome, uptime, lifecycle value, process improvement, and sustainability.          |
| Value delivery         | Production, distribution, installation, and warranty support. | Field service, remote monitoring, analytics, platforms, co-creation, and ecosystem delivery. |

|               |                                                          |                                                                                                       |
|---------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Value capture | Product sale, margin per unit, and spare parts revenue.  | Recurring revenue, subscription, pay-per-use, performance-based contracts, and service profitability. |
| Governance    | Manufacturer-led product control and channel management. | Data governance, platform rules, ecosystem coordination, risk sharing, and partner accountability.    |

## 7. INTEGRATED FRAMEWORK

The findings from the literature review indicate that the conditions for a successful servitization require congruency between: Capabilities, challenges and business model elements. The transition is possible via capabilities. Challenges Limit or minimise the transition. Business model transformation is the result which links value to the change in business models. The four values are proposition, value delivery, value capture and governance. In the event of these parts being aligned, servitization can create customer loyalty, recurring revenue, differentiation, innovation, and sustainable competitiveness. If they are misaligned, the firm may have to pay high costs, poor performance, and a lack of effectiveness. Poor financial performance, service failures, customer resistance, and adoption.

There are four layers in the proposed structure. The first layer is Strategic Intent. The decision is up to the firm. Why it's servitizing. The fact that it may be due to differentiation, recurring revenue, customer retention, and other issues. growth, sustainability or competition, digital. Capability development is the second layer. The firm has to be developed in terms of service, digital, relational, ecosystem, organisational and sales capabilities. The third layer is transformation management. This layer is concerned with internal resistance, customer, and performance factors. Pricing, data governance, ecosystem coordination, data performance and adoption. Business model outcome is the fourth layer. This involves shifts in a value proposition, value delivery, value capture, and governance.

The framework also offers suggestions for feedback loops. Customer data can be used to enhance service innovation. Service experience can be used to enhance product design. The ecosystem's learning can be enhanced through the digital platform. development. Measuring performance could help inform pricing and contract redesign. Therefore, servitization is not a one-off change. It should be treated as a continuous learning, which should be treated as a continuous learning process. This perspective is in line with the dynamic capability theory and the latest studies on digital. servitisation as a continuous process, instead of an end state (Chirumalla et al., 2023); Minaya et al., 2024).

## 8. FUTURE RESEARCH AGENDA

The review suggests some avenues for future research. In future studies, the following needs to be investigated: capability configurations not single capabilities. There are several studies that have been written on the concept of service capability, the ability to use digital devices, or relational devices alone. However, the success of

servitization could be determined by how these capabilities are integrated. Digital capability may not enhance performance, for instance. Otherwise, without the support of customer co-creation and value-capture ability. Configurational methods Qualitative comparative analysis (QCA) may be helpful.

Secondly, further longitudinal studies are required. Servitization is not a one-off event, it is a journey. These studies of cross-sections can illustrate associations, but not a full picture of how firms get from "here" to "there". products to services. Longitudinal case studies can illustrate the development of capability, the resistance, etc. The business models have evolved, and how they are managed. This is particularly crucial for: Knowing what is meant by the servitization paradox. Castka et al (2024) also note that pathways of the learning from the longitudinal and multi-case evidence helps to better understand dynamic capability development.

Third, more research needs to be conducted on SMEs. Large firms Enjoy better resources to create platforms, analytics teams and global service networks. SMEs may face greater financial, technological and human resource limitations. However, there are also SMEs that can be flexible and close to customers. An exploration of low-cost pathways, partner supported, needs to be investigated. In this regard, frugal digital servitization for SMEs and models were discussed.

Finally, there is a need for research that will expand the study of sales and customer adoption. Servitized offerings fail Where sales teams cannot express value and/or customers are skeptical of the offering. Kowalkowski et al. (2025) demonstrate that selling and sales management should be given more attention. servitization research. Future studies could focus on sales incentives, consultative selling, customer attitudes and behaviour, and sales position and job content. The three factors cited are resistance by buyers, pricing of services, and education.

Fifth, research into data governance and ethics should be conducted in the future. The ability to deliver products and services in a digital format relies on customer data. Yet, there are privacy, security, ownership, misuse concerns with data sharing, and competitive sensitivity. Future studies should look at how manufacturers are establishing agreements for sharing data and how the governance mechanisms are securing the trust of both the manufacturer and the customer. interests.

