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Social media usage and sustainable performance in manufacturing supply chains: exploring dynamic capabilities

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Abstract
Due to the global impact of COVID-19, businesses and supply chains worldwide have been disrupted, leading to challenges for manufacturing firms and customers. Social media usage (SMU) is a vital and valuable tool that builds customer-centric supply chains by effectively communicating large volumes of valuable data. This study examines the influence of social media usage on the development of dynamic capabilities, including supply chain sensing capabilities (SCSC), knowledge sharing capability (KSC), and social capital (SC), which are crucial for constructing agile and resilient supply chains that can effectively respond to dynamic and turbulent environments, ultimately enhancing sustainable business performance. To assess the proposed investigation model, data was gathered through a structured questionnaire administered to supply chain members currently engaged with manufacturing firms. The evaluation of the proposed hypotheses is carried out through the application of structural equation modeling (SEM). The results of this study offer empirical evidence supporting the proposition that SMU within manufacturing firms promotes the development of sensing capabilities, knowledge-sharing capability, and social capital. Furthermore, this study tests the moderation role of environmental dynamism in the relationship between social media use and sustainable business performance. This underscores the pivotal role played by SMU in facilitating the adaptation and responsiveness of the supply chain to dynamic and uncertain environments, thereby contributing to the long-term sustainability and competitiveness of organizations.

Keywords Social media usage · Sustainable performance · Supply chain · Dynamic capabilities

1 Introduction

Globalization, advanced and turbulent technologies and computerized systems resulted in intense competition among firms [1]. In this digital world, customers largely switched their attention toward using social media applications [2], and social media platforms are neither owned by firms, nor they are in their control [3]. Social media as a digital tool changed the business landscape by connecting with customers [4].

Most often, digital supply chains are linked with disruptive technologies such as big data, artificial intelligence, robotics and additive manufacturing, but digital transformation of the supply chain is more related to how supply chain processes are managed innovatively and how this transformation better captures customer preferences and quickly sense and anticipates

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changing patterns; social media is that vital tool which builds customer-centric supply chains by effectively communicating large volumes of valuable data [5]. Most of the firms don't have any idea how many opportunities are associated with social media, especially its usage in the supply chain, which can change operational functions dramatically due to direct, cheap and timely communication with consumers [4]. It is a cheap source for gaining insights, managing content, tracking conversion, and targeting customers [6]. Social media applications aid supply chain management by improving product quality, delivery, and flexibility [6]. Social media and social networking need to be used by supply chain managers strategically for strategic decision-making to uncover insights regarding long-term supply-demand patterns to gain a sustainable competitive advantage [7] as it predicts demand with more precision than any other methods [6], which ultimately leads toward sustainable business performance. The use of social media applications in enterprises, especially in operations, has become inevitable [8], and practitioners now recognize that effective use of social media builds trust and a strong network with key stakeholders [3].

Moreover, in this era, supply chain managers are also diverting their attention toward using social technologies, including free and paid platforms and self-managed communities, to increase their ability to sense environmental disruptions in a in a timely manner and to be proactive and resilient [7]. Especially the focus on digitalization in post COVID-19 era by firms increased tremendously to build trust-based customer relationships. This digitalization is achieved through social media content as it provides one-to-one effective and reliable interaction with customers [4, 9]. Although SMU is becoming an integral part of the modern world, it has been an overlooked topic in the supply chain so far [5]. It is still the least used medium in supply chain and firms aren't capitalizing its full benefits for developing customer-centered supply chains [4]. Various studies explored SMU in SMEs businesses and found its positive impact on performance [1–3, 8, 10, 11], but there is still limited research in manufacturing firms, specifically in the supply chain context. Despite the significance of SMU, there is a notable dearth of attention given to the critical supply chain capabilities, including sensing, knowledge sharing, and shared capital, in the relationship between SMU and sustainable business performance, particularly in the context of uncertain environment.

According to [12], improving sensing capabilities, which involve assessing and identifying technological opportunities and gaining insights from the market environment, can result in enhanced operational performance. Abbasi, M.N., et al., [4] discovered that knowledge shared through the SMU is easily accessible to all supply chain members, fostering social networks, learning, and operational excellence, thereby enhancing business performance. According to [6], social capital is that reservoir that is developed due to the network of supply chain members, and interaction among those specific members can be considered a valuable social resource that maximizes the performance of a business.

