

Strategic Manufacturing Planning and Performance in the Food Industry: The Mediating Influence of Sustainability.

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Abstract

The constantly changing environment, economic fluctuations, and product and services proliferation made the manufacturing plant's strategic planning a crucial decision any firm should base its operations on. Strategic manufacturing planning (SMP) witnessed an increased interest among scholars and practitioners due to its role in defining the success of any manufacturing firm. This study found a lack of empirical research, in the food industry, on the combined effect of SMP and sustainability on industrial performance. Therefore, this paper investigates the interaction between SMP and sustainability practices, and its impact on operational performance metrics (OPMs). A survey questionnaire was developed based on previous studies and sent to 104 food manufacturing firms. The survey consists of four SMP constructs: comprehensiveness, focus, horizon, and intensity, three sustainability dimensions: economic, social, and environmental, and four OPMs: cost, quality, delivery, and employees' morale and retention. The results show significant positive correlations ($p < .05$) between SMP, sustainability practices, and OPMs. Additionally, findings generated from polynomial regression, Sobel-statistics tests, analysis of variance (ANOVA) and response surface analysis reveal that sustainability practices play a major role in mediating the relationship between strategic manufacturing planning and operational performance ($p < .001$). This paper is unique in its depth and breadth since it is the first study that examines the comprehensive effect of strategic manufacturing planning and sustainability practices on the food industry performance. Furthermore, academicians and decision-makers can benefit from the developed model in determining the best practices to implement based on the targeted performance metric to be improved.

Keywords

Strategic manufacturing planning, Sustainability Practices, Operational Performance, Response Surface Analysis, Food Industry.

1. Introduction

Practitioners agree that the content of strategic manufacturing planning (SMP) is crucial for any manufacturing firm since it identifies its resources, limitations, and capabilities (Papke-Shields et al., 2002). Most of the previous literature agrees on that point and asserts its importance in different industries (Miller and Roth, 1994; Vickery et al., 1993; Schroeder et al., 1986). The outcome of any manufacturing firm will be dependent on the developed manufacturing strategy (Dean and Sharfman, 1993).

Any manufacturing strategy should be flexible to change with the advancements in technology (El-Khalil and Mezher, 2020; El-Khalil and Nader, 2020), globalization, and increased competition. Firms that are not flexible to change fail in keeping up pace with their competitors. That's why deep and thorough research on the firms' capabilities must be examined before developing any strategic plan. Also, firms should consider all departments while designing their strategic plan from accounting and finance, human resources, information technology, and marketing. By having a reliable SMP, employees and managers at all levels will be more productive and effective in their work. It will also enhance the communication between different stakeholders and empower individuals in the organization.

Although many organizations are adopting sustainable practices, very few are implementing these with any predefined fully-operational formal strategy. The main reason behind this is that every organization has its own vision, priorities and drivers when it comes to corporate social responsibility (CSR) (El Gammal et al., 2020). Some companies might prefer preserving natural resources and reduce energy, while others might secure first their economic sustainability and many others might possibly put more effort on social issues, and engage in these aiming at giving back to their society.

Currently, integrating sustainability in the SMP is not that easy to implement because of the unsteady environment and important level of unpredictability that urge leaders to amend their predetermined plans and develop new sustainability practices to overcome these challenges. In this context, a lack of empirical research was noticed, mainly on the relationship between the strategic manufacturing plan of firms, sustainability practices, and their impact on operational performance metrics. Very few studies examined them with limited depth and breadth. Therefore, the main objective of this paper is to study the interaction between SMP and sustainability practices, and their simultaneous influence on facilities' performance. Furthermore, this is the first study that investigates these relationships in the food industry. In view of that, a survey questionnaire was developed based on previous studies and sent to 104 multinational food manufacturing firms.

The remainder of the paper is organized as follows: Section 2 presents the literature review and hypothesis development. Section 3 discusses the conceptual model, research methodology and the data collection. Section 4 explains the results obtained. Section 5 presents the discussion, and the conclusions of the study with its implications and limitations are presented in section 6.

2. Literature Review

2.1. Industrial Operations Performance as Affected by SMP

2.1.1. Strategic Manufacturing Planning

Every firm is unique in conducting its SMP, and this uniqueness stems from the "strategic planning system", which is a set of planning characteristics that coordinates and organizes the manufacturing activities (Lorange and Vancil, 1977). Strategy is important in all areas, such as production (El-Kassar et al., 2020), technology (Yunis and Koong, 2012), and decision theory (El-Kassar et al., 2020). Previous literature has identified a set of characteristics, as shown in Table 1.

2.1.2. Strategic Manufacturing Planning and Operational Performance

Miller and Cardinal (1994) conducted a synthesis review of the effect of SMP on performance. The results of their study showed that planning positively impacts growth and profitability. Pearce et al. (1987) performed a systematic critical review of 18 studies that examined SMP and operational performance. Premkumar and King (1994) found a positive impact between planning characteristics and quality. Other studies, such as Ramanujam and Venkatraman (1987) and Segar and Grover (1998), revealed a positive relation between planning characteristics and effectiveness. Glaister and Falshaw (1999) indicated that SMP in the United Kingdom has not "resulted in rigidity and inflexibility."

Moreover, Tunalv (1990) and Platts (1994) stated that by planning effectively, firms can benefit from better coordination and communication. However, this must be coupled with rich and frequent meetings (Maruchek et al., 1990). Additionally, employee participation must be encouraged since it allows managers to know the capabilities of every individual in the organization (Mills et al., 1995).

Therefore, the following hypothesis is derived:

H1: Strategic manufacturing planning has a positive impact on operational performance metrics.

