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Designing Success: Unravelling the Impact of Product Service Design on Organizational Processes and Performance

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Research Paper

Abstract: *The primary objective of this investigation is to elucidate the extant correlation between the design of product services and the breadth of supply chain technology. Additionally, this study scrutinizes the nexus between product service design and process control. In the course of this research, supply chain technology breadth and process control were employed as mediating variables, while decision making served as a moderating variable in the assessment of the interconnections between product service design and the ensuing financial and market outcomes. The empirical data for this study were sourced from 217 individuals representing diverse departments across various organizations in Saudi Arabia. The analysis of the gathered data was conducted utilizing the Analysis of Moment Structures (ADANCO) software, thereby facilitating the achievement of the research objectives. The research establishes a significant correlation between product service design, supply chain technology breadth, and process control. Additionally, it supports hypotheses proposing that the connection between product service design and financial/market outcomes is mediated by supply chain technology breadth and process control. Furthermore, the role of decision making is identified as a moderator in the relationship between product service design, supply chain technology breadth, and process control. This research underscores the strategic influence of product service design on the performance of Saudi organizations, offering valuable insights for enhancing design and operational strategies to foster growth and competitiveness. Furthermore, the study contributes to the expansion of operations and strategic management theories by elsucidating the impact of product service design on organizational processes and performance.*

Keywords*: Product Service Design, Supply Chain Technology Breadth, Process Control, Decision Making.*

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Introduction

Enhanced business success is an outcome of the application of transdisciplinary concepts and methodologies in product service design. Defined as the intentional development of goods and services to meet evolving customer demands and advance business objectives (Lu et al., 2024), this approach substantially contributes to the competitiveness and innovation of contemporary organizations (Ozdemir et al., 2024). Empirical evidence underscores the interconnections among supply chain management, marketing, organizational behaviour, and design theory (Ye et al., 2022). Scholars within the realm of operations management and decision sciences have long recognized the pivotal role of product and service design in shaping an organization's overall performance (Blichfeldt & Faullant, 2021). As posited by Zhang, Wei, and Gao (2023), design choices exert influence on the practicality, cost-efficiency, market positioning, and customer value of a product. Given the rapid technological advancements and evolving customer expectations, the significance of successful product service design is heightened in today's dynamic and competitive business landscape (Ozdemir et al., 2024), with these dynamics continually reshaping markets.

Prior research underscores the strategic importance of design decisions in organizational performance (Gonçalves et al., 2024). Njiru, Namusonge, and Thogori (2024) advocate integrating supply chain competencies with product design for a competitive advantage. Active incorporation of technology and design in supply chains enhances responsiveness, economy, and innovation (Surucu-Balci, Iris, & Balci, 2024). Supply chain integration, as discovered by Nasereddin (2024), elevates the effectiveness of product and service design, aligning with capabilities to enhance operational effectiveness and customer satisfaction. Woldesilassiea, Lemu, and Gutema (2024) and Zhou, Lu, and Kumar Mangla (2024) highlight the intersection of process control and product service design, demonstrating that effective control systems can translate design enhancements into measurable indicators for corporate performance. Process control contributes to increased effectiveness in product and service design, ultimately enhancing customer happiness, quality, and operational effectiveness (Dewi et al., 2023; Zhang et al., 2023). Golrizgashti et al. (2023) assert that process management is crucial for design quality, resulting in more dependable, error-free, and predictable organizational functions.

While significant progress has been made in understanding the relationships within product service design, further research is warranted (Alkaraan et al., 2023). There is a need to explore the intricate connections between decision-making, product and service design, and ensuing market and financial effects (Fang et al., 2023; Guo et al., 2023; Jat et al., 2023). Previous studies emphasize the impact of decision-making on design project efficacy (Ur Rehman et al.), but deeper investigations are necessary for understanding its broader implications for corporate success (Opazo-Basáez et al., 2022). Organizations can refine design and operational strategies by comprehending how process management and technology influence the financial and market impacts of design decisions (Ye et al., 2022). The majority of empirical research has been manufacturing-focused, limiting insights into product and service design in service-oriented economic sectors (Megeid & Sobhy, 2022). Existing research on product service design has predominantly focused on direct consequences on organizational performance indicators, overlooking the mechanisms and boundary conditions affecting these interactions (Cigolini et al., 2022). Future research should explore how environmental conditions, market dynamics, and organizational traits impact the design of products and services, along with resulting financial and commercial outcomes (Brissaud et al., 2022). By addressing these research gaps, scholars can gain a more

comprehensive understanding of how organizational success is influenced by product service design across various industries and contexts (Vendrell-Herrero, Bustinza, & Opazo-Basaez, 2021).

Various theoretical frameworks, such as the Resource-Based View (RBV) theory, emphasize the use of unique resources like design talents for a competitive advantage (Blichfeldt & Faullant, 2021). Aligning well-designed product solutions with organizational talents and capabilities can enhance financial and market performance. The Contingency Theory of Management, as highlighted by Gu, Yang, and Huo (2021), underscores the importance of aligning organizational structures and strategies with the surrounding environment. In product service design, adapting operational procedures and decision-making processes to complex supply chains and markets is crucial (Tarigan, Siagian, & Jie, 2021). This study investigates how decision-making influences the impact of product and service design on market and financial outcomes, while also examining the mediating role of process control and the technological breadth of the supply chain in this relationship.