Sixth, further studies are needed to focus on sustainability outcomes. Servitization can contribute to circularity, Resource efficiency, product life extension and reduction in emissions. But digital technologies have also been used to create energy and require infrastructure. Future studies

should measure net sustainability effects. Discuss and explore the implications service contracts have for circular product design and life cycle responsibility. Seventh, more robust performance measures need to be implemented in future research. Financial performance is important, but it's not sufficient. Researchers should involve customer retention, renewal rates, the ability to

improve service profitability, installed-base utilization, data monetization, uptime, and customer productivity. The outcomes of innovation are: employee readiness outcomes, innovation outcomes, and sustainability outcomes. A multidimensional scale. There is a need for more stringent empirical testing to be supported.

**Table 4. Future research agenda**

| Research gap                | Suggested research question                                                                         | Possible method                   |
|-----------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------|
| Capability configurations   | Which combinations of service, digital, relational, and ecosystem capabilities lead to performance? | QCA, SEM, multi-case study        |
| Longitudinal transformation | How do manufacturers develop service-centric routines over time?                                    | Longitudinal case study           |
| SME servitization           | How can resource-constrained SMEs servitize without large platform investments?                     | Comparative case study, survey    |
| Sales and adoption          | How do sales incentives and customer trust affect adoption of advanced services?                    | Survey, experiments, interviews   |
| Data governance             | How do B2B manufacturers manage data ownership, privacy, and cybersecurity in digital services?     | Case study, Delphi method         |
| Sustainability impact       | When does servitization support circularity, resource efficiency, and lower emissions?              | Mixed methods, lifecycle analysis |
| Performance measurement     | What multidimensional metrics best capture servitization performance?                               | Scale development, PLS-SEM        |

## 9. MANAGERIAL IMPLICATIONS

The review provides some suggestions for managers. Firstly, manufacturers should not start servitization can be achieved only with the addition of services to products. They should start their thinking with a clear strategic dilemma: What is the value that the firm can create for the customer that the competition cannot? This helps avoid Random service expansion and focuses investment on value-relevant services.

Secondly, managers need to develop their skills in a progressive manner. Basic services ability and customer Prior to complex outcome-based contracts, understanding should come first. Digital tools should be included where they provide simple solutions to customer problems. A first approach with technology can reduce the value of the service without increasing costs. A customer-outcome-first approach can inform the use of digital technologies more effectively.

Firms should rethink the way performance is measured, third said. When service managers are only evaluating short-term revenue, they may not consider customer solutions that would be effective in the long-term. What if sales teams are only incentivized for selling? What if sales teams only get rewarded for selling? However, they are prohibited from selling products if they are to promote

service contracts. The incentives should be aligned with the managers. Lifecycle value, customer retention, service profitability and solution performance.

Fourth, data governance should be considered a business problem. Customers should be aware of How data is collected, what they are used for, who owns them, and how they are protected. Clear data agreements can decrease resistance and increase trust. This is particularly so in the B2B industries. Where data is sensitive and may be identified in the operational data.

Fifth, ensure that the ecosystem partnerships of the firms are built thoughtfully. Not all abilities have to be developed. internally. Software, analytics, cloud infrastructure, field service and training may be supported as a result of a contract. Through a contract, software, analytics, cloud infrastructure, field service and training may be supported. partners. Managers, however, must establish roles, standards of quality, revenue sharing, and accountability. In the absence of adequate governance of the ecosystem, even if the water source is safe, the trust placed in the water may be lost. The quality of the product manufactured is good.

Sixth, managers should invest in people. Servitization needs to instill a service culture and digital skills, Customer problem solving, consultative selling, cross

functional teamwork. Training, leadership communication, and cultural change are therefore essential. Service transformation is not only a technology project; it is an organisational transformation.

## 10. CONCLUSION

This review examined literature from 2016 to 2025 on the shift from product-centric to service-centric manufacturing. The findings show that servitization is a strategic transformation that changes the way manufacturers create, deliver, and capture value. It is no longer limited to after-sales support. It now includes digitally enabled services, advanced solutions, platforms, ecosystems, and outcome-based models.

