THE ROLE OF PRODUCT - SERVICE DESIGN AND STRATEGIC PLANNING IN PREDICTING COMPETITIVE ADVANTAGE

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Abstract

To gain and maintain competitive advantage in the 21st century, organisations must effectively understand and respond to customer needs. This study examines how strategic planning mediates the relationship between product-service design and competitive advantage through the lens of the Resource-Based View (RBV). The RBV framework suggests that the use of internal resources and capabilities, such as strategic planning processes, can enhance an organisation's competitive position. Jamovi software was used to test the fit, reliability and validity of the model through regression analysis, factor analysis and principal component analysis. The study used a stratified random sample of 200 managers from the Tanzania-Zambia Railway Authority (TAZARA). Data were collected using a five-point Likert scale questionnaire and analysed using descriptive statistics, regression analysis, factor analysis and principal component analysis. The results reveal a positive and significant relationship between product-service design and competitive advantage, and between strategic planning and competitive advantage. In particular, strategic planning was found to partially mediate the relationship between product-service design and competitive advantage. This study makes a unique contribution to the existing literature by demonstrating that strategic planning is a critical mediator that enhances the impact of product-service design on competitive advantage. It highlights the importance for organisations to effectively formulate and implement strategic planning in order to sustain competitive advantage. Future research should replicate this study in other industries and explore additional moderating and mediating variables to provide more comprehensive insights.

Keywords: Product - service design; Strategic planning; Competitive advantage; Mediation.

1. Introduction

Businesses around the world are trying to come up with fresh and inventive approaches to attract more customers and improve their financial success. As the success of any organisation depends on its customers, managers in organisations are working hard to understand and determine their customers' desires (Tryson, 2022) in order to meet the demands and maintain the competitiveness of their organisations in this tense, dynamic competitive environment. When it comes to doing the right thing and ensuring that what is promised is delivered, managers should ensure a high level of reliability in the promises made to consumers to ensure their satisfaction (Oyeniyi & Abiodun, 2012). To stay ahead of the competition and survive in today's volatile and dynamic environment, firms need to differentiate themselves from other competitors (Yangailo, 2023a). According to Sharp (1991), the future belongs to those who take a long-term view of market conditions by deciding what they want to do and what they are best placed to do, and then stick to their decision by concentrating on achieving excellence in serving their chosen market position. Product/service design is the most important thing to consider when developing a new product or service. Designs are created with the customer's wants and needs, existing products and market competition in mind. Managers now recognise the value of customer satisfaction in attracting and retaining more customers.

Although empirical studies show a positive relationship between product-service design and competitive advantage, few include a contingency variable as a moderator or mediator to provide more comprehensive insights into this relationship (Brissaud et al., 2022; Teixeira et al., 2012; Mukhtar et al., 2012; Polaine et al., 2013; Martinez et al., 2010; Baird et al., 2011). To fill this gap, the present study was conducted to further explore this relationship by including 'strategic planning' as a contingency variable.

Despite the established positive relationship between product-service design and competitive advantage, there is limited empirical research that includes strategic planning as a contingency variable to provide a more complete understanding of this relationship. This gap in the literature suggests the need to explore how strategic planning mediates the relationship between product-service design and competitive advantage in order to provide deeper insights for organisations seeking to improve their competitive positioning.

By including strategic planning as a mediating variable, the study provides a more nuanced understanding of the dynamics between product-service design and competitive advantage. This can help organisations identify the critical factors that contribute to sustainable competitive advantage.

2. Literature Review

In today's dynamic business environment, characterised by rapid technological advances, increased competition and changing customer expectations, companies must adopt innovative strategies to maintain a sustainable competitive advantage. One such strategy is Product-Service Design (PSD), which represents a significant departure from traditional product-centric approaches by integrating tangible products with complementary services to enhance market positioning. This literature review aims to provide a comprehensive examination of the interplay between PSD, strategic planning and competitive advantage. This section examines the theoretical frameworks that underpin these concepts, analyses

recent empirical studies and identifies existing gaps in the literature that this study seeks to fill.

2.1 Theoretical Framework

The Resource-Based View (RBV) is a key theoretical framework for understanding the dynamics between PSD, strategic planning and competitive advantage. The RBV posits that a firm's sustainable competitive advantage derives from its unique combination of tangible and intangible resources. These resources, characterised by heterogeneity and imperfect mobility, create barriers to imitation and enable firms to achieve superior performance (Madhani, 2010). Recent advances in RBV theory highlight the importance of cross-functional capabilities and strategic alignment in explaining why some firms outperform others (Chatterjee et al., 2023). However, the RBV literature often lacks a detailed exploration of how PSD specifically contributes to leveraging these resources for competitive advantage.