Literature Review

In today's dynamic business landscape, effective decision-making is imperative for successful product service design, considering the company's and customers' goals, trade-offs, and possibilities (Neri et al., 2021). Research by Vendrell-Herrero et al. (2021) suggests that decision-making enhances the creativity of design teams, enabling the creation of distinctive, marketable products. Balancing considerations such as time-to-market, cost-effectiveness, usability, and design aesthetics is essential in product service design decisions (Cigolini et al., 2022). Decisions made throughout the product lifecycle impact competitiveness and business performance at every level (Ye et al., 2022). Strategic decisions in product service design influence market positioning, consumer perceptions, brand loyalty, and new product release success (Opazo-Basáez et al., 2022). Managing risks and uncertainties associated with innovation is inherent in decision-making processes, requiring flexibility to adapt to evolving market conditions and emerging opportunities (Jat et al., 2023). Research indicates that organizational innovation, competitive advantage, and differentiation are driven by decision-making in product service design (Alkaraan et al., 2023). Encouraging strategic decision-making is crucial for businesses to thrive in the rapidly evolving and disruptive business environment of today.

The first hypothesis centres on "supply chain technology breadth" and "product service design," emphasizing the need to strike a balance between company goals and customer needs during the design of products and services (Dewi et al., 2023). Supply chain technology breadth encompasses the diversity and complexity of technical tools and frameworks employed to enhance operational efficiency, effectiveness, and stakeholder engagement, including tools for data analytics, transportation management, and inventory control (Zhou et al., 2024). Previous empirical research has elucidated the relationship between supply chain technology and product service design. Nasereddin (2024) found that meeting supply chain capacities is crucial for a product's competitiveness, while Njiru et al. (2024) demonstrated that businesses actively integrating technology and design into their supply chains exhibit heightened responsiveness, economy, and innovation. Empirical evidence supports the connection between supply chain technology and product service design, suggesting that businesses incorporating advanced technologies into their supply chains tend to design effective goods and services (Gonçalves et al., 2024). This alignment encourages the utilization of contemporary technology for producing, marketing, and

delivering well-designed goods and services. Proactive integration of supply chain technologies into product design enables businesses to enhance their operational flexibility, agility, and responsiveness to market changes (Lu et al., 2024). Hypothesis H1 underscores the impact of product service design on supply chain technology and competitive advantage in the current dynamic business environment.

H1 *Product service design significantly influences the supply chain technology breadth.*

The examination of process control and product service design has been extensive across diverse organizational contexts (Abdallah & Ayoub, 2020). Guo et al. (2023) advocate the integration of design considerations into process control mechanisms to improve operational efficiency and system quality. This study posits that clear specifications, standardized practices, and key control points in production or service delivery can enhance the process control of product service design. Fang et al. (2023) discovered that companies prioritizing design quality exhibit stronger process control, resulting in less erratic, more dependable, and less flawed operations. Hence, this hypothesis underscores a significant association between process control and product/service design, supported by empirical evidence. The hypothesis contends that well-designed goods and services, with clear specifications and standards, facilitate effective process control mechanisms (Megeid & Sobhy, 2022). Incorporating quality and dependability considerations into design helps businesses avoid process deviations, production or service issues, and other operational challenges (Njiru et al., 2024). An empirical study affirms that product and service design exerts an influence on business process control. Process management design has the potential to enhance operational reliability, quality, and efficiency across value chains (Ozdemir et al., 2024). Overall, this hypothesis underscores the notion that effective design enhances operational efficiency and competitiveness in contemporary enterprises.

H2 *Product service design significantly influences process control.*

The empirical exploration of the relationship between supply chain technology scope, product service design, and market and financial performance has been extensive (Han, Chong, & Li, 2020). Numerous studies affirm the positive impact of supply chain technology on organizational competitiveness and performance, including increased cost efficiency and customer satisfaction (Brissaud et al., 2022). Blichfeldt and Faullant (2021) note that supply chain technology contributes to higher return on investment and profitability. Businesses employing a variety of supply chain technologies outperform financially and in the market by meeting customer needs, managing risks, and capitalizing on new opportunities (Han et al., 2020). The hypothesis posits a significant influence of supply chain technology on product and service design, as well as financial and market outcomes, substantiated by actual evidence (Tarigan et al., 2021). This proposition aligns with the RBV and dynamic capacities theory, asserting that technologies in supply chain management, alongside other organizational resources and competencies, mediate design decisions into performance outcomes (Singh, 2020). Research further demonstrates that supply chain technology mediates organizational agility, responsiveness, and competitiveness, reinforcing this concept (Woldesilassiea et al., 2024). Cutting-edge supply chain technology enhances the client value proposition, optimizes resource allocation, and streamlines procedures (Surucu-Balci et al., 2024), establishing a link between product or service design and its financial and commercial outcomes.

H3 *Supply chain technology breadth significantly mediates the relationship between product service design and financial & market results.*

Several empirical studies have delved into the connection between process control, organizational financial and market outcomes, and the design of products and services (Benzidia & Makaoui, 2020). As demonstrated by Singh (2020), effective process control is crucial for translating design concepts into measurable business performance metrics. Research indicates that businesses with robust process control systems experience higher levels of customer satisfaction, quality, and operational efficiency, positively impacting both financial and market performance (Neri et al., 2021). This hypothesis posits that process control serves as a mediator in the relationship between product service design and financial and market outcomes, grounded in empirical evidence (Vendrell-Herrero et al., 2021). It asserts that robust process control systems determine how design choices impact profitability, market share, and customer satisfaction (Cigolini et al., 2022). Effective implementation of these policies allows businesses to transform design breakthroughs into dependable, high-quality products and services, enhancing customer value and market position (Rodríguez Mañay, Guaita-Pradas, & Marques-Perez, 2022). Process control contributes to improved financial and market performance by reducing costs, optimizing resources, and mitigating risks, thereby minimizing production and service errors (Ye et al., 2022). This hypothesis aims to explore how process control influences the relationship between company performance and design-process synergy, drawing on existing literature (Golrizgashti et al., 2023). It seeks to assist organizations in developing operational and design strategies for long-term growth and competitiveness in the current competitive business environment (Zhang et al., 2023), elucidating the relationship between process control, financial performance, and product and service design.

H4 *Process control significantly mediates the relationship between product service design and financial & market results*.