The review revealed six primary capability groups: strategic service orientation, digital and data, technology, people, process and information. In particular, the capability of customers to create, the capability of the ecosystem to be orchestrated and the organisational capability. There are four capabilities which can be changed: change capability, sales and value communication capability. These capabilities are interdependent. They are both needed together for firms to deal with the challenges of Servitization. Some of the critical issues are value capture problem, high transformation costs, digital complexity, organisational resistance, customer data concerns, ecosystem dependency, and poor performance. measurement.

The paper adds by proposing an integrated framework which connects capabilities, challenges, and business model transformation. The framework proposes that there are three key factors to successful servitization: programme management, alignment of strategic intent and capability development, transformation management, and programme management. business model outcomes. The review also provides a research agenda for future empirical research, particularly in capability configurations, longitudinal transformation, SMEs and sales management and data. governance, sustainability and performance measurement.

The main message for the manufacturing companies was obvious. Servitization must not be considered an add-on service activity. It will be a business model shift and must be treated as such. Firms that are able to fuse The service, digital intelligence, customer intimacy, and ecosystem are all considered to be key drivers of product excellence. coordination is more likely to create sustainable competitive advantage in a service-based business. manufacturing..

## REFERENCES

1. Abou-Foul, M., Ruiz-Alba, J. L., & López-Tenorio, P. J. (2023). The impact of artificial intelligence capabilities on servitization: The moderating role of absorptive capacity-A dynamic capabilities perspective. *Journal of Business Research*, 157, 113609. <https://doi.org/10.1016/j.jbusres.2022.113609>
2. Abou-Foul, M., Ruiz-Alba, J. L., & Soares, A. (2021). The impact of digitalization and servitization on the financial performance of a firm: An empirical

- analysis. *Production Planning & Control*, 32(12), 975-989. <https://doi.org/10.1080/09537287.2020.1780508>
3. Baines, T., Ziaee Bigdeli, A., Bustinza, O. F., Shi, V. G., Baldwin, J., & Ridgway, K. (2017). Servitization: Revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*, 37(2), 256-278. <https://doi.org/10.1108/IJOPM-06-2015-0312>
4. Castka, P., Donovan, J., & Sousa, R. (2024). Pathways of development of dynamic capabilities for servitization transformation: A longitudinal multi-case study. *Industrial Marketing Management*, 116, 66-81. <https://doi.org/10.1016/j.indmarman.2023.11.010>
5. Chen, L., Dai, Y., Ren, F., & Dong, X. (2023). Data-driven digital capabilities enable servitization strategy-from service supporting the product to service supporting the client. *Technological Forecasting and Social Change*, 197, 122901. <https://doi.org/10.1016/j.techfore.2023.122901>
6. Chirumalla, K., Leoni, L., & Oghazi, P. (2023). Moving from servitization to digital servitization: Identifying the required dynamic capabilities and related microfoundations to facilitate the transition. *Journal of Business Research*, 158, 113668. <https://doi.org/10.1016/j.jbusres.2023.113668>
7. Chirumalla, K., Oghazi, P., Nnewuku, R. E., Tuncay, H., & Yahyapour, N. (2025). Critical factors affecting digital transformation in manufacturing companies. *International Entrepreneurship and Management Journal*, 21, Article 54. <https://doi.org/10.1007/s11365-024-01056-3>
8. Davies, P., Liu, Y., Cooper, M., & Xing, Y. (2023). Supply chains and ecosystems for servitization: A systematic review and future research agenda. *International Marketing Review*, 40(4), 667-692. <https://doi.org/10.1108/IMR-10-2021-0318>
9. Favoretto, C., Mendes, G. H. S., Oliveira, M. G., Cauchick-Miguel, P. A., & Coreynen, W. (2022). From servitization to digital servitization: How digitalization transforms companies' transition towards services. *Industrial Marketing Management*, 102, 104-121. <https://doi.org/10.1016/j.indmarman.2022.01.003>
10. Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141, 341-351. <https://doi.org/10.1016/j.techfore.2019.01.014>
11. Ghobakhloo, M., Mahdiraji, H. A., Iranmanesh, M., Grybauskas, A., & Jafari-Sadeghi, V. (2024). From Industry 4.0 digital manufacturing to Industry 5.0 digital society: A roadmap toward human-centric, sustainable, and resilient production. *Information Systems Frontiers*. <https://doi.org/10.1007/s10796-024-10476-z>
12. Ghosh, S., Hughes, M., Hodgkinson, I., & Hughes, P. (2022). Digital transformation of industrial businesses: A dynamic capability approach. *Technovation*, 113, 102414. <https://doi.org/10.1016/j.technovation.2021.102414>