2.2 Competitive Advantage

Competitive advantage is defined as the ability of an organisation to carry out its activities in a way that is different from its rival competitors (Kotler, 2000). "Competitive advantage allows a firm to consistently outperform its competitors and generate significant profits from a large portion of its market" (Yangailo, 2023b). Achieving "true" customer loyalty is necessary in the current context of intense competition; moreover, gaining customers' trust and commitment is a crucial step towards long-term customer loyalty (Vasquez-Parraga & Sahagun, 2014). The competitive advantage capabilities that differentiate a firm from its competitors are quality and cost/price (Tracey et al., 1999). This highlights a gap in understanding how PSD contributes to developing and sustaining these competitive advantages in contemporary markets.

2.3 Product Service Design

Furrer (1997) defines the product-service idea as "proposing a mix of tangible products and intangible services that are designed and combined to optimise product use and performance". Motivation, ideas for improvement, organisational skills and forecasting are all part of the design process. Innovation, research and development are critical components of the manufacturing process. Because of the impact that product and service design can have on an organisation, the design process is encouraged to be a component of the organisation's strategy. Forecasting, organisational skills, suggestions for improvement and motivation are all part of the design process (Yangailo, 2024a). Product Service Design is a new approach to responsible industrial innovation (Peruzzini et al., 2014). Despite the growing recognition of the strategic importance of PSD, there is still limited research on how its integration into business strategy directly influences competitive advantage and organisational performance.

2.4 Strategic Planning

Strategic planning is a method that assists an organisation in determining its destiny and purpose (Barry, 1997). "Strategic planning helps organisations to know what to do, why to do it and how to do it" (Yangailo, 2024b, p. 48). Strategic planning is the process of

validating and directing entrepreneurial efforts by evaluating both current and future goals (Henderson & Hines, 2019). Strategic planning helps organisations determine what to do, why to do it, and how to do it. The selection of goals that shape the company's strategy is influenced by strategic planning (Yangailo, 2022). However, the literature also indicates inconsistencies in how strategic planning affects competitive advantage, suggesting a need for more nuanced research in this area (Yangailo, 2022).

2.5 Product - Service Design and Competitive Advantage

Service design thinking can help rethink value propositions to include solutions that meet customer needs while maintaining competitive advantage (Rau et al., 2017). It has also emerged as a competitive tactic to force producers to offer a comprehensive range of products and services (Geng et al., 2010). Constant development is a key criterion in the global retail industry, with a focus on continuous benchmarking with competitors (Brondoni et al., 2013). Ferdousi et al. (2018) examined the relationships between organisational characteristics, TQM and competitive advantage. The results show that the extent to which TQM practices, including product-service design, were adopted was positively associated with competitive advantage. Despite this, there is a need to further explore how PSD interacts with other strategic factors to enhance competitive positioning in different industry contexts.

It is clear that product-service design and competitive advantage are inextricably linked, as evidenced by previous studies (Brissaud et al., 2022; Teixeira et al., 2012; Mukhtar et al., 2012; Polaine et al., 2013; Martinez et al., 2010; Baird et al., 2011). The existence of the positive relationship between product-service design and competitive advantage based on previous studies is undeniable, therefore, this study adopts the following hypothesis:

> Hypothesis 1: *Product-service design has a positive significant impact on competitive advantage.*

2.6 Product service design and Strategic Planning

Several studies have demonstrated and presented that strategic planning is a process that leads to the creation and implementation of product-service systems (Mitake et al., 2020), and the positive substantive relationship between them is undeniable. The relationship between strategic planning and PSD is well documented, but further studies are needed to explore how this relationship evolves and affects competitive outcomes in different sectors (Kurpiela, 2022; An et al., 2008). This suggests a gap in understanding how strategic planning frameworks can be effectively integrated with PSD processes to achieve sustainable competitive advantage. As a result of the importance of strategic planning in PSD, the following hypothesis has been developed:

> Hypothesis 2: *Product-service design has a positive significant relationship with strategic planning.*

2.7 Strategic Planning and Competitive Advantage

Mulyaningsih et al. (2021) aimed to assess the influence of SP on the competitive advantage of Indonesian small and medium-sized enterprises (SMEs). The results of the

study show that SP has a significant impact on competitive advantage. Kiiyo (2019) conducted a study in Kenya on the influence of organisational structure and employee behaviour on the relationship between SP and competitive advantage in manufacturing firms. According to the results of the study, SP has a significant impact on competitive advantage.

Miller et al (2004) conducted a study of 55 companies in the UK to learn about tactics for successful implementation of strategic decisions. The results suggested that meticulous managerial planning does not ensure effective outcomes in a firm. Powell (1992), after examining the relationship between planning and performance from a resource perspective, found that SP did not meet the criteria for long-term competitive advantage.

There is a need for further research into the nature of the relationship between strategic planning and competitive advantage. This discrepancy highlights the need for further research into the specific conditions under which strategic planning effectively contributes to competitive advantage (Yangailo, 2024c). The literature on the impact of SP on competitive advantage is inconclusive. As a result, the following hypothesis was selected for the purposes of this research study:

> Hypothesis 3: *Strategic planning has a positive significant impact on competitive advantage.*

This literature review reveals a complex interplay between PSD, strategic planning and competitive advantage. While the existing research provides valuable insights, several gaps remain, particularly regarding how PSD and strategic planning together influence competitive advantage in contemporary business environments. Addressing these gaps will improve our understanding of how organisations can use PSD and strategic planning to achieve and sustain competitive success.

