



Paradoxical Mindset as a Moderator between Sustainability Practices and Sustainability Performance

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Abstract

Sustainability has recently become a key to long-term business success. Firms are applying Sustainability Practices (SPs) to improve their Sustainable Performance (SP). However, the application of these practices has led plants managers with the competing demands of sustainability objectives. Paradoxical Mindset (PM) may help these managers respond to such competing demands. However, the existing literature lacks empirical research on the role of PM in SPs–SP path. To fill this research gap, our paper aims to test the direct relationship between SPs and SP. Furthermore, the study also aims to explore how a PM affects this direct relationship. The data was collected from 224 manufacturing plants and analyzed using Structural Equation Modeling (SEM). The findings revealed that SPs positively influence Economic Performance (EcP), Environmental Performance (EnP) and Social Performance (SoP). Furthermore, this study discovered that PM moderates the relationships between SPs, and EnP. However, the study did not find any empirical evidence to support the effect of the interaction of PM and SPs on SoP. This study attempts to fill certain gaps in operations management literature and provides researchers and manufacturing managers with a deeper understanding of the roles of SPs and PM of the plants' managers in the manufacturing sector.

Keywords: *Sustainability Performance; Sustainability Practice; Paradoxical Mindset; Economic Performance; Environmental Performance; Social Performance.*

Introduction

Sustainable development has become a very popular field of research in the last decade. Driven by social changes, environmental deterioration and accompanying public interest, sustainability is becoming a key topic among academic's researchers and practitioners (Mensah, 2019). Scientific research on sustainability can help firms approach sustainability principles to meet the expectations of their current shareholders and at the same time sustain and enhance the natural resources and social assets for future generations (Büyükoçkan and Karabulut, 2018). In the context of operations management, sustainability provides manufacturing firms with opportunities for contributing to sustainable development. These opportunities; however, require more studies that develop or test theories to help those plants achieving superior SP. SP refers to integrating three dimensions, including environmental performance (EnP), economic performance (EcP) and social performance (SoP) (Norman and MacDonald, 2004). However, literature has shown that most manufacturing organizations mainly focus on achieving EcP leaving behind EnP and SoP, creating an imbalance among these dimensions (Khan *et al.*, 2021; Muñoz and Cohen, 2018; Phan *et al.*, 2020). Literature has also shown that growing sustainability awareness among stakeholder's forces manufacturing plants to seek out sustainability practices (SPs) sustainable performance (SP) (Abdul-Rashid *et al.*, 2017; Adam *et al.*, 2019; Afum *et al.*, 2020; Agan *et al.*, 2013; Ahmad *et al.*, 2020; Busu and Nedelcu, 2018; Gimenez *et al.*, 2012; Habidin *et al.*, 2013; Khan *et al.*, 2021).

According to contemporary research, SPs–SP relationship has been approached from two research stream viewpoints. The first research stream has addressed this issue from a business-case approach. Most of these researchers' findings supported the significant relationship between SPs and related SP (Hajmohammad *et al.*, 2013; Yang *et al.*, 2013; Zhan *et al.*, 2018; Zhu and Sarkis, 2004). In the business case approach, the focus is on the shareholders' values, in terms of profit maximization with limited attention to social and environmental aspects. Accordingly, in the business case approach, sustainability objectives are dominated by economic objectives, which may lead to success in the short-term period (Gao and Bansal, 2013). However, this view gives equal weighting to SP elements (i.e., economic, environmental, and social), and most of the researchers supported the significant positive relationship (Abdul-Rashid *et al.*, 2017; Gupta *et al.*, 2018; Wijethilake, 2017b). Accordingly, firms' performance should not only EcP, but EnP and SoP also should be considered in an integrated manner (Evans *et al.*, 2017) because the applications of triple bottom line SPs render them to face situations in which they need to address competing demands of sustainability objectives (i.e. economic, environmental, and social objectives) simultaneously (Hahn *et al.*, 2014b).

Surprisingly, many firms put economic objectives ahead of social and environmental objectives (Hahn *et al.*, 2014b; Hockerts, 2015; Sharma and Jaiswal, 2017). How firm managers address sustainability objectives might explain the inconsistent findings in the previous studies. Which mean that firms differ in how they are

applying SPs, which lead to varied level of SP outcomes. These differences can be attributed to how they are addressing sustainability objectives i.e. by either prioritizing economic objectives over social and economic ones, or addressing all together such three objectives.

