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RESEARCH ARTICLE

Analysis of Business Model Innovation Using Product Service System Mapping in the Coating Industry

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Abstract: This study examines the business model transformation of PT XYZ, an Indonesian coating manufacturer, through Product-Service System (PSS) implementation to enhance competitiveness and create added value in the furniture coating industry. The research employs a qualitative case study approach using PSS questionnaires with Yes/No categorical questions, in-depth interviews with the Plant Manager, non-participant observations, and secondary data from company documents and scientific literature on PSS frameworks. Data were analyzed through PSS Matrix mapping to identify current position, expected future position, and capability-based eligibility across nine PSS quadrants, followed by gap analysis and trade-off assessment to formulate strategic recommendations. The results show that PT XYZ currently operates in Quadrant 4 (Product-Related Software) with a color-detection application as a usage enabler, demonstrating initial transition from conventional product sales toward use-oriented services. Eligibility analysis reveals the company possesses adequate capabilities to enter seven PSS quadrants, supported by expert human resources, financial capacity, and solid business networks. The findings suggest that PT XYZ should strategically focus on three priority quadrants: Quadrant 4 (enhancing digital platforms with integrated technical data and consultation services), Quadrant 5 (developing equipment leasing services with bundling schemes), and Quadrant 8 (implementing outsourcing strategies through professional contractors), enabling gradual transformation from product seller to solution provider that delivers higher functional value and strengthens long-term competitive advantage in saturated global markets

Keywords: Product-Service System, Business Model Transformation, Coating Manufacturing, PSS Matrix, Service Innovation.

1. Introduction

In recent years, manufacturing firms have been increasingly pressured by highly saturated and commoditized global markets, requiring them to fundamentally rethink and transform their business operations (Gaiardelli et al., 2021). Enhancing competitiveness in the manufacturing sector largely depends on a company's ability to innovate and optimize operational efficiency (Andin, 2023). According to data reported by CNBC Indonesia (2025), the manufacturing sector remained one of the main contributors to Indonesia's economic growth, recording a



0.90% expansion in 2024. This figure represents the highest contribution compared to other sectors.

To preserve competitive advantage and sustain customer contentment, the Product–Service System (PSS) has emerged as a widely adopted strategic approach in recent years. PSS introduces a new business model where organizations incorporate tangible products accompanied by additional services to offer thorough and unified customer solutions. This concept moves organizations away from purely product-based offerings toward a unified combination of products and services that enhances value creation and improves the overall customer experience (Fadhilah et al., 2024). A business model may be understood as a conceptual framework illustrating an organization's value creation process. Therefore, companies must engage with and understand PSS design (Salwin et al., 2022).

One of the companies facing these challenges is PT XYZ, a main role in Indonesia's furniture coating industry, which has significantly contributed to the growth of the national chemical manufacturing sector since its establishment in 2006. PT XYZ is a manufacturing company producing various coating products, including primers, base coats, and top coats for diverse industrial needs. To date, the company still operates under a conventional business model focused primarily on product sales, while technical services and application support are provided informally and have not yet been integrated into a structured business model.

A Product–Service System is a system that integrates products and services to meet users' functional needs, providing economic value to producers while minimizing the environmental impact associated with delivering these offerings. The implementation of a Product–Service System is expected to stimulate innovation in both products and services, supporting corporate sustainability, enhancing customer satisfaction, increasing sales, and ultimately improving profitability (Putra & Lukmandono, 2018). As in the case of PT XYZ, the company needs to implement the PSS concept within its business growth processes to continuously generate product and service innovation that meets customer satisfaction, thereby increasing sales and improving profitability through added value.

As in the study by Putra & Lukmandono (2018), titled “Product Service System Design Considering Aspects of Product Innovation and Service Creation,” the Product-Service System approach enables companies to develop service models that align with customer expectations and organizational capabilities. Their research demonstrated several service developments undertaken by the company, including establishing a customer service program, improving service standardization, implementing interactive packaging, and applying a “keep my client” strategy. Through the application of the PSS concept, the company was able to improve its cigarette products by designing canned packaging for all variants, setting retail prices, distributing the new packaging to all stores, and providing promotional media such as banners and display shelves, thereby enhancing product quality and competitiveness in the market.