Therefore, this research aims to address this question and, based on existing literature,

Q1. Does the social media usage have an impact on sustainable business performance?
Q2. Does the social media usage impact supply chain sensing capability, knowledge-sharing capability and share capital?
Q3. Do supply chain sensing capability, knowledge sharing capability and share capital mediate between the social media usage and sustainable business performance?
Q4. Does environmental dynamism play moderate role between social media usage and sustainable business performance?

This study makes several significant contributions to the existing body of literature. Firstly, social media is a customer-facing technology, and its impact on business performance is highly unpredictable [10, 13], so investigation of their link in this digitalized world is inevitable. Secondly, there is a lack of research on social media usage for sustainable business performance in developing countries [1], especially very limited literature on social media adoption in Pakistan [3], so this study aims to fulfill this gap specifically in Pakistan. Thirdly, current research and empirical evidence of SMU in the supply chain is developing and insufficient [8]; supply chain managers are now diverting their attention regarding SMU for developing dynamic capabilities and resilient supply chains [7], so current research empirically proves a significant positive link of SMU in development of those capabilities which sense opportunities and threats offered by the ever-changing environment to build resilient and agile supply chains to enable a firm to attain and maintain SBP. Little is known about how SMU in manufacturing firms' supply chains can affect performance, especially in Pakistan.

2 Literature review and hypothesis development

2.1 Social media usage and sustainable business performance

Success of a firm directly depends on the purchasing decisions of customers, suppliers' reliability and coordination and social media apps have become vital gadgets to communicate with suppliers change the beliefs of customers [8] maximize potential firms need to capture customers' dynamic expectations [4]. Abbas, J., et al., [2] Their study proved a positive relationship between SMU and a firm's sustainable performance by suggesting that recently, SMU has increased a business's two-way communication with customers to assist and interact with them easily to communicate lucrative offers such as discounts and exclusive coupons, which builds trust, customer loyalty and customer satisfaction which heightens sales volume and ultimately improves sustainable performance. Moreover, they argued that SMU offers a platform to be in touch with suppliers, retailers and stakeholders by conveying them superior value compared to rivals and building long-term relationships with them in the competitive business landscape, which leads to improved sustainable performance [1]. Suggested a significantly positive impact of SMU to improve SMES sustainable performance because [6] described that it allows to monitor and analyze consumer conversations [3]. Suggested that social media dramatically improves firm performance through increased customer loyalty, retention, visibility, and cost efficiency. However, [10] found that there is no significant relationship between social media adoption and business performance in SMEs, they asserted that SMEs weren't getting immediate benefits of adoption and its usage must be intended to support as a tool to implement strategies to attain already established goals and shouldn't be considered as an end product. Similarly, [11] indicated an insignificant association between SMU and the sustainable performance of Indonesian SMEs and proposed that there is no direct relationship, but SMU positively affects innovation capability and employee's commitment which later results in SBP. Therefore, based on inconsistent results found in literature, we investigated the relationship and hypothesized that;

H1: Social media usage positively affects sustainable business performance.

2.2 Social media usage and supply chain sensing capability

An organization develops its dynamic capabilities through identifying threats as well as sensing and seizing opportunities offered by the external environment [14]. This sensing capability enables an organization to predict information that is being reflected in its surroundings [7]. To achieve dynamic sensing capability, firms' outreach must be broadened including their suppliers and customers [14]. According to [6], social media by supply chain members is used to develop supply chain intelligence through conducting market research and gathering information related to consumer behavior, they specifically revealed how textual sentiment analysis is being used to identify contents on social media and how their association and collaboration positively affects supply chain performance. However, [7] indicated that the use of social media for gathering information from the environment to improve a firm's sensing capability for the supply chain is still limited. Therefore, there is a dire need to explore their underlying association. So, based on above discussion we hypothesized that;

H2a: Social media usage positively affects supply chain sensing capability.