Current literature work has adopted the paradox theory of Smith and Lewis (2011) to explain how firms respond to the competing demands of sustainability objectives. Such theory posits that the effectiveness of addressing the competing demands of sustainability objectives i.e., economic, environmental and social) depends on how managers respond to these sustainability objectives based on their paradoxical mindset (Hahn *et al.*, 2017; Hahn *et al.*, 2014b; Sharma and Jaiswal, 2018; Van der Byl and Slawinski, 2015a). Paradoxical Mindset (PM) is operationalized as the extent to which manufacturing plants respond (i.e. accept, value, and work comfortably) to accommodate competing demands of sustainability objectives (Miron-Spektor *et al.*, 2018).

However, two main objectives of this research paper are: to empirically investigate the direct relationships between SPs and EcP, EnP and SoP, and to investigate the moderating effect of PM on the SPs and EnP and. Findings of this paper attempt to fill the specific gaps in the existing operations management literature and help researchers and plants managers better understand the positive effects of SPs application and the role of plants managers across the manufacturing process. The remainder of the research paper is organized as follows. In the second section, the study conceptualized the relationship between SPs and SP in the manufacturing context. The third section and fourth explains the methodology and analysis of data respectively. The final sections are about conclusion, contribution and future research.

Conceptual Overview

Sustainability Performance (SP)

Previously, firm performance has been limited to EcP (Haddach *et al.*, 2016). It includes economic value added, return on assets, and profit (Fauzi *et al.*, 2010). In recent years, firms no longer rely economically on their operations (Haddach *et al.*, 2016). Other obligations are grown and firms are never again restricted to include direct shareholders but rather integrate different stakeholders (Haddach *et al.*, 2016). From the stakeholders' viewpoint, SP measures the degree to which firms deliver economic, environmental, and social benefits (Artiach *et al.*, 2010; Lee and Ha-Brookshire, 2018; Wagner *et al.*, 2002). However, there is still a lack of studies that address SP based on the triple bottom approach which takes the three dimensions of sustainability aspect into account (i.e. environmental, economic and social aspects (Abdul-Rashid *et al.*, 2017; Henao *et al.*, 2019). In this paper, SP is defined as the extent to which manufacturing firms have managed to achieve EcP, EnP, and SoP. EcP was operationalized as the extent to which manufacturing firms managed to achieve financial benefits (Sajan *et al.*, 2017). EnP is defined as the extent to which manufacturing plants have managed to reduce the harmful manufacturing impact of their process on the natural system (Sajan *et al.*, 2017; Yang *et al.*, 2011). The SoP is operationalized as the extent to which manufacturing plants have managed to improve the quality of life for their employees and the surrounding community.

Sustainability Practices (SPs)

The term practice is associated with several relatively similar terms such as actions, interactions, and activities (Silva and Figueiredo, 2017). Sustainability can be practical because it

depends on existing organizations to carry out actions that enable sustainability to happen (Silva and Figueiredo, 2017). Practice is a repeated action that eventually becomes rooted in one's daily routine. Pham and Kim (2019) defined SPs as a group of actions/activities executed by one organization in a specific context and driven by a sustainable value. Miska *et al.* (2018) defined SPs as the framework of activities/actions that contribute to the economic, social, and environmental causes. In this paper, sustainability practice is conceptualized as three-dimensional attributes EcPs, EnPs, and SoPs (Pham and Kim, 2019). EcPs refer to the degree to which manufacturing plants undertake activities that consider the economic aspect (i.e., the survival of the manufacturing plants in the marketplace, maintaining stable cash flow, providing important products for consumers, and profitability) when running their manufacturing operations (Uddin *et al.*, 2008).

The EnPs refer to the extent to which manufacturing plants undertake actions for improving the harmful impact of their manufacturing process (Gimenez *et al.*, 2012). Relying on Gimenez *et al.* (2012), SoPs refer to the extent to which the manufacturing plant undertakes socially-related actions for enhancing their employees' well-being. These socially-related actions entail providing employees with health and safety, education, positive working conditions, as well as wages and perspectives.