Table 1. Description of the SMP constructs by previous researchers

Construct	Definition	References
Horizon	Length of time considered in strategic planning	Kukalis, 1991; Steiner, 1979
Comprehensiveness	Extent to which all possible strategic alternatives are identified and considered	Fredrickson and Mitchell, 1984
Intensity	Magnitude of resources committed to planning as evidenced by frequency and richness of meetings	Dutton and Duncan, 1987
Flow	Locus of authority for strategic planning	Dutton and Duncan, 1987; Lorange, 1980
Formality	The extent to which the planning process is structured, through written procedures, schedules, and other documents, and the extent of documentation resulting from the planning process	Anderson et al., 1991; Armstrong, 1982;
Participation	Variety of individuals involved in strategic planning	Dutton & Duncan, 1987; Dyson & Foster, 1982; Hart, 1992
Focus	Extent to which control or efficiency, usually seen as a tight link with budgets, rather than creativity is emphasized	Chakravarthy, 1987; Lorange, 1980

2.2. Industrial Operations Performance as Affected by Sustainability Practices

2.2.1. Sustainability Practices

Sustainability is the ability to meet the needs of the current generation without compromising the needs of future generations (Redclift, 2005). As shown in table 2, sustainability practices consist of the triple bottom line (TBL) dimensions (Bauer et al., 2018; King and Lenox, 2001). TBL dimensions are economic, social, and environmental (Yusuf et al., 2013; Golicic and Smith, 2013; Paulraj et al., 2017; Wong et al., 2012; Chin et al., 2015; Sarkis et al., 2010). From this standpoint, firms that aim to adopt sustainable practices must create a balance between social, environmental, and economic practices.

2.2.2. Sustainability Practices and Operational Performance

Pagell and Gobeli (2009) examined the impact of environmental performance and employee wellbeing on operational performance. They found out that managers do not think about sustainability in the short term. However, their results suggest that environmental performance and employee well-being interact in a significant way with operational performance. El-Khalil and Mezher (2020) showed that in the automotive industry, sustainability practices improve delivery, morale, productivity, and efficiency. Esfahbodi et al. (2016) result also revealed that sustainability practices will improve both cost and efficiency. Zhu et al. (2013) result suggested that sustainability practices indirectly affect economic performance. Similar results were also suggested by El-Khalil and El-Kassar (2018), Lin et al. (2006) and Geyi et al. (2020).

Therefore, the following hypothesis is formulated:

H2: Sustainability practices have a positive impact on operational performance metrics.

Table 2. The triple bottom line of Sustainability Practices

Sustainability Dimensions	Sustainability Practices
Society	The company ensures product safety The company complies with the law The company treats suppliers fairly The company has good community relations The company respects human rights The company has good working conditions
Economy	The company continuously create jobs The company works on enhancing anti-bribery and corruption policies The company pays all the taxes responsibly The company supports, creates, and drives innovative ideas The company generate sales and profits The company invest in the local community The company invest in the infrastructure
Environment	In the production/manufacturing process, the company minimize the use of hazardous substances In the production/manufacturing process, the company minimize wastes and emissions The company use alternative and renewable energies The company works toward protecting biodiversity The company uses energy resources efficiently

2.3. Strategic Manufacturing Planning and Sustainability Practices

It is of paramount importance to agree and define what sustainability means for the manufacturing firm to efficiently and strategically move towards sustainability (Broman et al., 2000). Several authors such as Robert (2000) stress on the need to develop a framework that incorporates sustainability as a strategic plan. Every organization, depending on its SMP, has a unique way of implementing sustainability practices. To become sustainable and enhance performance, organizations should incorporate in their strategic plan the practices that they will follow (Leon-Soriano et al., 2010). Firms today compete based on the strategic plan they developed (Wu, 2007). A successful strategic plan minimizes external environment threats, improves employee welfare, helps the company manage and allocate its resources, and allows managers to act proactively in unforeseen circumstances (Wu, 2007). This aligns with the goal of sustainability in preserving and allocating resources and improving the working conditions (Redclift, 2005). Hallstedt et al. (2013) proposed eight key elements for the successful implementation of a strategic sustainable plan. These elements are categorized into four groups: tools, roles, internal processes, and organization. Moreso, without a clear plan, organizations cannot exploit the benefits of sustainability practices, leading to poor operational performance.

Therefore, the following hypotheses are derived:

H3: Strategic manufacturing planning has a positive impact on Sustainability Practices.

H4: Sustainability practices mediate the relationship between strategic manufacturing planning, namely comprehensiveness, and operational performance.

H5: Sustainability practices mediate the relationship between strategic manufacturing planning, namely focus, and operational performance.

H6: Sustainability practices mediate the relationship between strategic manufacturing planning, namely horizon, and operational performance.

H7: Sustainability practices mediate the relationship between strategic manufacturing planning, namely intensity, and operational performance.