2.3 Social media usage and knowledge sharing capability

According to [1], SMU disseminates information effectively, which smooth's the process of knowledge sharing, improves collaboration and builds business alliances, which improves business performance. Social media applications increase the flow of information and knowledge sharing in supply chains, and business partners can easily access valuable information within supply chain networks [8]. It encourages knowledge sharing to customers as well because they are readily opting for it to access reliable and timely information and to share their views, opinions and experiences, this required and easily accessible knowledge highlights problems and their solutions within and across supply chains [4]. Agnihotri, R., et al., [5] Indicated that increased SMU provided supply chain partners a medium to communicate, exchange information, and facilitate knowledge acquisition, accumulation and sharing to smooth supply chain operations. [6] Confirmed that SMU magnified real-time communication between producers and consumers to share information easily.

H2b: Social media usage positively affects knowledge-sharing capability.

2.4 Social media usage and social capital

The term "social capital" has roots in the field of political science and sociology but, over the years gained acceptance and applicability in economics, social sciences, and organizational and management sciences [6]. Social capital cannot be developed without social networks and interactions, and these social relations are considered valuable resources from which benefits can be reaped [6]. Nasrollahi, M. [8]indicated that social media uses a channel of social capital to influence business performance. Supply chain members, when they understand specific dimensions of social media content develops social capital [15]. Examines the impact of social media usage by B2B sales professionals on collaborative value generation and performance in cross-selling and up-selling endeavors. Moreover, leveraging social media enhances the social capital of sales representatives, consequently leading to direct and cooperative enhancements in value generation and the promotion of complementary and supplementary products.

H2c: Social media usage positively affects social capital.

2.5 Supply chain sensing capability, knowledge sharing capability, Social capital and sustainable business performance

[12] Revealed that enhancing sensing capabilities, which entails evaluating and recognizing technological opportunities and learning from the market environment, can lead to improved operational performance. "Sensing capability and distinctive competence play a significant role in determining competitiveness and ensuring business sustainability. Moreover, effectively utilizing sensing capability is essential for fostering creative and competent human resources, which are crucial for driving innovation and product development [16]. Abbasi, M.N., et al., [4] Indicated that information and knowledge that is created through the SMU is easily accessible to all supply chain members, eliminates irregularities, improves social networks of members, thereby creates social and intellectual capital, and improves learning and exploitation of this intense and quality knowledge, ultimately improving operational excellence and business performance. Moreover, dynamic capabilities and the effective management of knowledge have the potential to aid companies in establishing a robust supply chain during periods of significant disruption and uncertainty [17]. According to [6], social capital is that reservoir that is developed due to the network of supply chain members, and interaction among those specific members can be considered a valuable social resource that maximizes the performance of a business. Moreover, [18] explored the positive correlation between social capital and sustainable business performance, specifically in relation to profit, market share, turnover, and employment.

H3a: Supply chain sensing capability is positively correlated with sustainable business performance.
H3b: Knowledge-sharing capability is positively correlated with sustainable business performance.
H3c: Social capital is positively correlated with sustainable business performance.

2.6 The mediating role of supply chain sensing capability, knowledge sharing capability and social capital

[19] defined agility in the digital era as: "… digital technologies such as the IoT, big data, and artificial intelligence that enable fast and smart sensing of both demand and supply conditions in real-time". Moreover, Social media platforms offer the opportunity to cultivate sensing capabilities, resulting in the harmonization of resilience and efficiency within the supply chain domain [20]. Similarly, sensing heavily depends on digital technologies, playing a crucial role in bolstering the flexibility and resilience of supply chains. Moreover, it is essential for enhancing supply chain adaptability and resilience, consequently improving overall business performance [21]. Belhadi, A., et al., [22] emphasizes the role of information and communication technologies in transforming supply chains, while [17, 23] highlights the importance of knowledge management and dynamic capabilities in developing resilient supply chain models. Moreover, [24] companies are increasingly utilizing social media platforms to tap into insights from external sources, notably customers and other users, in order to enhance the innovation process and overall firm performance. Furthermore, social media acts as an intermediary in the impact of external knowledge exchange on firm innovation, particularly when companies prioritize contemporary human resource management practices. The