Paradoxical Mindset (PM)

Based on Gaim (2018), a PM is defined as the emotional and cognitive factors that firm members use to make sense of competing demands and respond accordingly. These cognitive and emotional dimensions give grounds for a behaviour or action. Further Raza-Ullah (2018) explained that emotions (feelings) and cognition (thinking) are closely connected. Therefore, the interaction between emotional and cognitive factors shows managerial responses. Accordingly, how firm members make sense of the competing demands of sustainability objectives is guided by their PM which reflects their behaviours in responding to such demands (Gaim, 2018). In this research paper, a PM is operationalized as the extent to which manufacturing firm members accept, value, and work comfortably to accommodate competing demands of sustainability objectives (Miron-Spektor *et al.*, 2018).

Theoretical Foundations and Proposed Research Model

Manufacturing firms as open systems use resources from a natural system to produce consumer products by the production process (Fiksel *et al.*, 2014). The production process generates manufacturing waste and emissions (e.g., solid waste, toxic waste, air pollution, and water pollution) which are deposited into the environment (Fiksel *et al.*, 2014). communities consume the products supplied by manufacturing firms and generate additional waste that may be recycled into manufacturing systems or deposited into the environment (Fiksel, 2012). Accordingly, these linkages between manufacturing plants, natural environment and community, identify the pathways for creating three types of value (i.e. economic, environmental and social) (Fiksel, 2012; Fiksel *et al.*, 2014). Work practices in terms of SPs could maximize these values, through running the operations economically, reducing the harmful manufacturing impact and enhancing employee's well-being. Based on social-technical work practices, the manufacturing practices are usually divided into three best work practices (technical (i.e., economic), social and environmental) to support

efficient production (Qureshi *et al.*, 2019). Therefore, in response to those calls, this research model focuses on internal SPs and their relation to SP.

The idea of the moderating role of a PM is not new. Miron-Spektor *et al.* (2018) tested the moderating role of PM in the relationship between resource scarcity tensions and job performance and innovation, the results showed that when employees experience tensions, those with high PM scores are more likely to approach tensions as opportunities for gaining energy. Therefore, those employees search more broadly for integrative solutions, thereby enabling superior job performance and innovation. In contrast, employees who are lacking a PM are trying to eliminate tensions by leaving fewer resources available for performing their jobs. Besides that, Ingram *et al.* (2016) confirmed that PM moderates the relationship between a managing family business and innovative behaviour, when firm leaders engage in paradoxical thinking, they are more likely to manage these tensions to become innovative. Consequently, they suggested that paradoxical thinking plays a fundamental role in encouraging innovative behaviour. Figure 1 presents the current research model that SPs impact SP through the interaction effect of PM. The research model consisted of five variables, i.e. SPs as exogenous, EcP, EnP and SoP as endogenous, and PM as moderator. The next section discusses hypothesis development and empirical studies on the relationship between variables.