Therefore, this research aims to analyze the business model of PT XYZ using the PSS Matrix and to align the Product-Service System concept within the coating manufacturing context to generate additional value for the organization and enhance competitiveness in the coating industry. Overall, this study not only provides an overview of the current service conditions at PT XYZ, but also offers a long-term development direction to enhance competitiveness through sustainable integration of products and services. The PSS approach in this research is expected to serve as a strategic framework that supports the company's transformation from a product seller into a solution provider that delivers higher functional value to its customers.

2. Literature Review

2.1. Product Service System

Terminologically, a Product-Service System is defined as tangible goods and services provided to fulfill user needs, while services are defined as economically valuable activities



with commercial objectives (Alamsyah & Rahmawati, 2023). Product–Service System (PSS) is generally recognized as a value-creation concept that integrates tangible products and intangible services, designed in such a way that the combination can provide added value and effectively satisfy customers' specific needs and expectations (Putra & Lukmandono, 2018). PSS is widely regarded as an effective means of improving competitiveness while supporting sustainability. In many industries, products have become highly uniform and are now perceived as comparable commodities (Tukker, 2004).

The objective is to highlight the key developmental directions of the PSS ecosystem in response to emerging industrial trends, including growing demand for customized products, increasing servitization, rapid technological advancement in highly competitive markets, economic digitalization, and production automation. The evolution of PSS can be understood across four major dimensions: (1) the form of value offerings, (2) the customer value experience, (3) the mechanisms of value creation, and (4) the interactions involved in value creation (Gaiardelli et al., 2021).

2.2. Categories of Product Service System

According to Tukker (2004), the categories and subcategories of Product-Service Systems (PSS) are described as follows.

(1) Product-Oriented Services

The business model remains primarily focused on product sales, although additional services have been incorporated to complement the offering.

- a. Product-Related Service model, the provider sells a product while also delivering services that support its use, such as maintenance contracts, financing options, consumable supply, or end-of-life take-back agreements.
- b. Advice and Consultancy model, the provider offers guidance on how to use the product more effectively, which may include recommendations on team organization or optimizing operations and logistics where the product is applied.

(2) Use-Oriented Services

The traditional product remains essential, but the operating model has moved beyond focusing on selling it. Instead, the provider retains ownership and offers the product in alternative forms, which may serve multiple customers simultaneously.

- a. Product Lease model, providers retain ownership and maintenance duties while customers pay periodic fees for exclusive, continuous access to the product.
- b. Product Renting or Sharing model, providers own and maintain products that customers access through payment, with the product being used by different customers in sequential rotation rather than exclusively.
- c. Product Pooling model, similar to renting models but allows concurrent usage by multiple customers simultaneously.

(3) Result-Oriented Services

The client and provider primarily establish mutual understanding of the intended results, without detailing a predefined product.

- a. Outsourcing, involves delegating part of a company's activity to a third party, often with performance-based quality controls, while the execution method largely remains unchanged, such as in catering or office cleaning services.
- b. Pay-per-Service-Unit model, allows users to pay only for the product's output rather than the product itself, with the provider handling all related maintenance and supplies, as seen in pay-per-print copier services.
- c. Functional Result, focuses on delivering an agreed outcome in abstract terms, giving the provider full freedom in how to achieve it, such as ensuring a comfortable office climate or minimizing crop loss for farmers.

2.3. Product-Service System Methodology

The PSS methodology, developed by UNEP and Delft University of Technology, involves four main stages (Putra & Lukmandono, 2018):

- (1). Identifying sustainability dimensions, this stage examines the industrial system with attention to external factors, such as market needs and demands.
- (2). Formulating and selecting recommendations, using PSS worksheets and portfolio diagrams, feasible recommendations are generated and assessed.
- (3). Developing detailed recommendations, the selected recommendations are elaborated in detail.
- (4). Evaluating and selecting recommendations, radar portfolio diagrams are used to compare the projected outcomes of the recommendations with the current system, aiding in final selection.