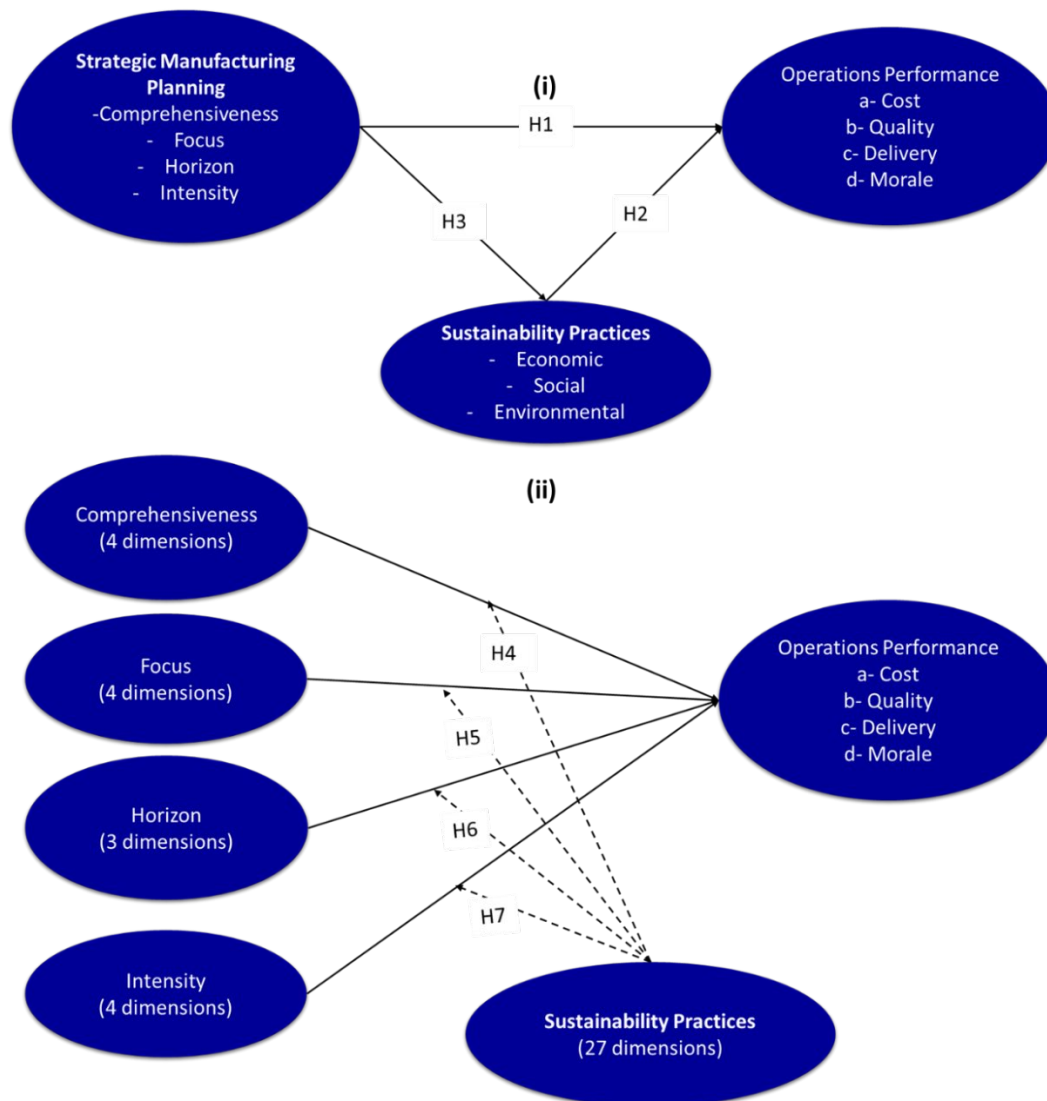


Figure 1. Conceptual Framework (i) Direct Effects (ii) Mediating Effects

3. Research Methodology and Data Collection

3.1. Data collection

Data was collected through a survey to test the suggested hypotheses. At first, a draft questionnaire based on a deep literature review was developed and tested by practitioners (senior and general managers, CEOs) to check if all dimensions are covered and the objective of each question is well understood. Based on their expertise, some modifications were applied to the questionnaire before dissemination. Then, data collection was launched and a sample of representatives from 104 multinational food manufacturing firms were surveyed. Virtual meetings were arranged with managers and continuous follow up emails were sent to the non-respondents to complete the survey. To reduce common method bias (Wei et al., 2017), a t-test revealed no significant difference between early and late responses.

3.2. Measures

The questionnaire was divided into four sections and the constructs were selected based on a literature review to cover the main pillars and aims of the study. In the first part, some demographic questions regarding the firm's size, number of employees, their gender, education, years of expertise, etc. were asked. Then, the second section included 29 indicators related to the manufacturing planning practices which were loading in 7 multi-dimensional latent variables, 4 of which were selected for the present study- Comprehensiveness, Focus, Horizon, and Intensity. The third section focused on the sustainability practices with 28 questions targeting the economic, social and environmental practices.

The last section covered the operational performance indicators of the firms including cost reduction, quality improvement, enhancement in delivery, employees' morale and retention. All these constructs were measured with a seven-point Likert scale where 1 is "not applicable" and 7 "extremely applicable".

3.3. Measurement model validation and regression analysis

Data was collected and then explored using complementary software: Statgraphics (Centurion 18, Windows XP) and SPSS (IBM SPSS Statistics 26). First, the reliability and validity of the tools used for the measurement of SMP and Sustainability practices were investigated. Factor loadings between items and their constructs, Cronbach's α , composite reliability (CR) and average variance extracted (AVE) were calculated to test the constructs reliability and convergent validity of the measurement model. Then, a conceptual framework was developed as portrayed in Figure 1. Hypotheses testing and polynomial regression (Nader et al., 2021) coupled to response surface analysis were conducted to validate the model and detect the direct and indirect significant effects. Moreover, the main objective of this study is to prove that sustainability practices have a mediating effect on the relationship between SMP and OPMs. Therefore, a Sobel test was performed in order to calculate t-statistics and p-values and to identify significant mediations. Furthermore, correlations between all variables were also investigated. Standardized Pareto Charts (Nader et al., 2018) and three-dimensional Response Surfaces (Nader et al., 2017) were used to illustrate and concretize the obtained results.

4. Results analysis

4.1. Validity and reliability of the measurement model

Prior to hypotheses testing, three tests were performed in order to test the measurement model. Constructs were considered as reflective since items described well the latent variable in question and the scales have shown high reliability and validity throughout this study for reported measurements. In fact, all factor loadings were higher than 0.7, all AVE values exceeded the threshold of 0.5 and all CR values were greater than 0.7 (Chang & Chen, 2020). These results confirm the convergent validity and the reliability of the measurement model. In addition, discriminant validity was verified by comparing the AVE values to the squared correlation coefficients. Results showed that AVE were greater than the inter-constructs correlation values (El-Khalil, 2018).

4.2. Model assessment and hypotheses testing

Table 3 shows the demographics of the firms, including country, gender, education and year of expertise of the respondents, numbers of employees and annual turnover. The sample includes 104 food manufacturing firms. 66% of the respondents have higher level of education (PhD, DBA or Masters) and an extensive expertise in their field with 85% of them having more than 10 years of experience. The table shows that 58% of the companies were based in the US and 42% of them in EU, showing a relatively even distribution. 76% of the entire respondents represent enterprises with less than \$ 500 million annual turnover whilst large industries with more than 1000 employees were accounting for 70% of the sample size.