13. Jang, K. K., Bae, J., & Kim, K. H. (2021). Servitization experience measurement and the effect of servitization experience on brand resonance and customer retention. *Journal of Business Research*, 130, 384-397. <https://doi.org/10.1016/j.jbusres.2020.03.012>
14. Kapoor, K., Bigdeli, A. Z., Schroeder, A., & Baines, T. (2022). A platform ecosystem view of servitization in manufacturing. *Technovation*, 118, 102248. <https://doi.org/10.1016/j.technovation.2021.102248>
15. Khanra, S., Dhir, A., Parida, V., & Kohtamäki, M. (2021). Servitization research: A review and bibliometric analysis of past achievements and future promises. *Journal of Business Research*, 131, 151-166. <https://doi.org/10.1016/j.jbusres.2021.03.056>
16. Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research*, 104, 380-392. <https://doi.org/10.1016/j.jbusres.2019.06.027>
17. Kolagar, M., Parida, V., & Sjödin, D. (2022). Ecosystem transformation for digital servitization: A systematic review, integrative framework, and future research agenda. *Journal of Business Research*, 146, 176-200. <https://doi.org/10.1016/j.jbusres.2022.03.067>
18. Kowalkowski, C., Gebauer, H., Kamp, B., & Parry, G. (2017). Servitization and deservitization: Overview, concepts, and definitions. *Industrial Marketing Management*, 60, 4-10. <https://doi.org/10.1016/j.indmarman.2016.12.007>
19. Kowalkowski, C., Kramer, V., Eravci, S., Salonen, A., & Ulaga, W. (2025). Selling and sales management for successful servitization: A systematic review and research agenda. *Journal of Personal Selling & Sales Management*, 45(4), 319-345. <https://doi.org/10.1080/08853134.2025.2502168>
20. Martín-Peña, M. L., Díaz-Garrido, E., & Sánchez-López, J. M. (2018). The digitalization and servitization of manufacturing: A review on digital business model. *Strategic Change*, 27(2), 91-99. <https://doi.org/10.1002/jsc.2184>
21. Minaya, P. E., Avella, L., & Trespalacios, J. A. (2024). Synthesizing three decades of digital servitization: A systematic literature review and conceptual framework proposal. *Service Business*, 18(2), 193-222. <https://doi.org/10.1007/s11628-024-00559-x>
22. Münch, C., Marx, E., Benz, L., Hartmann, E., & Matzner, M. (2022). Capabilities of digital servitization: Evidence from the socio-technical systems theory. *Technological Forecasting and Social Change*, 176, 121361. <https://doi.org/10.1016/j.techfore.2021.121361>
23. Paschou, T., Rapaccini, M., Adrodegari, F., & Saccani, N. (2020). Digital servitization in manufacturing: A systematic literature review and research agenda. *Industrial Marketing Management*, 89, 278-292. <https://doi.org/10.1016/j.indmarman.2020.02.012>
24. Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J., & Gebauer, H. (2019). Servitization: A contemporary thematic review of four major research streams. *Industrial Marketing Management*, 83, 207-223. <https://doi.org/10.1016/j.indmarman.2019.03.015>
25. Shen, L., Sun, W., & Parida, V. (2023). Consolidating digital servitization research: A systematic review, integrative framework, and future research directions. *Technological Forecasting and Social Change*, 191, 122478. <https://doi.org/10.1016/j.techfore.2023.122478>
26. Sjödin, D., Parida, V., & Kohtamäki, M. (2023). Artificial intelligence enabling circular business model innovation in digital servitization: Conceptualizing dynamic capabilities, AI capacities, business models and effects. *Technological Forecasting and Social Change*, 197, 122903. <https://doi.org/10.1016/j.techfore.2023.122903>
27. Struwe, S., & Slepnirov, D. (2023). Unlocking digital servitization: A conceptualization of value co-creation capabilities. *Journal of Business Research*, 160, 113825. <https://doi.org/10.1016/j.jbusres.2023.113825>
28. Vendrell-Herrero, F., Bustinza, O. F., Parry, G., & Georgantzis, N. (2017). Servitization, digitization and supply chain interdependency. *Industrial Marketing Management*, 60, 69-81. <https://doi.org/10.1016/j.indmarman.2016.06.013>