Previous PSS studies in manufacturing show that companies typically transition from product-oriented offerings toward more integrated service models through gradual capability building. For example, PSS adoption in the automotive and machinery sectors often begins by introducing digital support tools and advisory services before expanding into leasing or performance-based models. Similarly, service-oriented transformation in the furniture and coffee industries such as those discussed by Putra & Lukmandono (2018) and Fadhilah et al. (2024) demonstrates that companies commonly progress from basic support services toward bundled solutions and outsourcing arrangements. PT XYZ's expected transition follows a comparable trajectory, indicating that its transformation path is consistent with the wider evolution of PSS implementation in manufacturing contexts.

The four dimensions of PSS evolution proposed by Gaiardelli et al. (2021) value offering, value experience, value creation mechanisms, and value interaction also offer a relevant conceptual framework for analyzing service-oriented transformation in manufacturing contexts. These dimensions explain how companies shift from product-centric offerings toward digitally supported services, how customer interaction and experience improve through application-based tools, how new mechanisms such as leasing or service bundling expand value creation, and how collaborations with contractors or suppliers reshape value interaction networks. This framework provides theoretical grounding for examining PSS development within industries where product performance is closely tied to technical support and service innovation, including the coating sector. These dimensions provide a relevant conceptual foundation for analyzing PSS transformation within coating-related business environments, where digitalization, service bundling, and outsourcing practices are increasingly adopted.

3. Research Method and Materials

This research employed a qualitative case study approach to analyze the current service implementation and the potential development of a Product–Service System (PSS) at PT XYZ, a coatings manufacturer located in West Jakarta producing primers, base coats, and top coats. The study used a descriptive qualitative design to provide a comprehensive overview of the company's position within the PSS Matrix, including its current condition, existing capabilities, and desired development direction.

Data were collected through both primary and secondary sources. Primary data were obtained from a PSS questionnaire consisting of Yes/No categorical questions to map PT XYZ's position within the nine PSS quadrants, as well as an in-depth interview with the Plant Manager conducted on 26 September 2025, followed by periodic confirmations to ensure data accuracy. The Yes/No questionnaire used in this study was adapted from established Product–Service System frameworks, particularly the PSS Matrix introduced by Tukker (2004) and the methodological guidelines developed by UNEP and Delft University of Technology. Non-participant observations were also carried out to understand operational processes, technical service systems, and customer interactions in real product usage contexts.



Secondary data were obtained from internal company documents, such as corporate profiles, and from scientific literature on PSS, service management, and solution-based business models. The primary research instrument was the PSS questionnaire, which was used to determine the company’s current position, desired future position, and feasible quadrants based on its capabilities and conditions.

The questionnaire results were then mapped onto the nine PSS quadrants to identify the company’s service orientation, followed by a gap analysis to compare the current state, strategic expectations, and implementation feasibility. A trade-off assessment was also conducted to define realistic strategic priorities aligned with organizational capabilities, enabling the formulation of recommendations for developing services in the most relevant quadrants.

To strengthen the validity of the findings, the questionnaire results were triangulated with insights from in-depth interviews and non-participant observations conducted during field visits. Interview data provided managerial perspectives on service implementation, while observational data validated how technical support and product usage actually occur in practice. The convergence of these three data sources ensured that the quadrant mapping and subsequent analyses were consistent, credible, and grounded in real operational conditions.

The research stages included problem identification, collection of primary and secondary data, mapping results into the PSS Matrix, interpreting the gap between current and expected conditions, analyzing strategic alignment, and formulating recommendations for PSS development to enhance PT XYZ’s competitive advantage.

4. Results and Discussion

4.1. Current PSS Position (AS-IS Quadrant)

The questionnaire results indicate that PT XYZ is positioned in Quadrant 4, indicating a use-oriented model in which product sales remain central while technology-based services support product use.