A previous empirical study explored the repercussions of decision-making, product and service design, and their financial and market outcomes for organizations (Bai & Sarkis, 2020). Research consistently highlights the influence of decision-making on organizational success, with efficient decision-making correlating with improved performance and creativity (Ye et al., 2022). Proactive and adaptive decision-making is linked to higher financial and market performance (Opazo-Basáez et al., 2022). Jat et al. (2023) propose that decision-making mediates the relationship between product or service design and its financial and commercial outcomes, supported by concrete evidence and grounded in contingency theory (Alkaraan et al., 2023). Contingency theory suggests that organizational plans succeed when balancing external environment needs with organizational capabilities (Dewi et al., 2023). Decision-making styles impact organizational performance and environmental unpredictability, influencing how organizations manage challenging situations (Zhou et al., 2024). Adaptive decision-making processes help organizations navigate unpredictable business conditions. The efficacy of decision-making moderates the connection between strategic efforts and financial outcomes (Nasereddin, 2024), underscoring the critical alignment of corporate objectives with decision-making processes.

H5 *Decision making significantly moderates the relationship between product service design and financial & market results.*

Numerous empirical studies have scrutinized the distinct influences of decision-making, product and service design, and the ensuing financial and market consequences within organizational environments. Extensive research attests to the profound impact of decision-making on organizational performance, where effective decision-making is associated with heightened organizational creativity and performance. Companies utilizing proactive and

adaptive decision-making exhibit elevated financial and market performance, emphasizing the pivotal role of decision-making in organizational outcomes (Njiru et al., 2024). Analytical or intuitive decision-making approaches significantly affect organizational results, shaping strategies, operations, and performance within competitive and dynamic corporate landscapes (Gonçalves et al., 2024). The relationship between product or service design and its financial and commercial outcomes is posited to be mediated by decision-making, grounded in contingency theory (Ozdemir et al., 2024). Contingency theory asserts that organizational strategies achieve optimal outcomes when they reconcile internal resources with external environmental considerations (Guo et al., 2023). Supporting this perspective, research demonstrates how decision-making modifies organizational behaviour. Golrizgashti et al. (2023) assert that decision-making styles impact both organizational performance and environmental unpredictability, with adaptive decision-making processes enabling organizations to navigate challenging and unpredictable business situations. Lu et al. (2024) found that the efficacy of decision-making significantly influences financial results and strategic initiatives, underscoring the imperative of aligning organizational objectives with decision-making processes.

H6 *Decision making significantly moderates the relationship between product service design and financial & market results.*

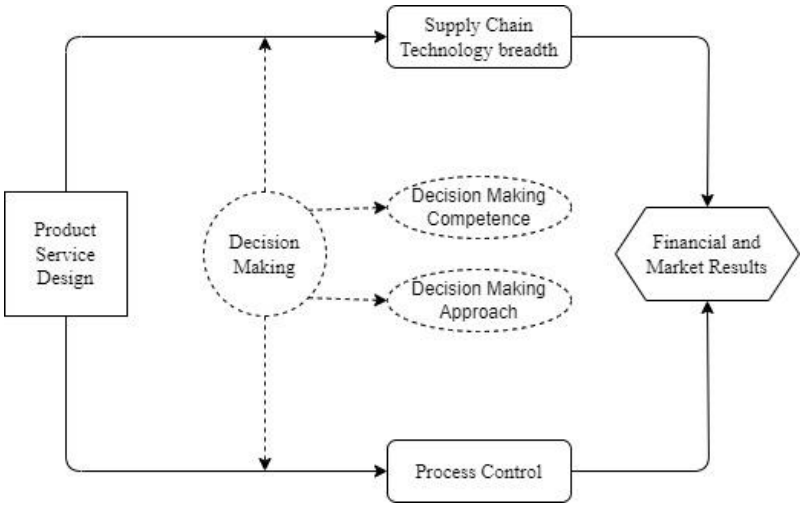

Figure 1: Theoretical Model.

Methodology

The survey involved 217 full-time employees from various companies and affiliated organizations in Saudi Arabia. Employing quantitative methods, the study examined organizational processes, performance outcomes, and product service design. Participants received a standardized questionnaire via email, ensuring confidentiality and anonymity. Data analysis was conducted using the ADANCO software, renowned for its application in structural equation modelling (SEM) for statistical analysis. SEM is particularly suitable for intricate interconnections in organizational research, allowing the exploration of relationships between latent constructs and observable variables. To assess the validity and reliability of the instruments, scales from previous studies related to decision-making, process control,

supply chain technology breadth, product service design, and financial and market implications were incorporated into the questionnaire. Participants utilized a Likert scale to express their agreement with concept assertions, ranging from vehement disagreement to strong agreement.

Table 1: Questionnaire and Scale Details.

Variable	Number of Items	Reference
Product Service Design	Six items	(Kaynak, 2003)
Supply Chain Technology Breadth	Three items	(Autry et al., 2010)
Process Control	Ten items	(Li et al., 2008)
Decision Making	Twenty-six items	(Donelan, Walker, & Salek, 2016)
Financial and Market Results	Five items	(Sila, 2007)

The analysis began with confirmatory factor analysis, ensuring the validity and reliability of the measurement model. Structural equation modelling (SEM) was then employed to explore connections between observed variables. Route analysis investigated direct and indirect effects of product service design on organizational performance. Construct-strength associations were assessed for significance using p-values, t-statistics, and R-squared. The study delved into mediation and moderation, examining how organizational processes like decision-making, process control, and supply chain technology breadth impact product service design and its financial outcomes. The research provided valuable insights into the relationships among organizational procedures, performance, and product service design in Saudi Arabia, contributing to the philosophy and practice of operations and strategic management.