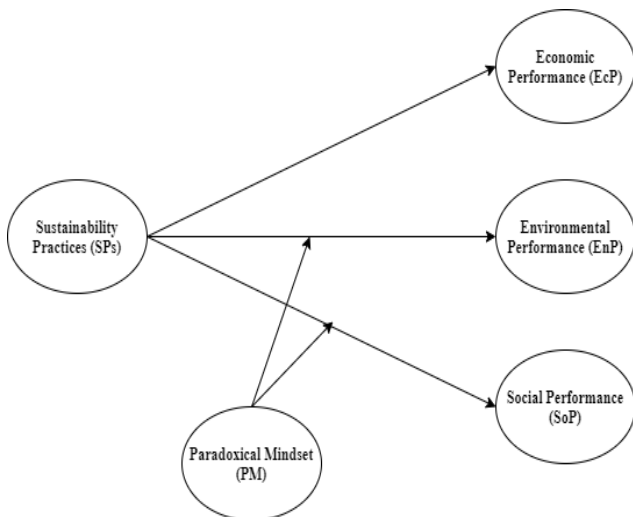


Figure 1. Research Model

Hypothesis Development

The concept of SP refers to integrating three dimensions: economic, social, and environmental. The achievement of a high level of SP depends on the patterns of SPs. The first fundamental component of SP is EcP (Khan *et al.*, 2021). EcP is defined as the extent to which manufacturing firms have managed to achieve financial benefits (Sajan *et al.*, 2017). The high level of such financial benefits relies on the extent to which manufacturing plants carry out actions that add economic values, improving the harmful manufacturing impact and employee's well-being (Pham and Kim, 2019). For instance, the extent to which those plants consider the economic aspects when it is running their operations, in terms of efficiency, productivity, survival, healthy cash flow, and profitability, will determine the degree of EcP achievement. In addition to considering economic initiatives, the application of EnPs in the manufacturing process would reduce energy and water costs. For example, recycling and reuse would reduce waste ' costs and help in avoiding costs required to correct environmental

damage (Pullman *et al.*, 2009). EnPs can also lead to production efficiency, lower raw material costs, and corporate image' improvement (Ninlawan *et al.*, 2010). According to Molamohamadi and Ismail (2014), firms that adopting SoPs are likely to reduce operational costs.

H1: SPs have a positive relationship with EcP.

The second essential component of SP is EnP (Khan *et al.*, 2021). It assesses the degree to which manufacturing plants have managed to reduce the harmful manufacturing impact of their process on the natural system (Sajan *et al.*, 2017; Yang *et al.*, 2011). Accordingly, the effective implementation of such SPs (i.e. EcPs, EnPs SoPs) will lead to a great level of EcP. For example, EnPs should enhance the utilization of materials and energy usage, reduce manufacturing waste, and harmful emissions. SoPs such as employees' education, wages, health and safety, positive working conditions and perquisites, are necessary to increase the levels of employee's abilities knowledge and skills (Marimuthu *et al.*, 2009). (Govindarajulu and Daily, 2004). Moreover, those types of employees are more committed and environmentally responsible towards their activities (Govindarajulu and Daily, 2004).

The literature on operations management highlighted the implications of SPs on ENP. For instance, Wijethilake (2017a) revealed that a proactive sustainability strategy is positively and significantly related to EnP. Green *et al.* (2012). Hajmohammad *et al.* (2013) indicated a positive and significant link between EnPs and EnP. In the same vein, Hami *et al.* (2015) confirmed that sustainable manufacturing practices positively and significantly impact EnP. To summarize, based on the over mentioned discussion, the applications of SPs (i.e. EcPs, ENPS, SoPs) are expected to increase the level of the EnP.

H3: SPs has a positive influence on ENP.

The third essential component of SP is SoP (Khan *et al.*, 2021). It assesses manufacturing plants performance on social indicators, e.g., training and development, health and safety, working condition, and other employee-related benefits. A company with EcPs applications is expected to provide extra funds for the employees' well-being investment (Scholtens, 2008). Hence, the adoption of SPs in terms of EcPs are expected to have a positive effect on the social systems. For example, the healthy cash flow and the manufacturing plants survival in the market may improve the quality of life for employees and all the surrounding community (Gimenez *et al.*, 2012). Besides EcPs, EnPs also may influence the workers' health and productivity at work (Molamohamadi and Ismail, 2014). Regarding the SoPs, firms undertake actions to improve the impact of their operations and processes on both internal (e.g. employees) and external social systems (e.g. community) (Pullman *et al.*, 2009). Implementing those SoPs in terms of employee safety and working conditions will most probably improve employees' occupational health and safety, development, skills, and social reputation. SoPs can also maximize job satisfaction, which contains benefits measured such as wages and so on. Such sustainability measures also impact job satisfaction and include the design of the workplace, accident prevention, ergonomic stress, development (Jaehn, 2016).

H3: SPs have a positive relationship with firms' SoP.

The paradox theory explained how repeated responses to the competing demands enable sustainability. This theory has three key features: (1) a paradoxical tension, (2) managerial responses to such paradoxical tensions, and (3) the impact of the managerial responses on sustainability outcomes (Smith and Lewis, 2011).