2.8 Conceptual Framework

The following hypothesized model was built based on the association between the variables used in this study and the literature review, as shown in Figure 1.

Figure 1 − Hypothesised Model
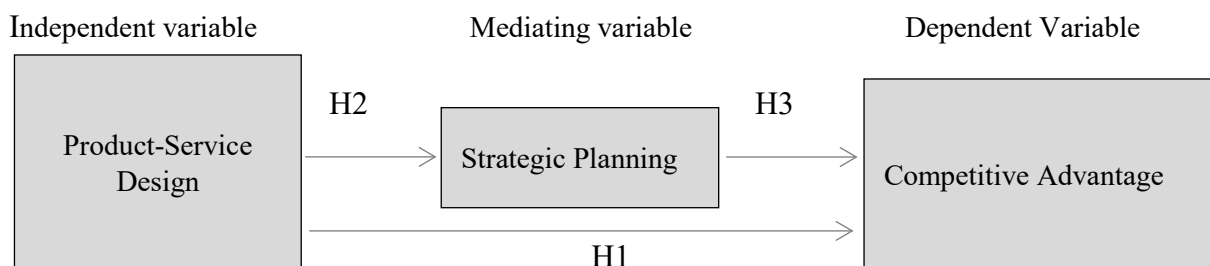
Source: Authors (2024)

2.9 Research Hypotheses

The hypotheses summarised below are based on the primary goal of this study, the findings of the literature review, and the hypothesised model.

Hypothesis 1*:   Product - service design has a positive significant impact on competitive advantage.*

Hypothesis 2*:   Product - service design has a positive significant relationship with strategic planning.*

Hypothesis 3*:   Strategic planning has a positive significant impact on competitive advantage.*

Hypothesis 4*:   Strategic planning has a mediating effect on the relationship between Product - service design and competitive advantage.*

3. Methodology

The subject of this research, TAZARA, is a railway authority jointly owned by Zambia and Tanzania and has been in operation since its inception in 1975. Out of a target population of 240, the questionnaire was distributed to 200 managers with a response rate of 75%, resulting in 150 completed questionnaires. Using Jamovi software, the model's fit, reliability and validity were tested using regression, factor and principal component analysis in order to draw meaningful conclusions about the relationships between strategic planning, product-service design and competitive advantage.

3.1   Sample and Participants

This study used a stratified random sampling technique to ensure a representative sample from different departments within the Tanzania Zambia Railway Authority (TAZARA). The sampling frame included all managers with at least three years of experience in their respective positions, allowing for the selection of a sample of 200 managers. This approach was chosen to capture different perspectives within the organisation and increase the generalisability of the findings.

3.2 Data Collection

Data were collected through a self-administered questionnaire using a five-point Likert scale ranging from 'strongly agree' (5) to 'strongly disagree' (1). To maximise accessibility and response rates, the questionnaire was distributed in two formats:
- Physical copies: Questionnaires were delivered directly to managers at their place of work.
- Online survey: An online version was made available, allowing managers to participate conveniently from any location with internet access.

The questionnaire was pre-tested with a sample of 20 managers prior to full distribution. The purpose of this pre-test was to identify and address any ambiguities or areas for improvement in the clarity and understandability of the questions. Based on the

feedback from this pre-testing phase, the questionnaire was refined and then distributed to the final sample of 200 managers. The response rate was 75%, with 150 completed questionnaires returned. The sample size of 150 from a target population of 240 was the minimum recommended by Krejcie and Morgan (1970) for conducting scientific research (see Table 1).

Table 1 – Determining the Sample Size of a Given Population

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note: N is population size, S is sample size.
Source: Krejcie and Morgan (1970)

3.3   Data Analysis

Data analysis was carried out using Jamovi software (version 2.3.28 solid), a robust tool for statistical analysis. Descriptive statistics were used to summarise the demographic characteristics of the respondents. Various statistical tests were performed to assess the fit, reliability and validity of the model:

- Regression analysis: This technique was used to assess the relationships between the study variables.
- Factor analysis: Used to identify the underlying factors influencing the data and to group related variables.
- Principal Component Analysis (PCA): Used as a dimensionality reduction technique to identify the most significant factors explaining the variance in the data.

3.4 Measures

The constructs of strategic planning, product-service design and competitive advantage were measured using five-point Likert scales with responses ranging from 'strongly agree' (5) to 'strongly disagree' (1). The measures for these constructs were developed based on established scales from the literature, specifically from the works of Coşkun (2011), Ang et al. (2000), Prajogo and Sohal (2006), Claver et al. (2003), Terziovski (2006), Berhanu (2019), and Hilmy (2016). This ensured the reliability and validity of the measurement instruments used in the study.