company strategically pursued acquiring, transferring, and assimilating market knowledge by investing in digital technologies and unique resources. As a result, this strategic initiative enabled the establishment of a robust supply chain framework adept at efficiently managing logistical and delivery obstacles during times of unpredictability and urgency [17]. According to [6], a supply chain is a complex socio-technical system that involves technical factors, including logistics and information systems, which are managed by formal mechanisms, as well as social factors, that are human centered focused on mutual trust and social relationships. Moreover, user-generated content on social media is a vital and valuable tool for supply chains whose potential need to be maximized [6]. Similarly, [25] highlights the importance of adopting online business networks and utilizing digital social capital to improve the efficiency of small and medium-sized enterprises owned by families. Family-owned enterprises can stimulate economic expansion, foster creativity, and maintain competitiveness [26] in the modern digital environment through active involvement in social media business platforms.

H4a: Supply chain sensing capability positively mediates the relationship between social media usage and sustainable business performance.
H4b: Knowledge-sharing capability positively mediates the relationship between social media usage and sustainable business performance.
H4c: Social capital positively mediates the relationship between social media usage and sustainable business performance.

2.7 Moderating role of environmental dynamism

In this turbulent and dynamic environment, SMU is developing the generation of environmental intelligence, which helps supply chain managers to perform best practices [7]. The dynamic nature of the environment exerts a negative influence on the relationship between technological innovativeness and overall business performance [27]. Moreover, environmental volatility functions as an adverse moderator on the impact of digitalization on sustainable performance, but acts as a favorable moderator on network capability [28]. Likewise, [29] findings indicate a favorable impact of digital marketing capability on the performance of MSMEs. Moreover, the presence of environmental dynamism further enhances this relationship, thereby underscoring its significance in facilitating organizational success in dynamic market conditions.

H5: Environmental dynamism moderates the relationship between social media usage and sustainable business performance.

Table 1 Demographic details

Identity	Narrative	Occurrence	%
Gender	Male	219	60.66
	Female	142	39.33
Age	20 to 30	103	28.53
	30 to 50	160	44.32
	Above 50	98	27.14
Education	Undergraduate	77	21.32
	Graduate	199	55.12
	Postgraduate	85	23.54
Hierarchy	Senior management	91	25.20
	Supervisory staff	159	44.04
	Low-level management	111	30.74
Job experience	< 10	101	27.97
	11 to 20	131	36.28
	Above 20 years	129	35.73

3 Methodology

This study utilizes a quantitative approach to explore the causal relationship between variables by testing predetermined hypotheses. To assess the proposed investigation model and research hypotheses, data was gathered through a structured questionnaire administered to supply chain members currently engaged with manufacturing firms. For additional details, consult Table 1 for demographic details and data-gathering methods. Questionnaires were disseminated electronically, garnering 391 responses. Of these, 30 were incomplete, leaving 361 questionnaires eligible for further examination.

The surveys were self-administered, and data was gathered using a pre-existing questionnaire from previous investigators. The components related to social media utilization comprising five elements were extracted from [30]. The measures assessing the supply chain sensing capability comprising five elements were selected from [7]. The study evaluated the knowledge-sharing capability by employing a measurement consisting of five items created by the researcher[31]. Five elements were employed to assess the social capital captured by [32]. The indicators for sustainable business performance comprising five elements were sourced from [33]. The components related to environmental dynamism encompassing five elements were acquired from [27]. The questionnaires are included in Appendix A. Figure 1 shows the research model. In the current research, constructs were measured on 5-point Likert-type scale, in which 1 denotes 'Strongly Disagree' and 5 depicts 'Strongly Agree'.

Statistical analysis is conducted using SmartPLS 4. The proposed hypotheses are evaluated through the application of structural equation modeling (SEM). SEM is considered a pragmatic approach that yields reliable and authentic results when examining the relationships among multiple factors, offering three significant advantages over preceding methodologies. First, it enables the accurate valuation of measurement imprecision. Second, it utilizes observable data to estimate observed variables. Finally, the model's validity is employed to evaluate and refine an order based on data conformity [34].

Moreover, the various multivariate techniques inherently disregard measurement errors as part of their design. However, the SEM investigates the relationships between response and predictor variables by analyzing estimation errors. Given its robustness and resilience, this methodology yields precise and accurate results [35].