Tension refers to competing elements such as contradictory demands, goals, interests, and perspectives (Hahn et al., 2014a; Miron-Spektor et al., 2018; Van der Byl and Slawinski, 2015a). The fact is that when firms' managers are faced with multiple competing demands, they make sense of them (Gaim, 2018). There are some organizational factors such as organizational design, process design, and resources allocation (i.e., financial resources, human resources and time) that activate tensions to be salient (Hahn et al., 2014a). In the context of SPs application, manufacturing managers experience tensions of competing demands which arise from addressing sustainability objectives (e.g., economic, environmental, and social). For instance, competing demands of sustainability exist between the efforts to increase productivity and competitiveness on one hand and to maintain better occupational health and safety for employees and environmental protection on the other hand (Maalouf et al., 2019; Van der Byl and Slawinski, 2015a). Hence, these competing objectives cause managers to face situations in which they need to address different needs (Smith, 2014).

Therefore, the direct effect SPs on SP can be moderated by variables explaining the mechanisms through which SPs impact SP (Magon et al., 2018). The PM explains the mechanism in which SPs impact SP. From a triple bottom line view, companies are responsible for achieving economic, environmental, and social benefits. However, it has been recognized that companies maximize owners and shareholders' wealth rather than looking after social and environmental issues (Evans et al., 2017; Sánchez-Flores et al., 2020). Because it is not easy to quantify environmental and social objectives (Camilleri, 2017). The paradoxical mindset may potentially identify new ways to address such issues, which ultimately optimize the related performance in reducing harmful manufacturing impact and improving employees' well-being. Accordingly, this research posits the subsequent hypotheses:

H4. PM moderates the relationship between SPs and EnP.

H5. PM moderates the relationship between SPs with SoP.

Methodology

Measures

The constructs of this research paper were measured based on many studies in the extant literature. EcP, EnP, SoP and PM were measured as first order constructs. EcP was measured using four indicators from Masocha and Fatoki (2018); EnP was measured using four indicators from Agan et al. (2013) and Perrini et al. (2007); SoP was measured using five indicators from Cantele and Zardini (2018) and Gimenez et al. (2012); and PM was measured using nine items taken from Miron-Spektor et al. (2017). The economic, environmental and social dimensions of sustainable performance (SP) were evaluated using five, five, and four items, respectively, sourced from Hami et al. (2016) and Sajan et al. (2017), Zhu et al. (2005) and Zhu et al. (2013), and Abdul-Rashid et al. (2017), in that order. For each dimension of SP, respondents were asked to rate the performance of their plants compared to their primary competitors over the past three years.

Data Collection

The total number of manufacturing plants in Khartoum State (the central industrial areas in Sudan) is 667. The statistical table of Krejcie and Morgan (1970) indicates that this population's total predicted sample size is 244. Survey methodology was used for collecting data from manufacturing plants in nine manufacturing sectors in this region. A total of 244 questionnaires were distributed according to the sample size of the manufacturing industry. A number of 224 questionnaires were returned, representing a 91%

rate of return. The reason for this splendid return rate could be due to the personal administration of the questionnaires. Table 1 shows the profiles of the responding companies regarding the number of employees, total job experience, manufacturing sector and the plant age.

To test the common bias, EFA analysis was conducted on the scale items. The results reveal that the two conditions suggested by Podsakoff et al. (2003), were fully satisfied. A total of 13 factors emerged with Eigenvalue >1, and the principal factor accounted for only 40.5% of the total variance. Therefore, it can be safely concluded that the common method's bias is not a threat to this data validity.

Table 1. Demographic Characteristics of Respondents

Variables	Category	Freq.	(%)
Number of Employees	1-99	44	17 %
	100 -199	40	18 %
	200 - 299	43	19 %
	300 - 399	45	20 %
	400 - 499	31	14 %
	More than 500	21	9 %
Manufacturing Sector	Foods Industry	53	24%
	Petrochemicals, Energy & Mining	22	10%
	Oil & Soap	12	5%
	Pharmaceutical, Fragrances & Cosmetics	17	8%
	Flour & Animal Product	8	4%
	Textile & Cloths	6	3%
	Packaging and Publication	15	7%
	Leather & Footwear	6	3%
	Engineering Industries	85	38%
	Less than 5	15	7%
Plant Age	5-10	47	21%
	11-15	59	26%
	16-20	36	16%
	More than 20	67	30%