4. Results and Discussion

The quantitative research approach was used in the analysis, which was carried out using Jamovi software. The results of the study are presented in the form of descriptive statistics, tables, figures and hypothesis tests.

4.1 Demographic Characteristics

Table 2 shows the demographic profile of the 150 respondents who participated in the study based on their gender and experience.

Table 2 – Demographic Profile

Description	Frequency	Percentage (%)
Gender		
Female	25	16.7
Male	125	83.3
Total	150	100
Experience in Years		
< 10	42	28
10-20	56	37.3
> 20	52	34.7
Total	150	100

Of the 150 respondents, 83.3% (125) were male and 16.7% (25) were female. Of the 150 respondents, 28% (42) had less than 10 years' experience, 37.3% (56) had 10 to 20 years' experience and 34.7% (52) had more than 20 years' experience with the organisation.

4.2 Descriptive Statistics

The mean, standard deviation, skewness and kurtosis for the constructs used in this research are shown in Table 3.

Table 3 – Mean, Standard Deviation, Skewness, & Kurtosis of Constructs (N = 150)

	SP	CA	PSD
N	150	150	150
Mean	3.24	2.91	3.18
Standard deviation	0.730	0.764	0.850
Skewness	-0.203	-0.0885	-0.308
Std. error skewness	0.198	0.198	0.198
Kurtosis	0.302	-0.0327	-0.0499
Std. error kurtosis	0.394	0.394	0.394

SP=Strategic Planning
CA-Competitive Advantage
PSD= Product-Service Design
Source: Jamovi computation

The mean values of the three constructs suggest that respondents responded positively. The skewness and kurtosis were in the -2 to +2 range, indicating that there was no significant deviation from normalcy for either component.

4.3   Reliability and Validity

4.3.1 Testing Assumptions of Study Variables

The data from the study were subjected to validity and reliability tests to ensure that the data could be analysed using factor analysis. Data must meet four assumptions in order to produce accurate results when using principal component analysis (Landau & Everitt, 2003). These assumptions include a linear relationship between variables, multiple variables scored at either ordinal or continuous levels, no major outliers, and sufficient sampling. After examination, the sample data collected met all four assumptions. In order to perform Principal Component Analysis (PCA), the data must contain at least 150 examples (Fan et al., 2008).

Therefore, the 150 cases met the minimum data requirement for PCA. A reliability test was conducted to provide reliable measures of the consistency and internal validity of the measures used. Cronbach alpha was calculated for all three construct scales using reliability analysis with a recommended minimum threshold of 0.7 (Hair et al., 2006; Nunnally, 1978).

4.3.2 Results of Reliability and Validity Tests

The 19 items in the instrument were factored. It was subsequently found that all 19 items correlated with at least one other item by at least three points (0.3), indicating good factorability. The Kaiser-Meyer-Olkin (KMO) indicator of sampling adequacy was 0.915 above the threshold of 0.6. The KMO measure of sampling adequacy shows the proportion of variance in variables that could be caused by underlying factors. Bartlett's sphericity test was statistically significant ($\chi 2$ (171) = 1270, p < .001). Based on the results, PCA was considered appropriate for the 19 items presented in Table 4.

Table 4 – Kaiser-Meyer-Olkin and Barlett's Test result

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.915
Bartlett's Test of Sphericity	Approx. Chi Square	1270
	Degrees of freedom	171
	Significance	.000

Source: Jamovi computation

The analysis shows that the Cronbach's alpha of the instrument was significantly higher than the required minimum of 0.7 (Nunnally, 1978; Hair et al., 2006). The alpha coefficient of the instrument ranged from 0.767 to 0.822. The strategic planning scales had an alpha coefficient of .822, the competitive advantage scales had an alpha coefficient of .802 and the product-service design scales had an alpha coefficient of .767. Table 5 shows that the Cronbach alpha coefficients for all three components met the required minimum level of 0.7.

Table 5 – Cronbach Alpha Test Results

Items	Cronbach's Alpha	McDonald's Mega	Number of Items	Comment
Overall	.920	.921	19	Accepted
Strategic Planning	.822	.827	11	Accepted
Product-Service Design	.767	.769	3	Accepted
Competitive Advantage	.802	.803	5	Accepted

Source: Jamovi computation

4.4 *Linearity*

The relationship between the independent and dependent variables is linear. The computation of Spearman and Pearson correlation coefficients, as shown in Table 6, validated this premise.

The results show that there are significant positive relationships between product service design, strategic planning and competitive advantage. There is a positive significant correlation coefficient of .504 between Product Service Design and Competitive Advantage. There is a significant positive correlation coefficient of .663 between product service design and strategic planning. There is a significant positive correlation coefficient of .597 between strategic planning and competitive advantage. The correlations suggest that there were no collinearity problems as they were all less than 0.85. The issue of multicollinearity does not arise (Hair et al., 2010).

4.5 *Model Fit*

Before estimating the suggested model, the regression model was tested individually.