Table 1: Current Quadrant PT XYZ

CURRENT PRODUCT SERVICE SYSTEM		
Product Oriented	Use Oriented	Result Oriented
<i>Product Related Service</i>	<i>Product Lease</i>	<i>Outsourcing</i>
<i>Advice & Consulting</i>	<i>Product Renting/ Sharing</i>	<i>Pay Per Service Unit</i>
<i>Product Related Software</i>	<i>Product Pooling</i>	<i>Functional Result</i>
Quadrant 4		

In the PSS framework, Quadrant 4 is characterized by the presence of service enablers, digital tools or support systems that enhance product use. PT XYZ’s color-detection application fits this category, as it enables customers to obtain accurate color formulation recommendations without manual consultation or laboratory assistance. This technology therefore functions as a value-adding tool that improves the overall product usage experience.

The AS-IS mapping clearly places PT XYZ in Quadrant 4 (Product-Related Software), consistent with the company’s existing service characteristics. PT XYZ currently offers a digital color-detection and formulation application that enhances product use but does not replace ownership, change the pricing structure, or introduce performance-based outcomes. This aligns with the definition of Quadrant 4 as a use-oriented model where digital tools support product utilization without shifting the business model toward leasing, outsourcing, or result-based contracts.

Table 2: Current Position PT XYZ

Assessment Aspect	Findings	PSS Implication	Quadrant
Core Product	Coatings (primer, base coat, top coat)	Product remains the core business	4
Supporting Services	Color-detection and formulation application	Provides additional utility for customers	
Service Characteristics	Usage-based information (use support)	Indicates a shift toward use-oriented PSS	
Quadrant Evaluation	Product + technology-based usage tool	Enhanced service function without selling outcomes	

The app-based service reflects a higher level of innovation than basic product-oriented models, but it has not yet shifted PT XYZ into an advanced service-provider position. The company remains in the early stage of PSS transformation, enhancing product use through technology without entering leasing, sharing, subscription, or performance-based models.

4.2. *Expected Future Position (TO-BE Quadrant)*

The second-stage questionnaire indicates that PT XYZ aspires to develop its services across three potential PSS positions, Quadrant 4 (Product Related Software), Quadrant 5 (Product Lease), and Quadrant 8 (Outsourcing), reflecting a gradual shift from use-support to use-enhanced and eventually toward result-oriented models.

Table 3: Expected Quadrant PT XYZ

EXPECTED PRODUCT SERVICE SYSTEM		
Product Oriented	Use Oriented	Result Oriented
<i>Product Related Service</i>	<i>Product Lease</i>	<i>Outsourcing</i>
	Quadrant 5	Quadrant 8
<i>Advice & Consulting</i>	<i>Product Renting/ Sharing</i>	<i>Pay Per Service Unit</i>
<i>Product Related Software</i>	<i>Product Pooling</i>	<i>Functional Result</i>
Quadrant 4		

Overall, these three quadrants indicate that the company aims not only to retain its current support technologies but also to expand its involvement in product use and potentially progress toward future result-based services.

4.3. *Eligibility Analysis*

The third stage of analysis evaluates PT XYZ’s readiness to adopt a Product–Service System (PSS) model by examining its internal capabilities. This assessment uses a Yes/No questionnaire covering six key aspects: human resources, software development capability, financial capacity, partnership networks, service delivery mechanisms, and the ability to provide services accessible to multiple customers simultaneously.

Table 4: 7 Questions to Eligibility Analysis

No.	Questions	Yes/No
1	Does your institution offer products in the form of goods or services only (not a combination)?	No
2	Does your company deliver bundled solutions combining tangible goods with service components concurrently?	Yes
3	Does your company have designated staff members with professional competence in domains connected to the products you provide?	Yes
4	Does your institution maintain a specialized team for developing software applications?	No (Partnership)
5	Does your institution have sufficient financial resources to offer installment/lease payments? (For example: company offers 6x installment payments per period, meaning the institution has reserves available equal to 6x the installment value per period).	Yes
6	Do the products/services allow for simultaneous access by multiple users?	Yes
7	Does your institution maintain partnerships that support the distribution of your products/services?	Yes
If you responded "Yes" to question 7, kindly address the following questions:		
7.a	Are your business collaborators agreeable to providing products/services through a usage-based pricing model?	Yes
7.b	Do your partners consent to offering customized solutions adapted to individual customer specifications?	No