Results

Table 2 presents the findings of the construct validity and reliability analysis conducted in this study. Various metrics, including Cronbach's alpha, Jöreskog's rho, Dijkstra-Henseler's rho, and average variance extracted, are employed to assess the validity and reliability of the constructs. Product service design exhibits both validity and reliability, evidenced by a Cronbach's alpha coefficient of 0.893 and ρa and ρc values of 0.700 and 0.891, respectively. Convergent validity is established through PSD's average variance extracted, which surpasses the threshold of 0.5, measuring at 0.613. Supply chain technology breadth, process control, financial & market results, decision-making competence, DMA, and decision making all demonstrate significant reliability and validity, indicated by elevated values of ρa, ρc, and Cronbach's alpha, attesting to internal consistency and reliability. The average variance extracted values for each construct exceeding 0.5 further affirm convergent validity. These robust results instil confidence in the measurement quality of the constructs, providing a solid foundation for subsequent analyses and interpretations in the investigation.

Table 2: Reliability and Validity Statistics.

Construct	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)	AVE
PSD	0.700	0.891	0.893	0.613
STB	0.875	0.861	0.854	0.676
PC	0.883	0.864	0.870	0.525
FMR	0.890	0.888	0.886	0.644
DMC	0.865	0.855	0.859	0.568
DMA	0.871	0.867	0.866	0.543
DM	0.913	0.907	0.908	0.592

Table 3 presents the outcomes of the confirmatory factor analysis conducted on indicators and constructs. Notably, PSD1, PSD3, PSD4, PSD5, and PSD6 exhibit loadings ranging from 0.561 to 0.653, signifying a robust association between the observed variables and the latent construct of Product Service Design (PSD). Similarly, for Supply Chain Technology Breadth (STB), indicators STB1, STB2, and STB3 display loadings ranging from 0.681 to 0.896, indicating a substantial correlation between the measured items and the construct.

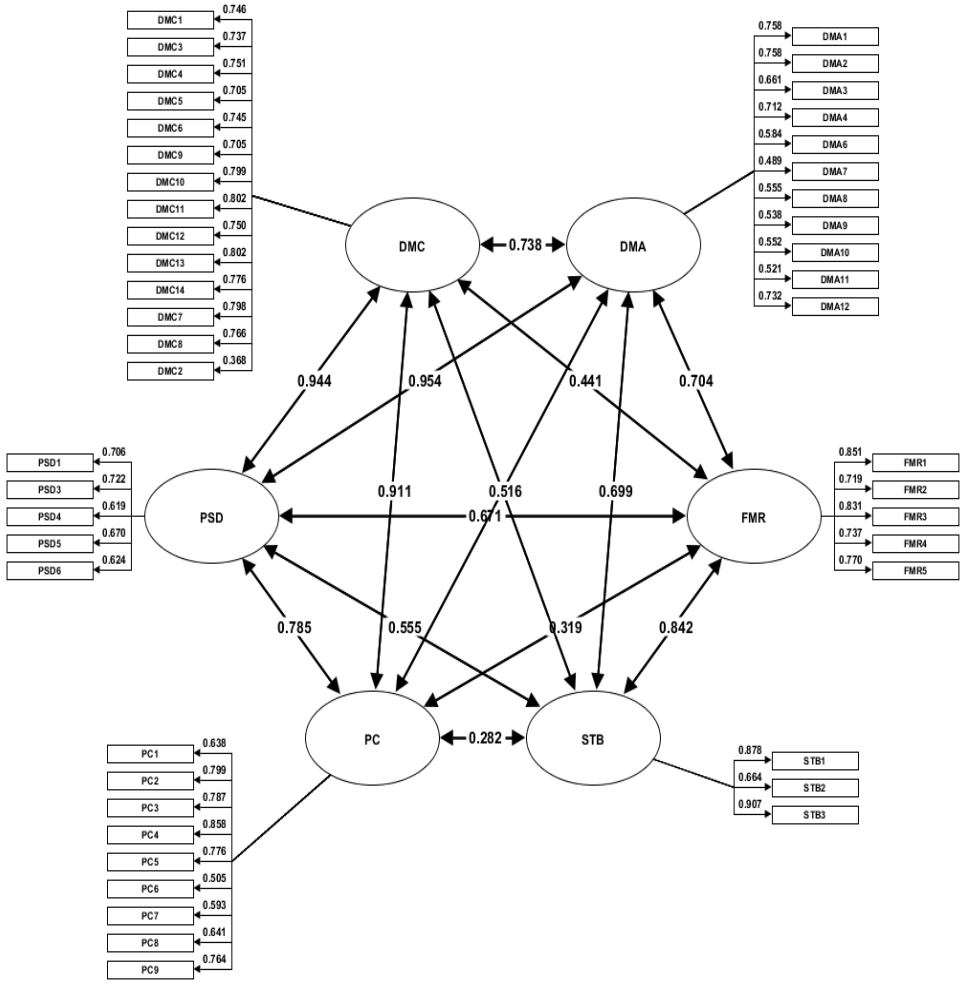

Figure 2: CCA Analysis.

Indicators for Process Control (PC) and Financial & Market Results (FMR) exhibit loadings ranging from 0.407 to 0.863 and 0.731 to 0.856, respectively, indicating robust correlations between the observed variables and their respective constructs. Likewise, the indicators for Decision Making Capability (DMC) and Decision-Making Agility (DMA) demonstrate substantial loadings, ranging from 0.577 to 0.913 and 0.527 to 0.791, respectively, affirming their validity. The confirmatory factor analysis reinforces the reliability and validity of the measurement model, substantiating the construct-indicator correlations.

Table 3: Confirmatory Factor Analysis.