4.5.1 Overall Regression Model Testing

The following hypothesis was used to examine the significance of the regression model.

$$H0: \beta 1 = \beta 2 = ... Bi = 0$$

$$Ha: \text{At least one regression coefficients is} \neq 0$$

Table 6 – Construct Correlation Matrix

		SP	PSD	CA
SP	Pearson's r	—		
	Spearman's rho	—		
	N	—		
PSD	Pearson's r	0.663 ***	—	
	Spearman's rho	0.579 ***	—	
	N	150	—	
CA	Pearson's r	0.597 ***	0.504 ***	—
	Spearman's rho	0.547 ***	0.452 ***	—
	N	150	150	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

SP=Strategic Planning
CA-Competitive Advantage
PSD= Product-Service Design
Source: Jamovi computation

The regression analysis revealed the existence of a strong and significant relationship between the constructs. The first model in Table 7 shows an excellent fit and significant values of R(0.597), R^2(0.356) and an F-value of 81.8, indicating the impact of strategic planning on competitive advantage. According to the model, strategic planning accounts for 36% of the variation in competitive advantage. The second model, which examined the impact of product-service design on competitive advantage, showed a good fit and significant values of R (0.504), R^2 (0.254) and F-value (50.5). Thus, product-service design accounts for 25% of the variation in competitive advantage. The final model demonstrating the relationship between strategic planning and product-service design had acceptable goodness of fit values of R(0.663), R^2(0.439) and a substantial F-value of 116. According to the model, strategic planning accounts for 44% of the variation in product-service design.

Table 7– Regression Model Fit Measure Summary

Model		R	R²	Adjusted R²	Overall Model Test	
					F	P
1	SP predicting CA	0.597	0.356	0.352	81.8	< .001
2	PSD predicting CA	0.504	0.254	0.249	50.5	< .001
3	SP predicting PSD	0.663	0.439	0.435	116	< .001

CA = Competitive Advantage
SP=Strategic Planning
PSD= Product-Service Design
Source: Jamovi computation

4.6   Hypothesis Testing

This study tested four hypotheses concerning a direct relationship and an indirect influence. Table 8 shows the results of the hypotheses tested. Table 8 displays the model path coefficients and their significance results. The study's four-relationship hypotheses are all supported.

Hypothesis 1 on the effect of product-service design on competitive advantage is statistically significant ($\gamma = 0.453$, p<0.001). As a result, hypothesis 1 is supported. When strategic planning is mediated, the link (direct effect) remains statistically significant at ($\gamma = 0.175$, p< .05). This suggests that strategic planning serves as a bridge between product-service design and competitive advantage. As a result, Hypothesis 4 is supported.

Product-service design has a substantial positive connection with strategic planning ($\gamma = 0.569$, p< .001). As a result, hypothesis 2 is supported. Strategic planning has a considerable beneficial influence on competitive advantage ($\gamma = 0.490$, p< .05). As a result, hypothesis 3 is supported.

Table 8 – Model Path and Mediation Estimates

		Mediation Estimates				
Effect	Label	Estimate	SE	Z	p	% Mediation
Indirect	a × b	0.279	0.0574	4.86	< .001	61.5
Direct	c	0.175	0.0774	2.26	0.024	38.5
Total	c + a × b	0.453	0.0634	7.15	< .001	100.0

		Path Estimates			
	Label	Estimate	SE	Z	p
PSD→ SP	a	0.569	0.0525	10.84	< .001
SP → CA	b	0.490	0.0900	5.44	< .001
PSD→ CA	c	0.175	0.0774	2.26	0.024

Source: Jamovi computation

4.6.1   Analysis of mediating effect

Through strategic planning, the indirect influence of product-service design on competitive advantage is statistically significant (p< 0.001, $\gamma = 0.279$; ratio effect = 0.615). As a result of this indicating a partial mediation impact of strategic planning, hypothesis 4 is supported.

4.7   Linearity

The results provided excellent support for the theoretical paradigm of product-service design, strategic planning and competitive advantage. According to the results of this survey, the majority of TAZARA management is male. The data also suggested that the majority of managers had between 10 and 20 years' experience, with those with more than

20 years' experience coming in second. This shows that TAZARA's management is a skilled team.

The primary objective of the study was to determine whether product-service design has a significant positive impact on competitive advantage. Hypothesis 1 on the effect of product-service design on competitive advantage is statistically significant ($\gamma = 0.453$, $p<0.001$). Therefore, hypothesis 1 is supported. When strategic planning is mediated, the relationship (direct effect) remains statistically significant at ($\gamma = 0.175$, $p< .05$). This suggests that strategic planning acts as a bridge between product-service design and competitive advantage. Therefore, hypothesis 4 is supported. This study confirms and also supports the previous studies that have shown that product-service design has a positive significant impact on competitive advantage (Brissaud et al., 2022; Tryson, 2022; Teixeira et al., 2012; Mukhtar et al., 2012; Polaine et al., 2013; Martinez et al., 2010; Baird et al., 2011; Rau et al., 2017; Geng et al., 2010; Ferdousi et al., 2018).