Results and Discussions

Measurement Model

Reflective items were used in the measurement model in this study. Convergent and discriminant validity were tested to identify whether the items reflect the underlying construct. As observed from Table 2 all the items loading is greater than 0.70 except the item PM which loaded 0.653, hence this item was deleted. The coefficients of composite reliability of the latent constructs range from 0.854 to 0.927, showing that all construct' composite reliability was greater than the minimum acceptable level and satisfied the required criteria (Hair et al., 2014). AVE was greater than 0.5 for all the constructs (Fornell and Larcker, 1981). The loadings for items related to EcPs, EnPs, and SoPs demonstrate strong and consistent values, ranging from 0.703 to 0.865 for EcPs, 0.789 to 0.837 for EnPs, and 0.751 to 0.865 for SoPs. These robust loadings indicate that the selected items effectively capture the essential characteristics of their respective constructs, reinforcing the reliability and validity of the measurement model.

Turning attention to the PM, the items exhibit substantial loadings ranging from 0.653 to 0.834. The high composite reliability (CR) value of 0.927 for PM, coupled with the average variance extracted (AVE) of 0.586, underscores the reliability and convergent validity of the PM construct. These results signify that the items successfully measure the latent construct of a paradoxical mindset, a pivotal aspect in the study's examination of the moderating role in sustainability practices.

The moderation constructs (EcPR, EnPR, SoPR) also demonstrate robust loadings, ranging from 0.708 to 0.868 for EcPR, 0.805 to 0.872 for EnPR, and 0.751 to 0.819 for SoPR. High composite reliabilities and average variance extracted values for these interaction constructs further validate their reliability and convergent validity. These constructs represent the crucial interaction terms in the study, capturing the nuanced relationships between sustainability practices, a paradoxical mindset, and their combined impact on sustainability performance.

In summary, the measurement model results collectively affirm the reliability and validity of the constructs, providing a solid foundation for the subsequent analyses exploring the intricate dynamics between a Paradoxical Mindset, Sustainability Practices, and Sustainability Performance. The robustness of the measurement instruments enhances the overall credibility and trustworthiness of the study's findings, offering valuable insights for both academia and practical sustainability initiatives.

The discriminant validity is assessed by evaluating the square root of AVE, i.e., the Fornell and Larcker (1981) criterion. As given in Table 3 all off-diagonal correlations among constructs are lower than the squared root of AVE along the diagonal, thus suggesting sufficient discriminant validity. This signifies that each construct shares more variance with its own indicators than with the indicators of other constructs, confirming discriminant validity.

Structural Model

To assess the significance of path coefficients between constructs in the structural model, a standard procedure of bootstrapping was adopted with 5000 bootstrap samples (Henseler et al., 2009). The results of the PLS Structural Model are shown in Table 4. Moreover, the results of the SEM with standardized coefficients and t values are produced in Table 4. Accordingly, all the paths of the direct relationship are significant. EcPs enhance the EnP ($\beta = 0.625$ $t = 13.456$ $p < 0.05$) (Hypothesis 1). This result signifies that firms actively implementing ecological practices experience notable enhancements in their environmental performance. Practically, it suggests that strategic investments in waste reduction, energy efficiency, and sustainable resource management can yield tangible benefits, contributing not only to environmental sustainability but also to corporate reputation, innovation potential, and regulatory compliance. This finding guides strategic decision-makers in prioritising and investing in specific ecological initiatives, aligning with global sustainability goals and positioning the organisation as environmentally responsible and forward-thinking. Overall, the result provides actionable insights for organisations seeking to integrate sustainability practices into their core strategies, fostering positive environmental outcomes and aligning with broader societal expectations.

SPs enhance the EnP ($\beta = 0.552$, $t = 9.302$, $p < 0.05$) (Hypothesis 2). This result underscores the critical role that sustainability initiatives play in fostering positive environmental outcomes. It suggests that organisations adopting a holistic approach to sustainability, encompassing social responsibility, ethical governance, and stakeholder engagement, are more likely to experience enhanced environmental performance. This finding contributes to a more nuanced understanding of the interconnectedness of sustainability practice, emphasizing that broader and integrated initiatives positively influence the environmental dimension. Practically, it encourages organisations to embrace a holistic sustainability framework, not only addressing ecological aspects but also integrating social and governance dimensions, thereby fostering a more sustainable and responsible approach that aligns with evolving societal expectations and global sustainability goals.