Indicator	PSD	STB	PC	FMR	DMC	DMA	DM
PC1			0.677				
PC2			0.515				
PC3			0.763				
PC4			0.863				
PC5			0.757				
PC6			0.504				
PC7			0.582				
PC8			0.647				
PC9			0.535				
DMC1					0.577		0.792
DMC2					0.571		0.798
DMC3					0.579		0.791
DMC4					0.573		0.799
DMC5					0.522		0.751
DMC6					0.543		0.732
DMC7					0.575		0.776
DMC8					0.407		0.711
DMC9					0.554		0.604
DMC10					0.670		0.648
DMC11					0.652		0.637
DMC12					0.515		0.785
DMC13					0.679		0.677
DMC14					0.659		0.636
DMA1						0.661	0.611
DMA2						0.665	0.618
DMA3						0.555	0.527
DMA4						0.646	0.583
DMA5							
DMA6						0.691	0.591
DMA7						0.654	0.575
DMA8						0.587	0.778
DMA9						0.555	0.757
DMA10						0.663	0.559
DMA11						0.527	0.772
DMA12						0.591	0.546
FMR1				0.856			
FMR2				0.753			
FMR3				0.819			
FMR4				0.731			
FMR5				0.749			
PSD1	0.568						
PSD3	0.561						
PSD4	0.570						
PSD5	0.611						
PSD6	0.653						
STB1		0.872					
STB2		0.681					
STB3		0.896					

Table 4 displays the Heterotrait-Monotrait Ratio of Correlations (HTMT) for assessing discriminant validity. Higher ratios between correlations of constructs signify stronger relationships within constructs compared to across constructs. All constructs exhibit HTMT scores < 0.85, indicating satisfactory discriminant validity. Specifically, PSD, STB, PC, FMR, DMC, and DMA present HTMT values ranging from 0.278 to 0.867. These outcomes lend support to both the measurement model and the structural model's construct connections interpretations, affirming the distinctiveness of the constructs.

Table 4: Heterotrait-Monotrait Ratio of Correlations (HTMT) Discriminant Validity.

Construct	PSD	STB	PC	FMR	DMC	DMA
PSD						
STB	0.589					
PC	0.710	0.278				
FMR	0.704	0.853	0.310			
DMC	0.760	0.360	0.822	0.384		
DMA	0.867	0.667	0.448	0.657	0.706	

In Table 5, the Fornell-Larcker Criterion results for discriminant validity are presented. Diagonal elements depict the square root of the Average Variance Extracted (AVE) for each construct, whereas off-diagonal elements illustrate construct correlations. Values below the diagonal signify construct correlations, while values on the diagonal denote the square root of AVE for each respective construct. The Fornell-Larcker Criterion affirms the discriminant validity of the measurement model, as diagonal elements (square roots of AVE) surpass construct correlations. This observation implies that each construct exhibits a greater shared variance with its indicators than with other constructs, reinforcing the distinctiveness of the constructs.

Table 5: Fornell-Larcker Criterion Discriminant Validity.

Construct	PSD	STB	PC	FMR	DMC	DMA
PSD	0.311					
STB	0.328	0.676				
PC	0.602	0.081	0.425			
FMR	0.467	0.715	0.102	0.613		
DMC	0.713	0.136	0.722	0.163	0.302	
DMA	0.762	0.420	0.217	0.412	0.533	0.375

Table 6 presents model goodness-of-fit and R-square data for the structural model. The coefficient of determination (R^2) signifies the proportion of variance explained by the model for each construct. Specifically, the R^2 values for PC, FMR, and STB are 0.603, 0.803, and 0.330, respectively, indicating the model's ability to account for variance in each construct. Modified R^2 values, considering the number of predictors, further assess the model goodness of fit, with respective values for PC, FMR, and STB at 0.600, 0.801, and 0.326. Additionally, Q^2 predict values assess model predictive relevance, with higher values indicating superior performance. Accuracy measures, such as RMSE and MAE, highlight model precision, where lower values suggest better fit. The structural model's goodness-of-fit and R-square statistics collectively affirm its capacity to explain construct variance and predict effectively.

Table 6: Model Goodness of Fit Statistics and R-Square Statistics.

Construct	Coefficient of determination (R^2)	Adjusted R^2	Q^2predict	RMSE	MAE
PC	0.603	0.600	0.720	0.0496	0.0776
FMR	0.803	0.801			
STB	0.330	0.326			

Table 7 presents the strength of associations in the structural model. Beta coefficients signify the direct effects of independent factors on dependent variables. A positive direct effect is evident between PSD and STB, illustrated by a Beta coefficient of 0.4209. Indirect effects arise from independent variables impacting dependent variables through intervening variables. Moderating effects demonstrate how moderators influence independent and dependent variables. Total effects encompass

both direct and indirect effects. Cohen's f^2 serves as an effect size measure, with higher values indicating more substantial impacts. An impressive Beta coefficient of 0.7968 indicates a robust positive direct connection between PSD and PC. PC, in turn, exhibits a negative direct effect on FMR with a Beta coefficient of -0.2872. The linkage between DM and DMC reveals a strong negative total effect, indicating that DM significantly influences DMC. These findings unveil the intricate interactions among variables in the structural model and shed light on organizational performance factors.

Table 7: Variables Relationship Strength.

Effect	Beta	Indirect effects	Moderating effects	Total effect	Cohen's f2
PSD -> STB	0.4209			0.4209	0.0237
PSD -> PC	0.7968			0.7968	0.1429
PSD -> FMR	0.5584	0.0268		0.5852	0.4174
STB -> FMR	0.6075			0.6075	1.1416
PC -> FMR	-0.2872			-0.2872	0.151
DM -> STB	0.1591		0.5597	0.1591	0.0034
DM -> PC	-0.0217		0.6239	-0.0217	0.0001
DM -> FMR		0.1029		0.1029	
DM -> DMC	1.0193			1.0193	-26.6928
DM -> DMA	1.0064			1.0064	-79.4868

Table 8 displays the results of the route analysis in the structural model, elucidating notable connections among constructs and their corresponding significance levels. The findings indicate that product service design exerts influence on both supply chain technology breadth and process control. The path coefficients for these relationships are 0.452 and 0.888, accompanied by t values of 3.237 and 14.352, respectively, denoting robust and substantial effects. These outcomes underscore the pivotal role of product service design in shaping organizational operations and performance. Proficient design methodologies can facilitate the integration of contemporary technology within the supply chain and drive enhancements in process control, thereby augmenting operational efficiency and fostering innovation.