The results of the study also showed that product service design has a significant positive relationship with strategic planning. Product service design has a significant positive relationship with strategic planning ($\gamma = 0.569$, $p< .001$). Therefore, hypothesis 2 is supported. This is consistent with previous research that found a positive significant relationship between product-service design and strategic planning (Mitake et al., 2020; Kurpiela, 2022; An et al., 2008).

The results of the study also showed that strategic planning has a significant positive impact on competitive advantage. Strategic planning has a significant positive impact on competitive advantage ($\gamma = 0.490$, $p< .05$). Therefore, hypothesis 3 is supported. This is consistent with previous studies that found similar results (Tryson, 2022; Mulyaningsih et al., 2021; Kiiyo, 2019), but not with other studies that found contradictory results (Miller et al., 2004; Powell, 1992).

The final objective of this study was to examine whether strategic planning mediates the relationship between product-service design and competitive advantage. Through strategic planning, the indirect influence of product-service design on competitive advantage is statistically significant ($p< 0.001$, $\gamma = 0.279$; ratio effect = 0.615). As this indicates a partial mediating effect of strategic planning, hypothesis 4 is supported. The results indicate that strategic planning partially mediates the relationship between product-service design and competitive advantage. This is the first study to empirically assess the mediating effect of strategic planning on the relationship between product-service design and competitive advantage. Further research is required to confirm these findings.

4.8   *Theoretical Managerial Implications*

The empirical findings of this study provide valuable insights for both decision makers and practicing managers. The partial mediating effect of strategic planning on the relationship between product-service design and competitive advantage implies that organisations need to invest in both the formulation and implementation of strategic planning processes. Focusing solely on product-service design while ignoring strategic planning, or vice versa, would prevent an organisation from achieving or maintaining competitiveness.

5. Conclusion

This study provides robust evidence for the critical role of product-service design and strategic planning in enhancing competitive advantage. The results clearly indicate that both product-service design and strategic planning have a significant positive relationship with competitive advantage, confirming hypotheses 1, 2 and 3. The results show that product-service design directly influences competitive advantage, which is consistent with previous research that emphasises the importance of innovative and customer-centric product-service solutions (Brissaud et al., 2022; Yangailo, 2023b). Furthermore, strategic planning was found to be an important mediator of this relationship, reinforcing the idea that a well-developed strategic planning process can enhance the effectiveness of product-service design in gaining competitive advantage (Barry, 1997; Henderson & Hines, 2019). The mediation effect, with an indirect impact ratio of 61.5%, highlights the role of strategic planning in facilitating the transition from product-service design to competitive advantage, thus validating Hypothesis 4.

The results of the study also show a strong positive relationship between product-service design and strategic planning ($\gamma = 0.569$, $p < .001$), confirming Hypothesis 2. This finding underscores the need for organisations to integrate strategic planning with product-service design efforts, aligning design initiatives with long-term strategic goals to ensure sustainable competitive advantage. The significant correlation between strategic planning and competitive advantage ($\gamma = 0.490$, $p < .05$) further reinforces the notion that strategic planning is essential for leveraging product-service design to achieve and sustain competitive advantage (Mulyaningsih et al., 2021; Kiiyo, 2019).

The implications of these findings are significant for both practitioners and academics. For practitioners, the findings advocate a strategic approach to product-service design in which strategic planning is not just a supporting function, but a critical element that enhances the effectiveness of design. This finding encourages managers to develop robust strategic plans that are closely aligned with their product-service design strategies to ensure that their offerings are not only innovative, but also strategically positioned to outperform competitors. For academics, the study opens avenues for further research, particularly in exploring other potential mediators or moderators that may influence the relationship between product-service design and competitive advantage. Future research could also extend the study to different industries and geographical contexts in order to further generalise the findings.

In conclusion, this study highlights the critical interplay between product-service design, strategic planning and competitive advantage. It highlights the importance of integrating strategic planning into product-service design processes to enhance competitive advantage, providing valuable insights for both theory and practice in the field of strategic management.

5.1 *Future Research and Limitation of Study*

One of the main limitations of this study is the relatively small sample size, which is limited to specific industries. This limitation limits the generalisability of the findings, making it difficult to apply the results broadly across industries and geographical regions. Future research could improve the external validity of the findings by including larger and more diverse samples.

Another important limitation is the cross-sectional design of the study. By collecting data at a single point in time, this design limits the ability to infer causality between product-service design, strategic planning and competitive advantage. Longitudinal studies that follow subjects over time could provide more robust insights into the temporal dynamics and causal relationships between these variables.

Relying on self-reported data from respondents introduces the possibility of bias that may affect the results of the study. Self-reported measures are subject to various biases, such as social desirability bias, where respondents may provide answers that they believe are more socially acceptable rather than a true reflection of their experiences. To mitigate this problem, future studies could incorporate multiple data sources, including objective performance measures, to validate and supplement self-reported data.