Table 3. Demographics

Relevant Dimensions	Profile
Country	58% US Industries 42% EU Industries
Gender	64% Male 36% Female
Education	1% PhD/DBA 65% Masters Degree 34% BS/BA/AD (Associate Degree)
Years of Expertise	20% < 10 years 55% 10-15 Years 25% >15 Years
Annual Turnover	76% \$ less than 500 million 24% \$ more than 500 million
Number of Employees	30% 100-1000 employees 70% >1000 employees
N=104	

A Pearson product-moment correlation was performed to study the relationship between the latent variables (SMP practices and sustainability) and the studied OPMs (Cost, Quality, Delivery, and Morale). Table 4 presents the correlation matrix and the descriptive statistics (mean and standard deviation) of all variables. Results showed that no common method bias can be found in this study based on the correlation coefficients which were below the 90% threshold (Yunis et al., 2018; El-Kassar et al., 2014). The mean value of the cost was 2.6 and all the other constructs scored around 5.5 in average. The values of the standard deviation (SD) ranged between 1.8 and 1.9. Additionally, the strongest correlation (correlation coefficient 0.84) noted was between Focus and sustainability (p -value < .001). On the other hand, the lowest correlation coefficient was 0.73 and was observed between delivery and morale. It can be obviously noticed that all correlations associated with the cost were negative, meaning that a cost reduction is usually linked to an improvement in SMP best practices, an enhancement in sustainability practices and at a time, it is coupled with improved performance metrics such as quality, delivery and morale (Ismail et al., 2019). Moreover, a significant positive correlation was observed between all the constructs and the OPMs.

Table 4. Correlation Matrix

	Mean	SD	Comprehens- iveness	Focus	Horizon	Intensity	Sustaina- bility	Cost	Quality	Delivery	Morale
Comprehens- iveness	5.62	1.84	-								
Focus	5.55	1.89	0.81**	-							
Horizon	5.59	1.79	0.81**	0.83***	-						
Intensity	5.53	1.86	0.81**	0.82**	0.82**	-					
Sustainability	5.59	1.90	0.83***	0.84***	0.82**	0.82**	-				
Cost	2.58	1.85	-0.79**	-0.8**	-0.8**	-0.8**	-0.81**	-			
Quality	5.34	1.9	0.8***	0.8**	0.79*	0.8**	0.81**	-0.76	-		
Delivery	5.25	1.89	0.78*	0.78*	0.77*	0.78*	0.8*	-0.76	0.76*	-	
Morale	5.30	1.85	0.78*	0.79**	0.78*	0.8**	0.8*	-0.76	0.76*	0.73*	-

Note : * p < .05 ** p < .01 *** p < .001

Further to studying the correlations between variables, a polynomial regression analysis was performed. First, while excluding the hypothesized mediator, which is “Sustainability Practices”, the direct effects of the studied SMP latent variables on OPMs were highly significant (p -value < .05). In fact, all SMP characteristics (Comprehensiveness, Focus, Horizon, and Intensity) were found to be positively affecting quality, delivery and morale (p -values < .05) in the food manufacturing firms while they had a negative effect on the cost incurred by those industries (p -value < .05). Then, a path analysis (Nader et al., 2016) was performed to study the mediating effect of sustainability practices on the relationship between strategic manufacturing practices and OPMs. As it can be seen in Table 5, the mediation analysis is divided into two parts: with and without mediation variable. The standardized coefficients of the direct effects were not similar to those of the indirect effects. The latter reflected partial mediations in some instances and complete mediations in some others. Sobel test was adopted to confirm these mediating effects of sustainability practices. As per the literature, Sobel test statistics have to be greater than 1.96 with a p -value lesser than 0.05 for a 95% confidence level (Yunis et al., 2017) to show a significant mediation. Results showed that sustainability practices mediate the relationship between Comprehensiveness and OPMs (H4-a, b, c, d) (p -value < .001), Focus and OPMs (H5-a, b, c, d) (p -value < .001), Horizon and OPMs (H6-a, b, c, d) (p -value < .001), and Intensity and OPMs (H7-a, b, c, d) (p -value < .001). Furthermore, in all cases, the different SMP dimensions had significant effects on Sustainability practices (p -values < .001), while the latter were significantly impacting OPMs (p -values < .001). Consequently, all the suggested hypotheses were supported.

5. Discussion

A conceptual framework was developed based on a literature review to analyze the factors affecting the firm's performance in food manufacturing firms. The statistical analysis showed that all hypotheses are supported. Sustainability (SUS) practices mediate the relationship between (H4-a, b, c, d) Comprehensiveness and OPMs, (H5-a, b, c, d), Focus and OPMs, (H6-a, b, c, d) Horizon and OPMs, (H7-a, b, c, d) Intensity and OPMs. Therefore, one main finding is drawn from empirical research which is that the strategic manufacturing practices can positively enhance the firm's performance (cost, quality, delivery and morale) through sustainability practices.

Table 5 shows the mediation effect of SUS practices on the relationship between SMP practices and the studied OPMs.