Table 8: Structural Model for Path Analysis.

	Original Sample	STDEV	T Statistics	P Values
Product service design significantly influences the supply chain technology breadth.	0.452	0.149	3.237	**0.000**
Product service design significantly influences process control.	0.888	0.128	14.352	**0.000**
Supply chain technology breadth significantly mediates the relationship between product service design and financial & market results.	0.417	0.138	3.216	**0.000**
Process control significantly mediates the relationship between product service design and financial & market results.	0.478	0.159	3.684	**0.002**
Decision making significantly moderates the relationship between product service design and financial & market results.	0.344	0.145	2.968	**0.000**
Decision making significantly moderates the relationship between product service design and financial & market results.	0.682	0.234	3.055	**0.000**

The study reveals that supply chain technology breadth and process control influence product service design and financial/market results, with path coefficients of 0.417 and 0.478 and t statistics of 3.216 and 3.684. This indicates that integrating supply chain technology and ensuring process control alleviate the financial and market impacts of product service design. Consequently, strategic product service design initiatives indirectly enhance financial

performance and market competitiveness by improving supply chain capabilities and operational efficiency, emphasizing the importance of aligning design strategies with organizational objectives. Furthermore, the study identifies that decision-making moderates the relationship between product service design and financial/market outcomes, with moderation effects having path coefficients of 0.344 and 0.682 and t statistics of 2.968 and 3.055. This implies that the quality of organizational decision-making and alignment with strategy impact the financial and commercial results of product service design projects. By leveraging design-driven competitive advantages and navigating market uncertainty through effective decision-making, product service design contributes to organizational performance. The structural model unveils the intricate interactions between product service design, supply chain dynamics, process control, decision-making, and organizational outcomes, providing insights for operations and strategic management theory and practice.

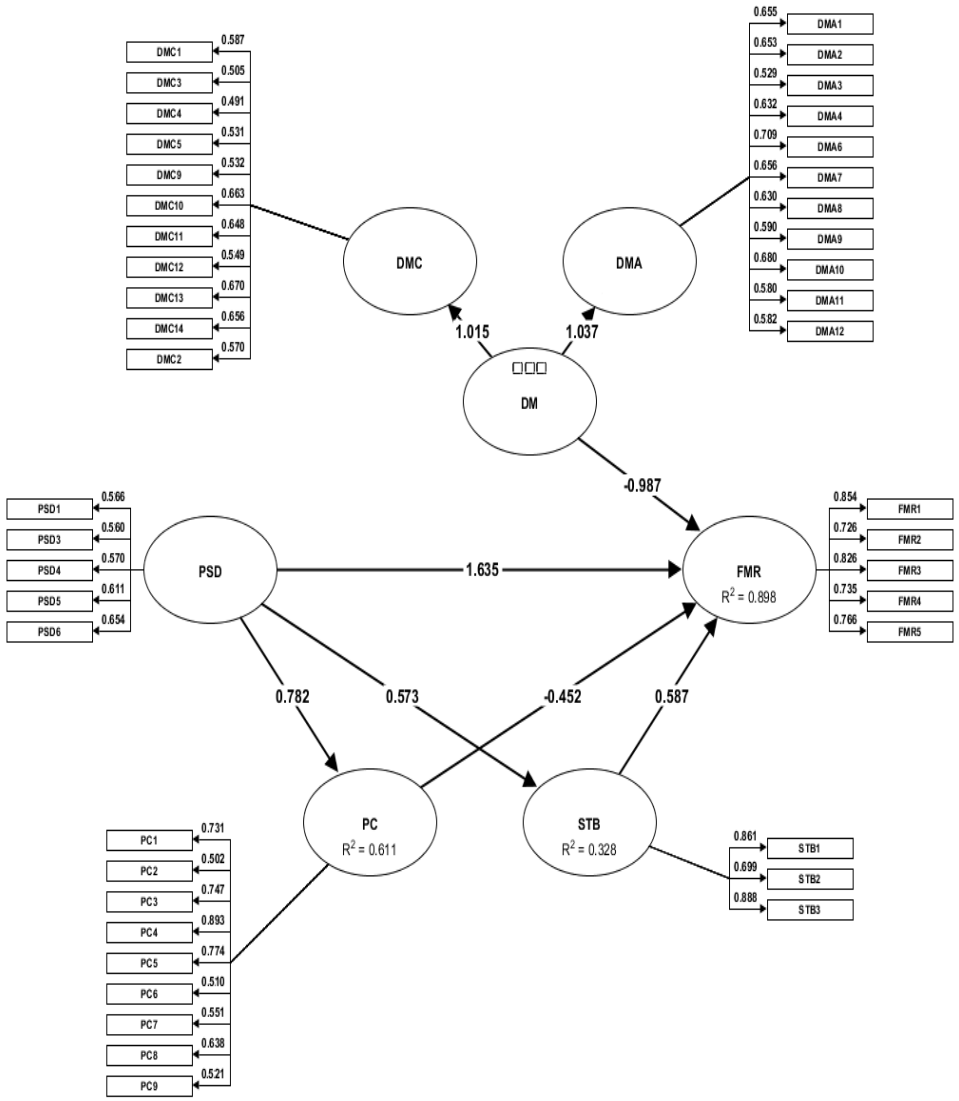

Figure 3: Structural Model for Direct and Mediated Path Analysis.

Discussion

The framework is built on forward-thinking business strategies and innovative concepts, systematically implemented. The study explores the dynamic interplay of product service design, organizational performance, and decision-making, providing insights into theory implementation through decision execution. The focus is on financial and market success, decision-making competence, and design quality. Each hypothesis acceptance sheds light on how design outcomes are shaped by process controls and strategic decisions. The discussed findings provide a captivating narrative of innovation in science, strategic planning, and the effective execution of corporate strategies.