Finally, the scope of strategic planning examined in this study is somewhat limited. The research considers strategic planning as a mediating variable, but does not explore the specific elements or dimensions of strategic planning that might influence the relationship between product-service design and competitive advantage. Future research could explore different aspects of strategic planning in more detail to understand their different effects and how they interact with other variables in the context of competitive advantage.

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Appendices

Principal Component Analysis

Component Loadings	Component			Uniqueness
	1	2	3	
PSD1			0.683	0.454
PSD2			0.769	0.325
PSD3			0.754	0.365
CA1		0.747		0.383
CA2		0.692		0.415
CA3		0.646		0.468
CA4		0.629		0.554
CA5		0.763		0.407
SP1	0.564		0.378	0.530
SP2	0.462		0.587	0.394
SP3	0.472		0.480	0.487
SP4	0.710			0.490
SP5	0.758			0.362
SP6	0.729			0.349
SP7	0.537		0.311	0.543
SP8	0.595		0.394	0.437
SP9	0.448	0.371	0.514	0.397
SP10	0.367	0.332		0.667
SP11	0.499	0.489		0.453

Note. 'varimax' rotation was used

Assumption Checks

Bartlett's Test of Sphericity

χ^2	df	p
1270	171	< .001

KMO Measure of Sampling Adequacy

	MSA
Overall	0.915
PSD1	0.914
PSD2	0.900
PSD3	0.918
CA1	0.896
CA2	0.921
CA3	0.892
CA4	0.875
CA5	0.876
SP1	0.901
SP2	0.938
SP3	0.949
SP4	0.892
SP5	0.873
SP6	0.919
SP7	0.916
SP8	0.947
SP9	0.956
SP10	0.881
SP11	0.943

Estimate Plot
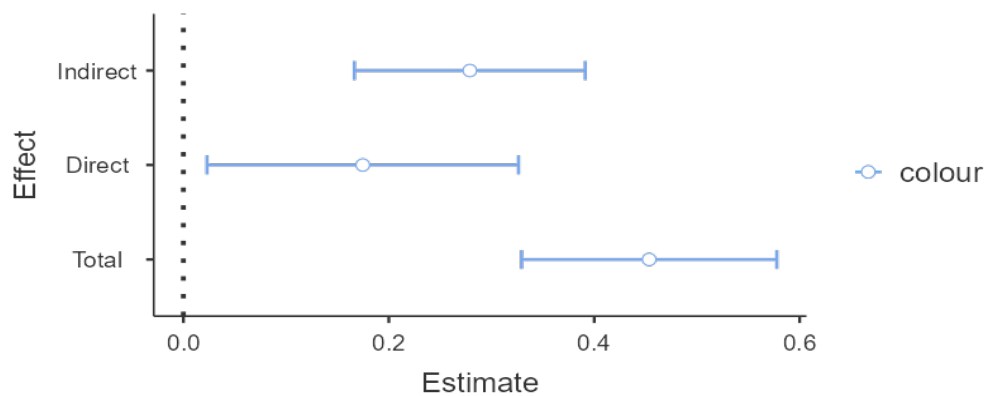
Plot
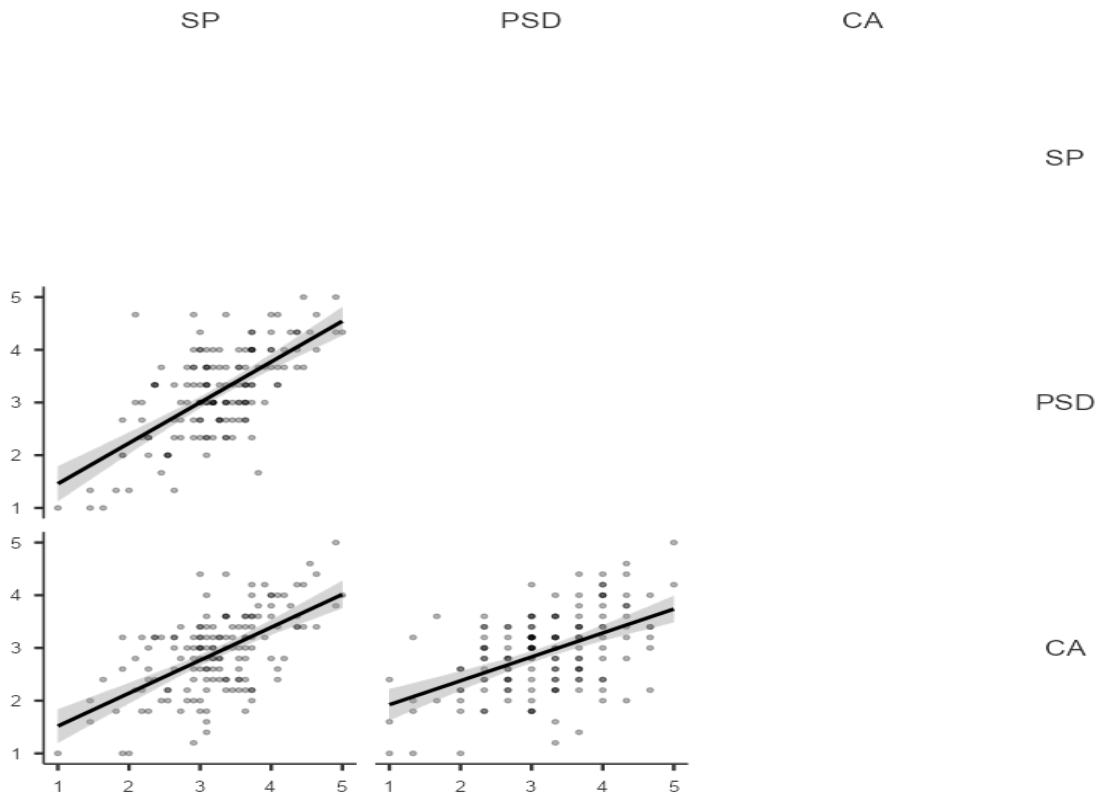
Reliability Analysis