Table 5. Hypotheses testing of the mediating effects

Hypotheses	Direct effect without Mediation variable	With mediation variable		Sobel test statistics	Decision (Supported)
		Path	Std. error		
H4-a	Comprehensiveness → Cost (-0.22*)	Comprehensiveness → Cost (0.04)	0.12	-8.175 (p-value <0.001)	Supported
		Comprehensiveness → SUS (1.01***)	0.019		
		SUS → Cost (-0.97***)	0.12		
H4-b	Comprehensiveness → Quality (0.37**)	Comprehensiveness → Quality (0.22)	0.13	5.718 (p-value <0.001)	Supported
		Comprehensiveness → SUS (1.01***)	0.019		
		SUS → Quality (0.74***)	0.13		
H4-c	Comprehensiveness → Delivery (0.33*)	Comprehensiveness → Delivery (0.07)	0.15	5.982 (p-value <0.001)	Supported
		Comprehensiveness → SUS (1.01***)	0.019		
		SUS → Delivery (0.87***)	0.14		
H4-d	Comprehensiveness → Morale (0.16*)	Comprehensiveness → Morale (-0.05)	0.14	7.211 (p-value <0.001)	Supported
		Comprehensiveness → SUS (1.01***)	0.019		
		SUS → Morale (0.97***)	0.13		
H5-a	Focus → Cost (-0.22*)	Focus → Cost (0.05)	0.15	-6.457 (p-value <0.001)	Supported
		Focus → SUS (0.99***)	0.014		
		SUS → Cost (-0.98***)	0.15		
H5-b	Focus → Quality (0.14*)	Focus → Quality (0.06)	0.17	5.291 (p-value <0.001)	Supported
		Focus → SUS (0.99***)	0.014		
		SUS → Quality (0.89***)	0.17		
H5-c	Focus → Delivery (0.13*)	Focus → Delivery (0.07)	0.19	5.919 (p-value <0.001)	Supported
		Focus → SUS (0.99***)	0.014		
		SUS → Delivery (1.09***)	0.18		
H5-d	Focus → Morale (0.37*)	Focus → Morale (0.1)	0.17	4.807 (p-value <0.001)	Supported
		Focus → SUS (0.99***)	0.014		
		SUS → Morale (0.82***)	0.17		
H6-a	Horizon → Cost (-0.25*)	Horizon → Cost (-0.12)	0.12	-7.437 (p-value <0.001)	Supported
		Horizon → SUS (1.04***)	0.021		
		SUS → Cost (-0.82***)	0.11		
H6-b	Horizon → Quality (0.22*)	Horizon → Quality (0.18)	0.13	6.392 (p-value <0.001)	Supported
		Horizon → SUS (1.04***)	0.021		
		SUS → Quality (0.78***)	0.12		
H6-c	Horizon → Delivery (0.18*)	Horizon → Delivery (0.06)	0.14	6.448 (p-value <0.001)	Supported
		Horizon → SUS (1.04***)	0.021		
		SUS → Delivery (0.88***)	0.13		
H6-d	Horizon → Morale (0.07)	Horizon → Morale (0.04)	0.13	7.024 (p-value <0.001)	Supported
		Horizon → SUS (1.04***)	0.021		
		SUS → Morale (0.88***)	0.12		
H7-a	Intensity → Cost (-0.27*)	Intensity → Cost (-0.06)	0.11	-7.828 (p-value <0.001)	Supported
		Intensity → SUS (0.99***)	0.02		
		SUS → Cost (-0.87***)	0.11		
H7-b	Intensity → Quality (0.26*)	Intensity → Quality (0.12)	0.12	6.724 (p-value <0.001)	Supported
		Intensity → SUS (0.99***)	0.02		
		SUS → Quality (0.83***)	0.12		
H7-c	Intensity → Delivery (0.43**)	Intensity → Delivery (0.21)	0.14	5.437 (p-value <0.001)	Supported
		Intensity → SUS (0.99***)	0.02		
		SUS → Delivery (0.73***)	0.13		
H7-d	Intensity → Morale (0.35**)	Intensity → Morale (0.18)	0.13	6.004 (p-value <0.001)	Supported
		Intensity → SUS (0.99***)	0.02		
		SUS → Morale (0.75***)	0.12		

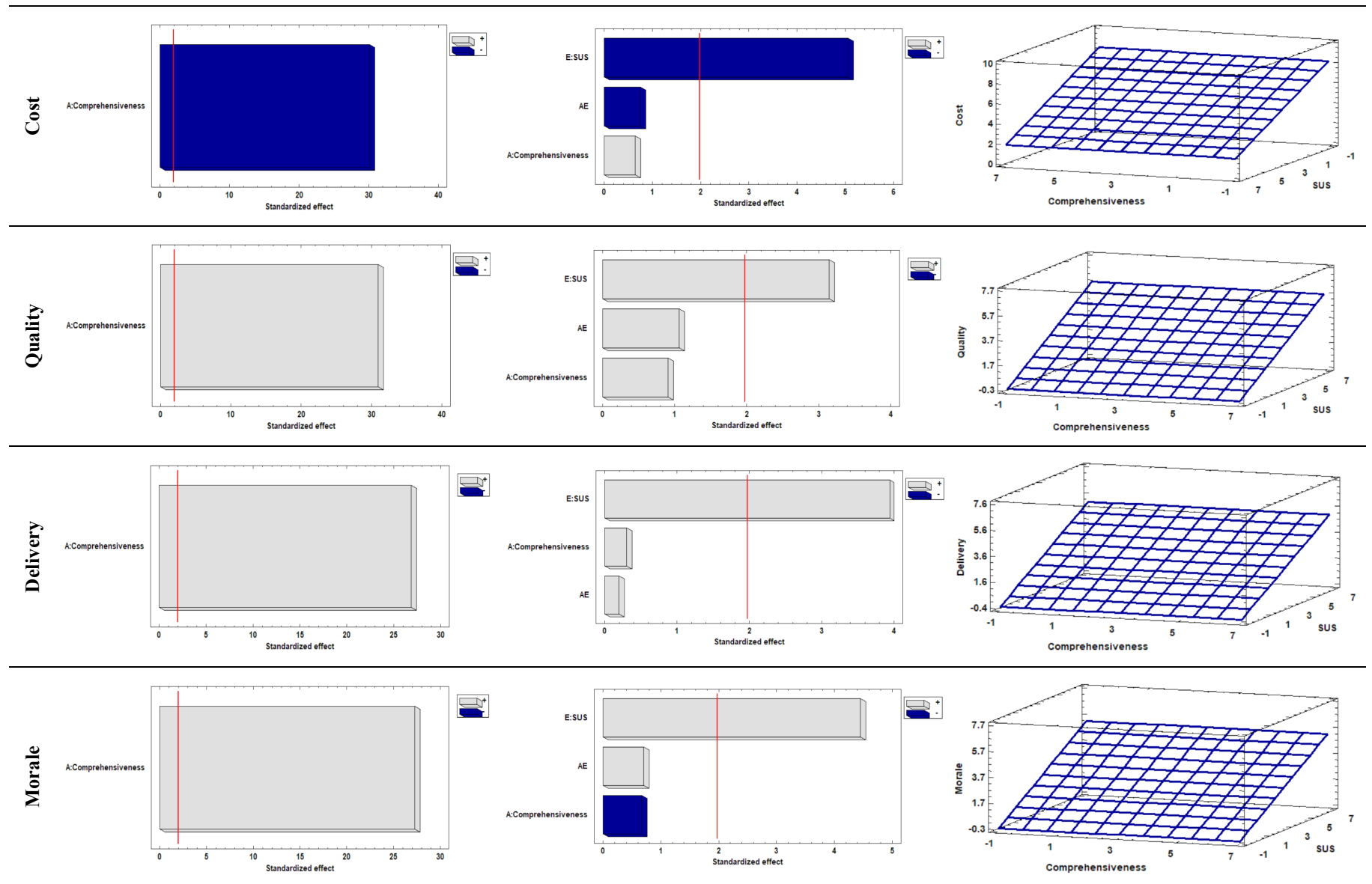


Figure 2. Standardized Pareto Chart and Response Surface showing the effect of Comprehensiveness on OPMs