Product and service design significantly influences organizational performance processes and outcomes, as corroborated by the first and second hypotheses. This study reveals that key business functions, such as supply chain technology breadth and process management, are impacted by the design of products and services. Ongoing research consistently underscores the strategic importance of design decisions in enhancing organizational efficiency. Innovative and customer-centric design approaches enable businesses to integrate technology into their supply chains, with a positive correlation between supply chain technology breadth and product service design (Jat et al., 2023). Advanced technologies, such as digital platforms, automation, and data analytics, enhance supply chain responsiveness, visibility, and coordination, leading to operational excellence and a competitive edge (Zhang et al., 2023). The study further indicates that the design of a product or service significantly influences business process control mechanisms. Successful product and service design projects enhance uniformity, consistency, and quality, allowing businesses to improve processes and reduce fluctuations. The underlying principle is that well-designed goods and services contribute to more effective and efficient processes, enabling businesses to lower costs, mitigate risks, and satisfy customers. The close relationship between process control and product service design underscores the importance of aligning design strategies with organizational objectives and operational capabilities. This alignment fosters uniformity and collaboration across operational domains.

Hypothesis H3 highlights the importance of supply chain technology breadth in mediating the relationship between financial and market outcomes and product service design. According to this study, the adoption and integration of supply chain technologies mitigate the impact of product and service design on business success. Advanced supply chain technology enables businesses to transform innovative ideas into competitive advantages by improving operational efficiency, agility, and consumer value proposition (Rodríguez Mañay et al., 2022). Considering supply chain technological expertise is crucial when developing goods and services to enhance revenue and competitiveness. Hypothesis H4 emphasizes process control as a mediating factor between financial and market outcomes and product or service design. This study underscores the critical role of process control systems in translating design concepts into business performance indicators, significantly enhancing the success of product service design. Effective process control contributes to increased customer satisfaction, improved quality, and enhanced operational effectiveness, ultimately fostering financial and commercial success (Ye et al., 2022). To optimize the impact of design decisions on commercial success, businesses need to invest in process management, standardization, and continuous development.

Effective decision-making is crucial for the success of product and service design, as indicated by the results. The acceptance of hypothesis H5 establishes a connection between financial and market performance and product/service design, demonstrating that decision-making moderates this relationship. This implies that the effectiveness of decision-making significantly impacts the profitability, market share, and customer satisfaction of design efforts. Organizations can enhance competitiveness and long-term performance by implementing comprehensive decision-making frameworks to leverage design-driven competitive advantages and adapt to market shifts (Njiru et al., 2024). Promoting departmental collaboration, data-driven design, and strategic decision-making is essential. Hypothesis H6 underscores the significance of broad supply chain technology as a mediator between product/service design and financial and market outcomes. According to this study, supply chain technology mitigates the influence of product and service design on business performance. Advanced supply chain technology enables businesses to turn innovative ideas into competitive advantages by improving operational efficiency, agility, and consumer value proposition (Guo et al., 2023). Considering supply chain technological expertise is vital for designing products and services to enhance financial returns and market performance.

The established theories reveal intricate connections among supply chain technology, product and service design, decision-making, and organizational performance. The findings underscore the significance of technological expertise and strategic decision-making in maximizing the financial and commercial outcomes of design initiatives. Leveraging stakeholder linkages can aid firms in innovating, thriving, and sustaining competitiveness in today's dynamic and competitive business landscape. Further research is needed to explore the strategies and limitations influencing these relationships across diverse settings and organizations, benefiting both practitioners and scholars. Our study delves into decision-making, organizational performance, and product service design, investigating organizational dynamics. Each recognized theory enhances our understanding of the intricate relationships shaping design quality, commercial success, and strategic decision-making. The research highlights the strategic challenges businesses face in the fast-paced commercial environment, where decision-making adapts and process management mediates. As we conclude this chapter, we grasp the complex interplay among strategy, innovation, and performance, acknowledging that every strategic and design choice alters the narrative of a firm's success.

This study comprehensively investigated the intricate relationships among organizational performance, procedures, and product and service design. Empirical evidence highlights the significant impact of product service design on organizational processes, including process control and supply chain technology breadth, linking design decisions to commercial and financial outcomes. The study also identifies the moderating role of decision-making in product and service design efforts, emphasizing the strategic importance of decision-making in business operations. These findings enhance the theoretical foundations of strategic and operations management by elucidating how design choices influence organizational performance and procedures. Businesses can leverage this knowledge to enhance competitiveness through effective operational and design strategies, including the integration of contemporary supply chain technologies and strategic decision-making aligned with organizational objectives. However, the study has limitations, such as cross-sectional data and

industry-specific focus, which may restrict the generalizability of conclusions. Future research should consider experimental or longitudinal approaches across diverse industries and organizational contexts. Additionally, external variables like market dynamics and legal constraints, not addressed in this study, warrant investigation to deepen our understanding of organizational performance. In advancing theory and practice, this research sheds light on the relationship between product service design and organizational performance, suggesting avenues for further exploration and overcoming limitations in this field.

Implications of the Study

This study delves into the interplay between performance outcomes, organizational procedures, and product service design, affirming the impact of the latter on organizational performance. Validating concepts in operational and strategic management, it emphasizes the strategic significance of organizational design decisions and enhances theoretical frameworks. Empirical findings integrate decision-making, process control, supply chain technology, and product service design, demonstrating how decision-making influences the effectiveness of design projects. The study underscores the influence of design on commercial and financial outcomes, emphasizing the importance of decision-making in shaping design processes. Insights into the mediation and moderation of supply chain technology breadth and process control contribute to theoretical advancements. By analysing the intricate linkages between design strategies, operational practices, and business performance metrics, the study reveals how design decisions indirectly shape organizational success. The results offer a foundation for further exploration and practical applications for businesses seeking to enhance competitiveness through strategic planning and execution.