Based on the questionnaire results (Table 4), PT XYZ is deemed “eligible” to enter several PSS quadrants, specifically Quadrant 2, Quadrant 3, Quadrant 5, Quadrant 6, Quadrant 7, Quadrant 8, and Quadrant 9 as indicated in the feasibility mapping (Table 5).

Table 5: Eligible Quadrant PT XYZ

ELIGIBLE PRODUCT SERVICE SYSTEM		
Product Oriented	Use Oriented	Result Oriented
<i>Product Related Service</i>	<i>Product Lease</i>	<i>Outsourcing</i>
Quadrant 2	Quadrant 5	Quadrant 8
<i>Advice & Consulting</i>	<i>Product Renting/ Sharing</i>	<i>Pay Per Service Unit</i>
Quadrant 3	Quadrant 6	Quadrant 9
<i>Product Related Software</i>	<i>Product Pooling</i>	<i>Functional Result</i>
	Quadrant 7	

4.4. Trade-Off Analysis

The trade-off analysis assesses the alignment between the company’s strategic direction (expected quadrant) and its actual capabilities (eligible quadrant). This analysis is essential because PSS transformation depends not only on managerial vision, but also on resource readiness, operational risks, required investments, and the potential impact on the existing business model.

Following discussions and confirmation with company representatives, PT XYZ decided to retain its current position in Quadrant 4 while gradually progressing toward Quadrants 5 and Quadrant 8 in line with its capabilities and growth strategy.

Table 6: Expected vs Eligible vs Selected Quadrant

Expected	Eligible	Selected
Q4: Product Related Software	Q2: Product Related Service	Q4: Product Related Software
Q5: Product Lease	Q3: Advice & Consulting	Q5: Product Lease
Q8: Outsourcing	Q5: Product Lease	Q8: Outsourcing
	Q6: Product Renting/ Sharing	
	Q7: Product Pooling	
	Q8: Outsourcing	
	Q9: Pay Per Service Unit	

Although PT XYZ has the capability to enter seven quadrants, the company strategically focuses on three key quadrants (Quadrant 4, Quadrant 5, and Quadrant 8) that are the most relevant, scalable, and high-value, while maintaining its well-established current position.

4.5. PSS Transformation Roadmap for PT XYZ

Based on the PSS mapping results, PT XYZ identified three priority development quadrants, there are Quadrant 4 (Product-Related Software), Quadrant 5 (Product Lease), and Quadrant 8 (Outsourcing). These quadrants were selected because they align with the company's current capabilities and support a gradual and sustainable transition from product sales toward result-oriented solutions. The development strategies for each quadrant are outlined below.

(1) Quadrant 4: Product-Related Software

Quadrant 4 in the Product–Service System emphasizes providing product usage support through digital platforms, enabling customers to access technical information, application guidance, and self-help services. This approach is highly relevant to the coating industry, where application quality depends not only on product performance but also on proper procedures, surface preparation, operator readiness, and technical understanding.

PT XYZ already has a foundation through its color-matching application, which helps users determine formulas that match target shades. However, the application could be further enhanced to evolve from a formulation tool into a digital service platform that delivers greater value for industrial customers, retailers, and field applicators.

Therefore, the development of Quadrant 4 should be carried out systematically by enhancing technical content, strengthening digital capabilities, and converting manual information into accessible electronic formats. Several development actions can be implemented as follows.