When employing self-administered questionnaires, there is a risk of common variance bias, which may be exacerbated [36]. According to [36], conducting tests for common method variance (CMV) can assist in identifying variables that could introduce measurement errors and systematic biases when estimating associations among constructs. The issue may arise when data on both the predictor and criterion variables originate from the same respondent, the questionnaire employs a uniform scale format, and multiple constructs are measured concurrently using an identical instrument. So, Harman's single-factor analysis technique was employed, revealing no significant concerns with CMV. The analysis demonstrated the extraction of only a single factor, which accounted for 33.8% of the change in the criterion variable. The value is markedly lower than the specified benchmark of 50% [37].

In this inquiry, verbal authorization was obtained from survey respondents, and the research was carried out in adherence to ethical principles.

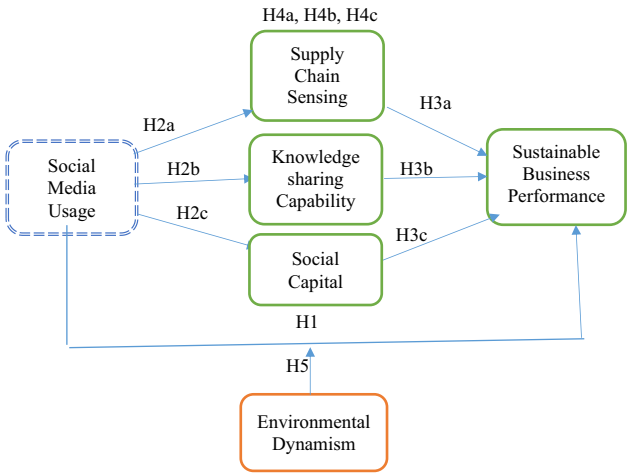
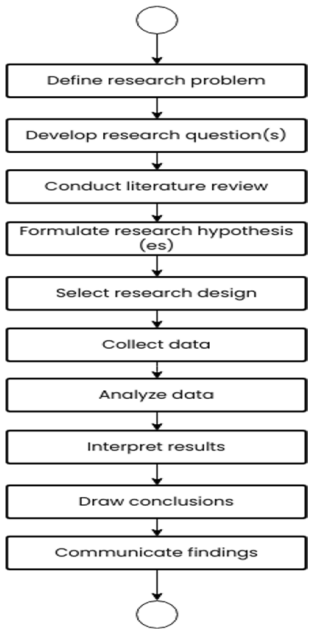


Fig. 1 Research model based on literature review

Fig. 2 Research flowchart



The research process flowchart outlines the steps (demonstrated in Fig. 2): defining the problem and developing clear research questions. After a literature review to identify gaps, formulate hypotheses predicting variable relationships. Select an appropriate research design based on the questions. Collect and analyze data, interpret results, and discuss limitations and implications. Communicate findings effectively to the audience, ensuring rigorous research that advances knowledge.

4 Data analysis and findings

4.1 Measurement model

In employing PLS-SEM to analyze the measurement model, assessing the individual reliability of reflective items hinges on examining the factor-loading values. In this investigation, an exploratory factor analysis was carried out to gauge the validity and reliability of all reflective items, affirming the unidimensionality of the constructs. Ultimately, the factor loadings for each reflective item were found to exceed 0.70 (see Table 2 and Fig. 3).

The construct reliability and convergent validity assessments indicate the internal consistency and validity measures for reflective items. Normally, assessments of construct reliability involve Cronbach's alpha and composite reliability. In this investigation, both Cronbach's alpha and composite reliability were reported, following [38] recommendation to evaluate reflective construct properties by examining Cronbach's alpha, composite reliability, and AVE. Table 2 illustrates that all values of Cronbach's alpha and composite reliability exceed or equal 0.70, indicating satisfactory reliability.

Convergent validity is evaluated by analyzing the AVE, which represents the proportion of variance in a construct attributed to its items relative to the variance attributable to measurement error [39]. Table 2 indicates that the AVE values for all constructs exceed 0.50 at the construct level. Therefore, the measurement model demonstrates acceptable convergent validity.