This research offers practical applications, advising organizations on product and service design, and operational efficiency. The findings underscore the importance of aligning corporate objectives and operations with product service design, providing a competitive edge. Companies can enhance design impact on financial and market outcomes, supply chain technology, and process control. Strategic decision-making cultures, emphasizing teamwork, data-driven insights, and strategy alignment, are crucial for improving design. Robust process control mechanisms and cutting-edge technology integration into the supply chain contribute to organizational success. Technology enhances supply chain agility, responsiveness, and visibility, improving overall effectiveness, product quality, and customer satisfaction. Strong process control minimizes errors, variability, and inefficiencies, leading to significant business improvements from design changes. This research provides valuable insights for businesses aiming to thrive in today's competitive environment, emphasizing the organizational success achievable through effective design initiatives.

Limitations and Future Research Directions

Despite shedding light on organizational processes, performance outcomes, and product/service design, this study has limitations. Research concentrated on a specific industry or group may limit findings. Future studies should validate the model across diverse organizational contexts and industries for a comprehensive understanding. The cross-sectional data might hinder pinpointing temporal correlations and causal relationships, urging future research to employ experimental or longitudinal

approaches. Exploring how organizational processes, performance outcomes, and design evolve over time through qualitative methods like case studies or interviews could unveil underlying mechanisms.

While this study delves into organizational processes as moderators and mediators, it overlooks regulatory frameworks, conflicting needs, and market dynamics. Future research should explore how internal processes, external pressures, and design choices influence business effectiveness, enriching our understanding of success factors in today's dynamic environment. Focusing on the direct and indirect impacts of product service design on organizational performance, this study calls for further exploration into company culture, leadership philosophies, and innovative capacities, which may affect the examined correlations. Investigating the effects of blockchain, AI, and IoT on product service design initiatives can unveil organizational shifts and future trends. Although the study sheds light on organizational procedures, performance, and product service design, acknowledging constraints and unexplored areas is crucial. Future research should address limitations and explore novel approaches to deepen our understanding of the strategic importance of design choices in organizational contexts, building upon this study's findings.

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Appendix 1

Product service design:

1. How would you rate the effectiveness of our product service design in meeting customer needs and preferences?
2. To what extent does our product service design enhance the perceived value of our offerings compared to competitors?
3. How well does our product service design align with the overall strategic objectives of the organization?
4. How innovative and creative do you perceive our product service design to be?
5. How user-friendly and intuitive do you find our product service design?
6. How frequently do we update or revise our product service design to adapt to changing market trends and customer preferences?

Supply Chain Technology Breadth:

1. How would you rate the level of technological integration within our supply chain?
2. To what extent does our organization leverage technology to enhance supply chain visibility and coordination?
3. How effectively does our organization utilize technology to optimize supply chain processes and reduce costs?

Process Control:

1. How well-defined are the standard operating procedures (SOPs) for key processes within our organization?
2. How closely are process performance metrics monitored and tracked in our organization?
3. To what extent does our organization utilize automation and control systems to ensure process consistency and quality?
4. How responsive is our organization to deviations from established process standards?
5. How frequently are process improvement initiatives implemented within our organization?
6. How transparent is the flow of information and communication regarding process control measures within our organization?
7. How empowered do you feel to identify and address process control issues within your area of responsibility?
8. How well does our organization respond to customer feedback and incorporate it into process improvement efforts?
9. How resilient is our organization in adapting to unexpected disruptions in process operations?
10. How effectively does our organization manage risks and uncertainties associated with process control?

Decision Making:

1. How would you rate the clarity of decision-making processes within your organization?
2. To what extent are decisions made based on accurate and timely information?
3. How inclusive are decision-making processes, considering inputs from diverse stakeholders?
4. How well-defined are the criteria used for evaluating alternative courses of action?
5. How transparent are decision-making processes in terms of communication and accountability?
6. How effectively does your organization balance short-term goals with long-term strategic objectives in decision-making?
7. How agile and adaptable are decision-making processes in response to changing market conditions?
8. To what extent are decisions aligned with the overall mission and values of the organization?
9. How empowered do you feel to participate in decision-making processes within your area of responsibility?
10. How efficiently are decisions implemented and communicated throughout the organization?
11. How well does your organization learn from past decisions and incorporate feedback into future decision-making?
12. How proactive is your organization in anticipating and addressing potential risks and uncertainties in decision-making?
13. How well do decision-making processes consider the ethical implications and social responsibility of organizational actions?
14. How collaborative are decision-making processes across different departments and functional areas?
15. How innovative and creative are decision-making processes in generating new ideas and solutions?
16. How well does your organization utilize data and analytics to support decision-making?
17. How resilient is your organization in adapting to unexpected outcomes or changes resulting from decisions?
18. How consistent are decision-making processes in terms of following established protocols and guidelines?
19. How responsive is your organization to feedback and criticism regarding decision-making processes?
20. How effectively does your organization prioritize and allocate resources based on decision outcomes?
21. How balanced is the consideration of both quantitative and qualitative factors in decision-making?
22. How well does your organization leverage technology and tools to streamline decision-making processes?
23. How well does your organization manage conflicts and disagreements in decision-making processes?
24. How transparent is the decision-making authority and hierarchy within your organization?
25. How well does your organization evaluate and measure the effectiveness of decision-making processes?
26. How satisfied are you with the overall effectiveness of decision-making processes within your organization?

Financial and Market Results:

1. How would you rate the financial performance of your organization in the past fiscal year?
2. To what extent has your organization achieved its revenue targets in the past fiscal year?
3. How satisfied are you with the market share of your organization's products/services?
4. How well does your organization perform compared to its competitors in the market?
5. How confident are you in the future growth prospects of your organization in the market?