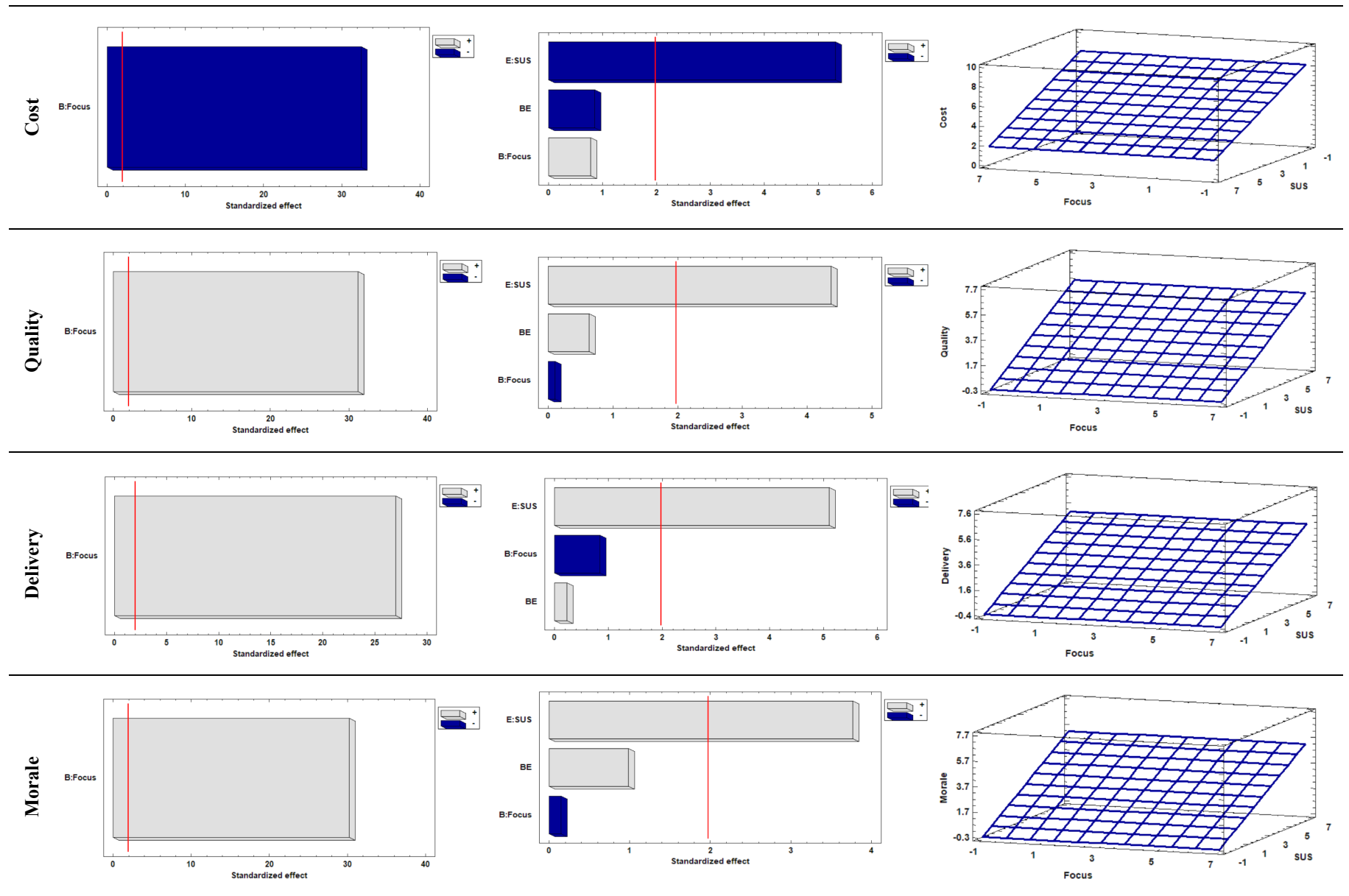


Figure 3. Standardized Pareto Chart and Response Surface showing the effect of Focus on OPMs.