	Mean	SD	Cronbach's α	McDonald's ω
Scale	3.14	0.664	0.920	0.921

Scale Reliability Statistics

Correlation Heatmap

Pearson Correlation

-1.0 -0.5 0.0 0.5 1.0

	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	SP11	PSD1	PSD2	PSD3	CA1	CA2	CA3	CA4	CA5
CA5																			1
CA4																		1	0.35
CA3																	1	0.49	0.43
CA2																1	0.45	0.37	0.5
CA1															1	0.56	0.48	0.35	0.49
PSD3														1	0.36	0.36	0.34	0.26	0.22
PSD2													1	0.58	0.30	0.36	0.41	0.27	0.23
PSD1												1	0.48	0.51	0.34	0.32	0.3	0.30	0.29
SP11											1	0.37	0.35	0.38	0.45	0.5	0.37	0.4	0.32
SP10										1	0.48	0.32	0.31	0.33	0.27	0.3	0.25	0.28	0.29
SP9									1	0.45	0.51	0.46	0.56	0.44	0.41	0.46	0.43	0.39	0.32
SP8								1	0.53	0.49	0.49	0.36	0.46	0.39	0.28	0.36	0.35	0.31	0.28
SP7							1	0.51	0.48	0.47	0.45	0.24	0.44	0.37	0.34	0.34	0.45	0.21	0.21
SP6						1	0.45	0.47	0.55	0.39	0.49	0.34	0.43	0.38	0.35	0.36	0.38	0.34	0.29
SP5					1	0.64	0.41	0.49	0.48	0.21	0.44	0.36	0.45	0.31	0.26	0.33	0.29	0.18	0.19
SP4				1	0.47	0.46	0.33	0.36	0.27	0.210	0.30	0.28	0.210	0.30	0.18	0.22	0.24	0.24	0.1
SP3			1	0.30	0.43	0.43	0.41	0.53	0.46	0.37	0.48	0.45	0.420	0.40	0.34	0.38	0.35	0.29	0.29
SP2		1	0.55	0.31	0.45	0.50	0.48	0.55	0.58	0.35	0.47	0.40	0.54	0.48	0.36	0.40	0.47	0.27	0.2
SP1	1	0.48	0.55	0.31	0.47	0.47	0.34	0.44	0.45	0.27	0.36	0.41	0.33	0.33	0.17	0.36	0.25	0.23	0.22

Reliability Analysis

	Mean	SD	Cronbach's α	McDonald's ω
scale	2.91	0.764	0.802	0.803

Scale Reliability Statistics

Correlation Heatmap
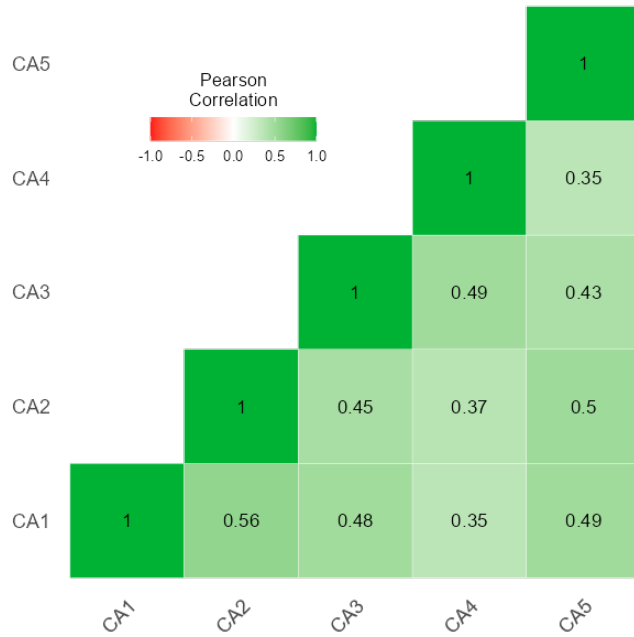
Reliability Analysis

	Mean	SD	Cronbach's α	McDonald's ω
scale	3.18	0.850	0.767	0.769

Scale Reliability Statistics

Correlation Heatmap