Table 2. Item Loading, CR, and AVE

Constructs	Items	Loadings	CR	AVE
EcP	EcP1	0.703	0.863	0.612
	EcP2	0.770		
	EcP3	0.835		
	EcP4	0.815		
EnP	EnP1	0.813	0.886	0.661
	EnP2	0.789		
	EnP3	0.812		
	EnP4	0.837		
SoP	SP1	0.818	0.916	0.685
	SP2	0.865		
	SP3	0.819		
	SP4	0.783		
	SP5	0.851		
EcPs	ECPR1	0.808	0.905	0.656
	EcPR2	0.868		
	EcPR3	0.834		
	EcPR4	0.796		
	EcPR5	0.739		
EnPs	EnPR1	0.708	0.912	0.675
	EnPR2	0.853		
	EnPR3	0.805		
	EnPR4	0.872		
	EnPR5	0.858		
SoPs	SoPR1	0.819	0.854	0.594
	SoPR2	0.751		
	SoPR3	0.755		
	SoPR4	0.756		
PM	PM1	0.653	0.927	0.586
	PM2	0.784		
	PM3	0.795		
	PM4	0.812		
	PM5	0.834		
	PM6	0.811		
	PM7	0.741		
	PM8	0.720		
	PM9	0.724		

Table 3. Squared Roots of AVEs (Fornell and Larcker Criterion)

	ECP	EcPs	EnP	EnPs	PM	SoP	SoPs
ECP	0.782						
EcPs	0.587	0.810					
EnP	0.511	0.355	0.813				
EnPs	0.499	0.557	0.657	0.821			
PM	0.397	0.469	0.374	0.476	0.783		
SOP	0.593	0.473	0.565	0.602	0.430	0.828	
SoPs	0.524	0.543	0.450	0.696	0.479	0.717	0.771

Table 4 Results of Hypotheses Tests

Relationship	β	t-Value	p-Value
SPs -> EcP	0.625	13.456	0.000
SPs -> EnP	0.552	9.302	0.000
SPs -> SoP	0.655	10.361	0.000
Moderating Effect 1 -> EnP	0.093	2.747	0.003
Moderating Effect 2 -> SoP	0.051	1.367	0.086

Accordingly, all the paths of the direct relationship are significant. EcPs enhance the EnP ($\beta = 0.625$ $t = 13.456$ $p < 0.05$) (Hypothesis 1). This result signifies that firms actively implementing ecological practices experience notable enhancements in their environmental performance. Practically, it suggests that strategic investments in waste reduction, energy efficiency, and sustainable resource management can yield tangible benefits, contributing not only to environmental sustainability but also to corporate reputation, innovation potential, and regulatory compliance. This finding guides strategic decision-makers in prioritising and investing in specific ecological initiatives, aligning with global sustainability goals and positioning the organisation as environmentally responsible and forward-thinking. Overall, the result provides actionable insights for organisations seeking to integrate sustainability practices into their core strategies, fostering positive environmental outcomes and aligning with broader societal expectations.

SPs enhance the EnP ($\beta = 0.552$, $t = 9.302$, $p < 0.05$) (Hypothesis 2). This result underscores the critical role that comprehensive sustainability initiatives play in fostering positive environmental outcomes. It suggests that organisations adopting a holistic approach to sustainability, encompassing various practices such as social responsibility, ethical governance, and stakeholder engagement, are more likely to experience enhanced environmental performance. This finding contributes to a more nuanced understanding of the interconnectedness of sustainability practice, emphasizing that broader and integrated initiatives positively influence the environmental dimension. Practically, it encourages organisations to embrace a holistic sustainability framework, not only addressing ecological aspects but also integrating social and governance dimensions, thereby fostering a more sustainable and responsible approach that aligns with evolving societal expectations and global sustainability goals.