- (a). Integration of Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) into the application.
- (b). Provision of automated recommendation modules, such as suggestions for primer type, top coat, and surface preparation methods based on material characteristics and application location.
- (c). Availability of video tutorials on coating techniques as visual guidance for users.
- (d). Inclusion of animated surface preparation guides to explain standardized preparation steps.
- (e). Addition of troubleshooting videos covering issues such as blistering, cracking, peeling, pinholes, fish-eye, and other defects.
- (f). Digital consultation services, for example through WhatsApp Business or an in-app chat feature, enabling users to receive technical support without requiring technician visits.

(2) Quadrant 5: Product Lease

Quadrant 5 focuses on use-oriented services in which the company not only sells products, but also provides access, guidance, or service packages to help customers use them optimally. This model is highly relevant in the coating industry, where application success depends not only on product quality, but also on operator skills, application techniques, equipment readiness, and technical procedures in the field.

PT XYZ already has skilled technical applicators, but this capability needs to be developed into structured, marketable service offerings. Several development steps can be implemented as follows:

- (a). Leasing services for application equipment such as spray guns, automatic mixing machines, small compressors, thickness gauges, gloss meters, and other inspection tools, offered on daily, weekly, or monthly rental schemes.
- (b). Bundling schemes in which the purchase of paint above a certain volume for a project includes free equipment rental for the duration of that project.
- (c). Rental fee discounts for customers who use PT XYZ's paint products, serving both as an incentive for product utilization and a way to strengthen customer loyalty.

(3) Quadrant 8: Outsourcing

In Quadrant 8, PT XYZ implements an outsourcing strategy by involving qualified third parties to support technical service activities. Application work, training, quality inspection, and performance testing can be delegated to professional contractors or institutions, enabling high service standards without additional internal investment. This approach allows PT XYZ to focus on core activities while expanding service coverage more efficiently and flexibly.

In Quadrant 8, PT XYZ shifts from fully internal service delivery to outsourcing part or all coating-related service activities to external partners. Several outsourcing strategies that can be implemented include:

- (a). Outsourcing coating application services to professional contractors.
- (b). Collaboration with equipment and inspection tool vendors to offer rental options without requiring PT XYZ to invest in the equipment directly.

5. Conclusion

This study analyzes the business model transformation of PT XYZ, an Indonesian coating manufacturer, through Product-Service System (PSS) implementation to enhance competitiveness and create customer value. The current position (AS-IS) places PT XYZ in Quadrant 4 (Product-Related Software), indicating an initial transition from conventional product sales toward a use-oriented model with a color-detection application as a usage enabler. The expected position (TO-BE) reveals aspirations to develop three strategic quadrants: Quadrant 4 (Product-Related Software), Quadrant 5 (Product Lease), and Quadrant 8 (Outsourcing), reflecting the company's vision to expand product involvement and progress toward result-oriented services.

Eligibility analysis confirms PT XYZ possesses adequate internal capabilities to enter seven PSS quadrants, supported by expert human resources, financial capacity for lease schemes, solid business networks, and multi-customer service delivery capabilities. Trade-off analysis strategically focuses development on three priority quadrants (4, 5, and 8) considering strategic alignment, resource readiness, operational risks, and required investments. The recommended PSS transformation roadmap includes: (1) enhancing digital platforms with integrated TDS, MSDS, automated recommendations, video tutorials, and digital consultation for Quadrant 4; (2) developing equipment leasing services with bundling schemes for Quadrant 5; and (3) implementing outsourcing strategies through professional contractors and equipment vendor collaborations for Quadrant 8.

The roadmap contributes to digital transformation in SMEs within the coating industry, particularly by providing accessible technical data, digital consultation, and application-support tools that help smaller firms adopt technology-enabled operational practices. Then, the transition toward service-based offerings strengthens Indonesia's broader manufacturing growth strategy, as it encourages value creation beyond physical products, supports servitization, enhances customer experience, and increases the competitiveness of domestic manufacturers in increasingly saturated global markets.

Overall, the PSS implementation provides PT XYZ with a structured pathway to evolve from a traditional product seller into a solution-oriented service provider. This transformation is expected to enhance customer satisfaction, operational efficiency, and long-term sustainability while simultaneously contributing to national-level industrial modernization and service-based value expansion.

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