This study employs three common methods to assess discriminant validity: (1) the Fornell–Larcker criterion; (2) cross-loading; and (3) the Heterotrait–Monotrait (HTMT) ratio. The evaluation of the Fornell-Larcker criterion involves comparing the square root of the AVE with the correlations between the primary construct and all other constructs (Table 3). All variables satisfy this criterion as the square roots of their respective AVEs surpass the correlations with other latent variables. In terms of cross-loading, each item's outer loading on the relevant construct is higher than its loadings on other constructs (Table 4), meeting the cross-loading criterion [40]. Lastly, the HTMT ratio results affirm that none of the HTMT criteria exceed 0.90[41] (Table 5).

Table 2 Reliability and convergent validity

	Factor loading	Cronbach's alpha	Composite reliability	The average variance extracted (AVE)
SMU1	0.772	0.752	0.857	0.667
SMU2	0.844			
SMU5	0.833			
SCSC1	0.829	0.905	0.929	0.725
SCSC2	0.874			
SCSC3	0.868			
SCSC4	0.821			
SCSC5	0.864			
KSC1	0.830	0.746	0.854	0.662
KSC2	0.814			
KSC3	0.797			
KSC5	0.830			
SC1	0.869	0.857	0.902	0.698
SC2	0.886			
SC3	0.864			
SC4	0.709			
SC5	0.869			
SBP1	0.805	0.881	0.912	0.678
SBP2	0.839			
SBP3	0.855			
SBP4	0.866			
SBP5	0.747			