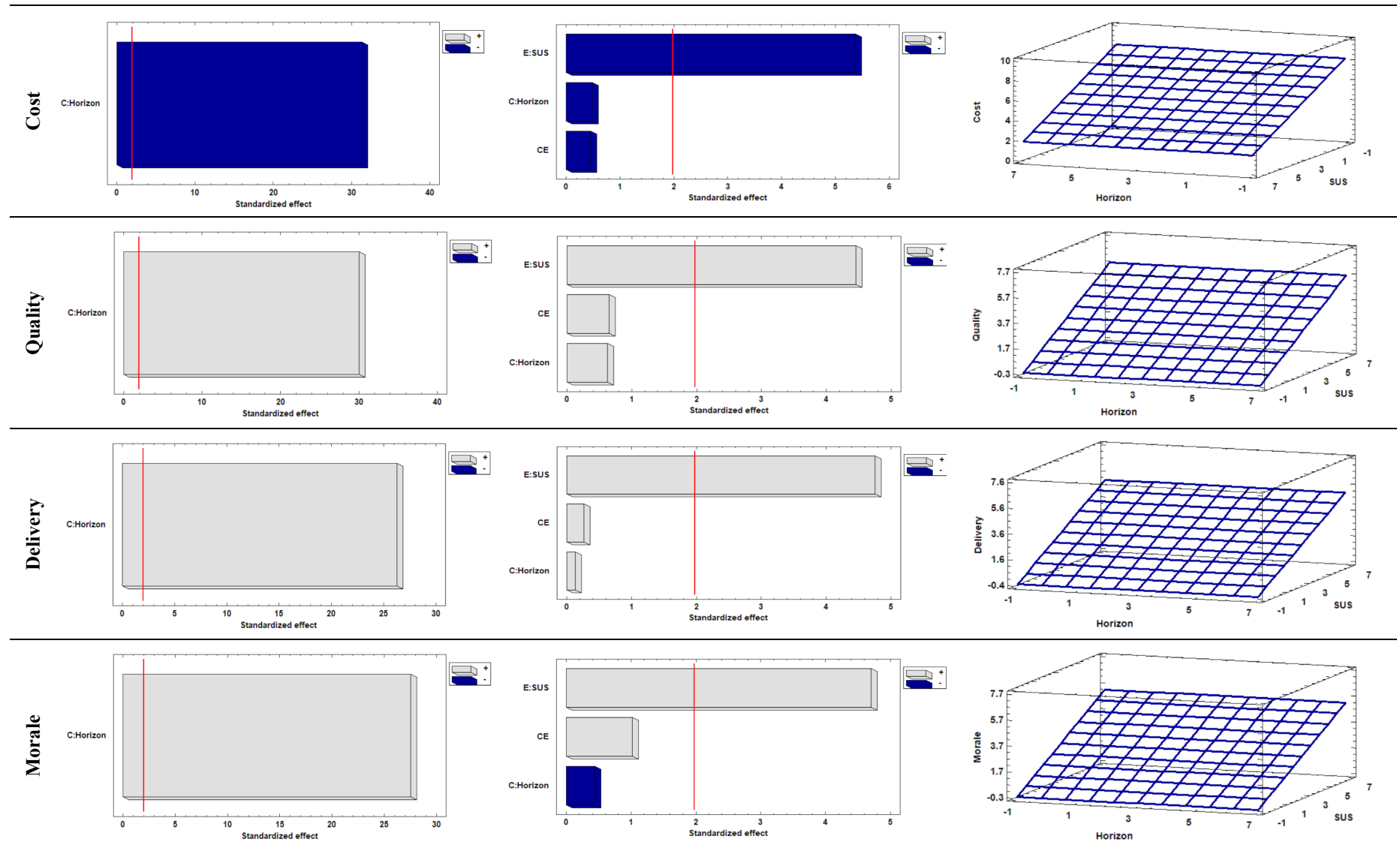


Figure 4. Standardized Pareto Chart and Response Surface showing the effect of Horizon on OPMs

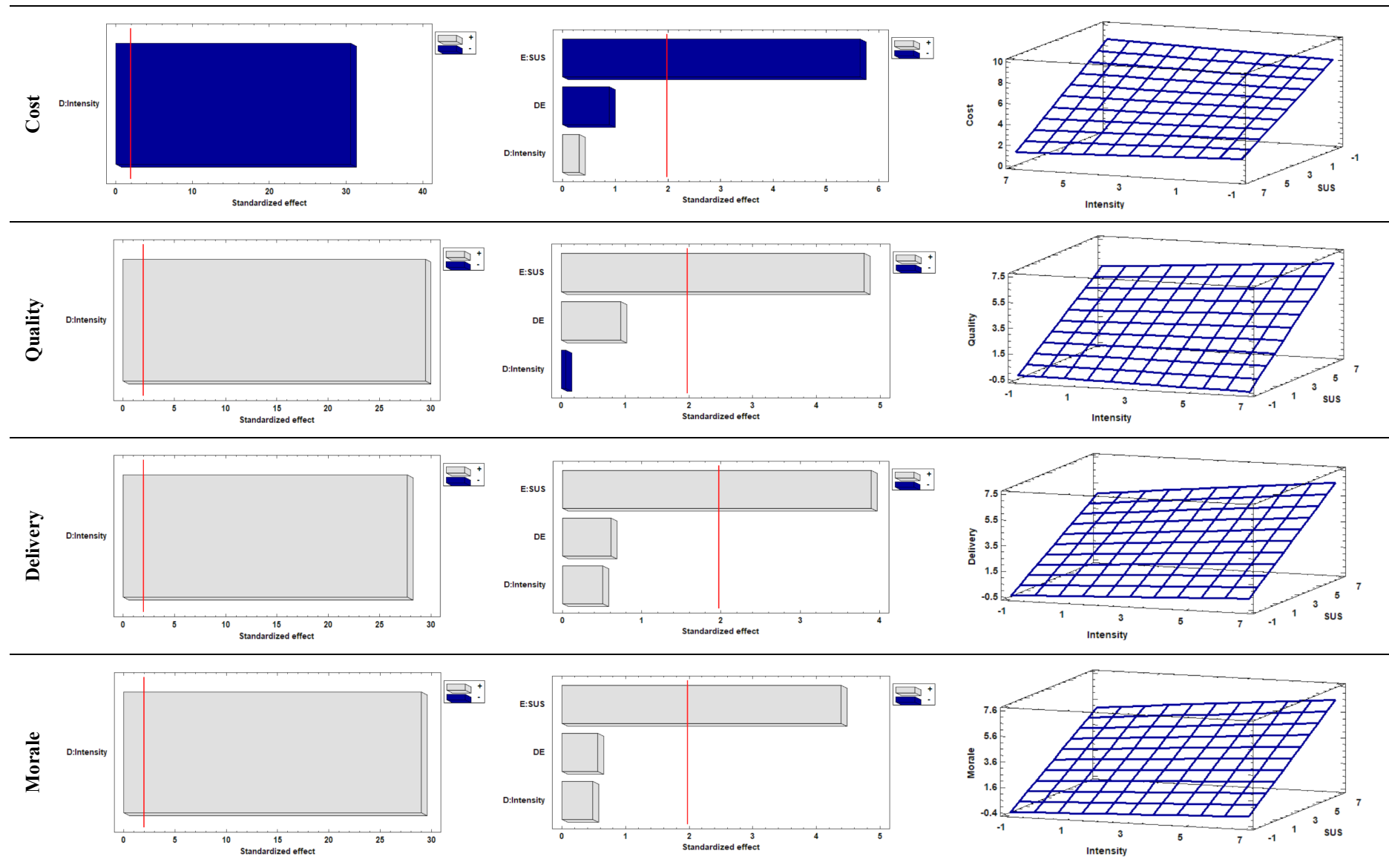


Figure 5. Standardized Pareto Chart and Response Surface showing the effect of Intensity on OPMs.