There is a positive relationship between SPs and SOP ($\beta = 0.655$, $t = 10.36$, $p < 0.05$) (Hypothesis 3). This result underscores that organisations actively involved in sustainability practices, which encompass ethical, social, and community-oriented initiatives, are likely to witness positive social performance outcomes. The interconnectedness highlighted here accentuates the holistic nature of sustainability, suggesting that initiatives addressing environmental concerns alongside ethical and social responsibilities contribute to positive societal impacts. Practically, this implies that organisations embracing a comprehensive sustainability agenda are not only fulfilling ethical and social obligations but also cultivating a positive image within their communities and among stakeholders. It encourages a strategic integration of sustainability practices that extend beyond environmental considerations, aligning with evolving societal expectations and fostering a positive and responsible corporate identity.

There is a significant interaction of PM and SPs on ENP ($\beta = 0.093$; $t = 2.747$; $p < 0.05$) (Hypothesis 4). This result suggests that the impact of sustainability practices on environmental outcomes

is not uniform but is contingent upon the presence of a paradoxical mindset. A paradoxical mindset, characterized by the ability to embrace contradictions and navigate complexities, appears to enhance the positive effects of sustainability initiatives on environmental performance. This underscores the importance of cultivating a corporate culture that fosters a paradoxical mindset, encouraging adaptability and innovation in approaching sustainability challenges. Practically, organisations aiming for heightened environmental performance should not only invest in sustainability practices but also nurture a culture that encourages employees to navigate paradoxes and complexities, thereby amplifying the positive impact of their sustainability efforts on environmental outcomes.

However, the interaction of PM and SPs on SoP (H4) fell short of statistical significance ($\beta = 0.051$; $t = 1.367$; $p > 0.05$). This suggests that, unlike the moderating effect observed in environmental performance, the influence of a paradoxical mindset on the relationship between sustainability practices and social performance is not statistically supported. Organisations may find that a paradoxical mindset plays a more pronounced role in shaping the impact of sustainability initiatives on environmental outcomes, while its moderating effect on social performance is less evident. Consequently, strategic efforts to foster a paradoxical mindset may have a more direct and significant impact on the environmental dimension of sustainability within an organisation. This result prompts leaders and practitioners to consider the nuanced and context-specific nature of the relationship between mindset, sustainability practices, and different dimensions of organizational performance, tailoring interventions accordingly for a more effective and targeted sustainability strategy.

Conclusion, Implications, and Future Research

Our paper explored the impact of SPs on SP from the triple bottom line approach empirically. Additionally, the study examines the moderating effect of PM on the relationship between SPs with EnP and SoP. These results may enable manufacturing plants to identify the means for achieving triple bottom line sustainability, through the right combination of SPs applications across manufacturing systems and respond actively to the competing demands of sustainability elements that may arise due to the limited resources and work design. This paperwork is among of the few attempts for examining the relationship between SPs and SP in the operations management field Abdul-Rashid et al. (2017), Chin et al. (2015b), Gimenez et al. (2012), Habidin et al. (2013), Hami et al. (2016) and Pham and Kim (2019). These effects from the triple bottom line did not receive adequate attention in prior research. It has been investigated extensively from the business case (Slawinski, 2015b; Zhang et al., 2015). Such an approach preferred the economic aspect over social and environmental ones (Xiao et al., 2019). This issue has dominated business sustainability. From the organization paradox view, there is growing research conducted on how firms respond to the competing demands of sustainability.

For the practical contributions, paradoxical thinking may enlighten practitioners, manufacturing plants that seeking to promote an optimal level of SP based on a triple bottom line approach to applying EcPs, EnPs and SoPs simultaneously across the manufacturing process. The objectives of this research paper were achieved, but it was not possible without some limitations on the scope of the study. Firstly, industries need a method to refine and measure specific indicators for environmental, economic, and social aspects at the factory in a practical way (Hartini et al., 2020).

Therefore, the current study focused on the internal SPs of the manufacturing process at the factory level. For this reason, external SPs are excluded. Therefore, future researchers could attempt to overcome this limitation by examining the influence of external SPs such as sustainable supply chains on SP in line with the triple bottom line approach. Secondly, as discussed earlier, to achieve optimal SP of SPs, firms' members experience the tensions of sustainability demands. Therefore, further research is needed to extend the current research model by testing empirically how sustainability tensions mediate the relationship between SPs and SP.

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