First, results portrayed by the direct effects (Nader et al., 2016) before incorporating any mediator, showed that the sole implementation of Comprehensiveness negatively affects the cost ($\beta -0.22, p < .05$) while it has a positive impact on the quality ($\beta 0.37, p < .01$), delivery ($\beta 0.33, p < .05$) and morale ($\beta 0.16, p < .05$). These results were confirmed and illustrated in the Standardized Pareto Charts and Response Surfaces. However, when introducing SUS practices, this latent variable will become insignificant with a decreased coefficient while SUS is found to be very significant ($p < .001$, Figure 2). As it can be identified in the response surface, at low implementation of SUS, the cost is high (7) while it starts decreasing until reaching its lowest value when the implementation of SUS is at its highest level. Same goes for the other OPMs. Quality, delivery and morale didn't change when implementing the Comprehensiveness but the slope increased when SUS was extensively adopted showing an increase in the performance. This could be explained by the fact that during initial phases of manufacturing planning, when comprehensive information is thoroughly collected for SMP and then all alternatives and possible actions are identified and carefully evaluated before making any decision, an optimal course of those actions is determined and implemented which will facilitate the overall manufacturing process and avoid any possible risks associated to it. Consequently, accurate decision making strategies would certainly, through SUS practices, reduce possible wastes and the relative unnecessary and/or unpredictable costs, enhance use of resources, ease the working environment, reduce the stress of the workers and it will indirectly trigger higher productivity levels, better quality of food products and improved delivery performance.

Moreover, the implementation of "Focus" characteristics alone affected the OPMs in the same way: cost ($\beta -0.22, p < .05$), quality ($\beta 0.14, p < .05$), delivery ($\beta 0.13, p < .05$) and morale ($\beta 0.37, p < .05$). The direct effects of "Horizon" followed similar trends as "Comprehensiveness" and "Focus". The standardized coefficients linking "Horizon" to cost, quality, delivery and morale were -0.25, 0.22, 0.18, and 0.07, respectively. Focus and Horizon showed almost same significant effects on all four OPMs. SMP reduces the cost while improving the quality, delivery and morale. However, when implementing economic, social and environmental SUS practices, the effect of SMP, namely "Focus" and "Horizon" dimensions, became insignificant while SUS showed a significant impact (Figures 3-4). This could be interpreted by the fact that within the Focus Strategies that are aligned with the main objectives of economic sustainability, when linking the manufacturing practices to the budgeting process and while integrating financial planning in the SMP, cost can be efficiently and drastically reduced. On the other hand, short planning horizon covering at least 5 years while considering far future implications in the SMP process, would have a great impact on operational performance when at a time SUS practices are carefully put in place. In addition, SMP encourages control over productivity and allows the firm to evaluate the plans and the outcomes by using control systems. Thus, the production will be cost-effective, on time, with fast paced deliveries free of defected items.

Finally, when implementing "Intensity" dimensions alone, this latent variable showed a significant effect on the studied OPMs: cost ($\beta -0.27, p < .05$), quality ($\beta 0.26, p < .05$), delivery ($\beta 0.43, p < .01$) and morale ($\beta 0.35, p < .01$). On the other hand, when introducing the sustainability practices as a hypothesized mediator, the standardized coefficient of SMP practices on OPMs changed and became insignificant while the relations SUS-OPMs became strongly significant ($p\text{-value} < .001$). Figure 5 presented the relationships between Intensity, SUS practices and the studied OPMs. At low implementation of sustainability practices and while implementing Intensity characteristics, quality, delivery and morale slightly improved. At high implementation of SUS and while adopting Intensity measures, the slope of the performance indicators greatly increased. This is mainly due to the concurrent implementation of both variables at a time, to the constant evaluation and reviews of strategic plans and to the continuous improvement strategies. Furthermore, periodic face to face meetings to discuss the SMP issues and adequate adaptation of strategic plans to changing conditions especially during unpredicted events, reflect a high level of maturity, flexibility and competence that would improve the manufacturing process outcomes in terms of quality, delivery, efficiency, productivity and overall organizational performance.

6. Conclusion

6.1. Theoretical implications

This paper gives insights about the relationship between Strategic Manufacturing practices, sustainability practices and the OPMs (cost, quality, delivery, morale). After an in-depth literature review, a survey was developed and modified by practitioners. Data was collected from 104 food manufacturing firms. The empirical analysis confirmed the suggested hypothesis regarding the enhancement of SMP effects on the studied OPMs through sustainability practices. A reduction of the cost and an improvement of the quality, delivery and the employee's morale were concluded when implementing both SMP and SUS practices.

6.2. Managerial implications

This study explains how the adoption of different practices simultaneously can improve the firm's performance at different level. The positive relationship between Comprehensiveness, Focus, Horizon, Intensity and SUS practices will enhance the performance. The conceptual framework can be used as a guideline for managers and practitioners to implement sustainability in association with SMP.

6.3. Limitations and future research

There are some limitations coupled with this empirical study. First, even though the obtained results provide important findings, the size of the sample can be expanded to achieve more accurate analyses and interpretations. Second, multiple variables can be added to improve the prediction capability of the model. Future research can target other manufacturing firms in order to cover different business sectors such as automotive, textile, electrical and electronic industries. Furthermore, future research studies could be focused on examining the mediating effects of other variables such as supply chain practices, Lean tools (El-Khalil, 2020), Flexibility and agility dimensions while investigating possible relationships between those variables and their effects on performance indicators that go beyond the ones covered in this study.

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