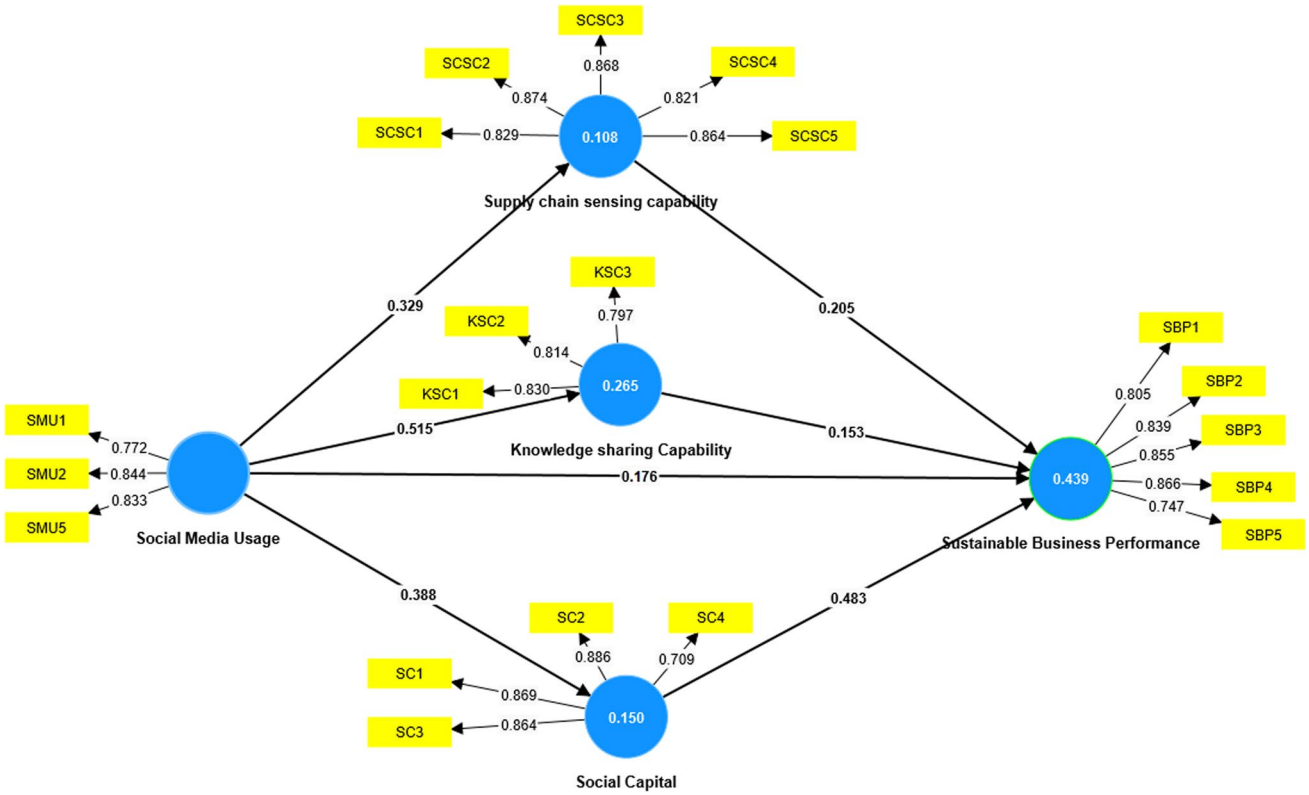


Fig. 3 Outer loading values

Table 3 Fornell–Larcker

	Knowledge sharing capability	Social capital	Social media usage	Supply chain sensing capability	Sustainable business performance
Knowledge sharing capability	0.814				
Social capital	0.364	0.835			
Social media usage	0.515	0.388	0.817		
Supply chain sensing capability	0.354	0.040	0.329	0.852	
Sustainable business performance	0.440	0.576	0.409	0.304	0.823

Table 4 Cross-loading

	Knowledge sharing capability	Social capital	Social media usage	Supply chain sensing capability	Sustainable business performance
KSC1	0.830	0.236	0.406	0.340	0.433
KSC2	0.814	0.258	0.409	0.238	0.263
KSC3	0.797	0.391	0.440	0.277	0.361
SBP1	0.337	0.358	0.307	0.307	0.805
SBP2	0.397	0.477	0.340	0.321	0.839
SBP3	0.381	0.464	0.346	0.281	0.855
SBP4	0.421	0.515	0.394	0.296	0.866
SBP5	0.259	0.549	0.285	0.028	0.747
SC1	0.423	0.869	0.453	0.227	0.575
SC2	0.358	0.886	0.319	0.055	0.526
SC3	0.225	0.864	0.303	0.076	0.396
SC4	0.116	0.709	0.139	0.223	0.376
SCSC1	0.265	0.059	0.279	0.829	0.304
SCSC2	0.304	0.015	0.269	0.874	0.284
SCSC3	0.325	0.050	0.303	0.868	0.224
SCSC4	0.320	0.067	0.289	0.821	0.151
SCSC5	0.300	0.091	0.266	0.864	0.304
SMU1	0.372	0.239	0.772	0.245	0.286
SMU2	0.439	0.376	0.844	0.222	0.305
SMU5	0.444	0.325	0.833	0.333	0.400

Table 5 HTMT values

	Knowledge sharing capability	Social capital	Social media usage	Supply chain sensing capability	Sustainable business performance
Knowledge sharing capability					
Social capital	0.417				
Social media usage	0.682	0.446			
Supply chain sensing capability	0.428	0.202	0.395		
Sustainable business performance	0.530	0.642	0.494	0.336	

4.2 Structural model analysis

In this investigation, the findings from the structural model are based on [40]. Initially, assessing the structural model involves scrutinizing each set of predictors for potential collinearity. The outcomes reveal negligible collinearity, as

Table 6 VIF values

	VIF
KSC1	1.528
KSC2	1.616
KSC3	1.387
SBP1	2.349
SBP2	2.344
SBP3	2.401
SBP4	2.484
SBP5	1.774
SC1	2.161
SC2	2.530
SC3	2.681
SC4	1.797
SCSC1	2.101
SCSC2	2.707
SCSC3	2.758
SCSC4	2.333
SCSC5	2.504
SMU1	1.463
SMU2	1.647
SMU5	1.474

the variance inflation factor (VIF) indicates. Consequently, the presence of collinearity among the predictor constructs does not pose a concern in the structural model, as all VIF values are under the threshold of 5 (Table 6).

Second, the PLS algorithm feature in SmartPLS 4 was utilized to calculate the beta (β) of path coefficients. To examine the research model and hypotheses, as well as gauge the direction, strength, and significance of path coefficients, the PLS-SEM technique known as bootstrapping was employed. This method generates standard errors and t-values [38]. The evaluation of the estimated path associations between latent variables in the model involves considering the sign, magnitude of path coefficients, and 95% bias-corrected and accelerated bootstrap confidence intervals. The outcomes are presented in Table 7.

Table 7 shows the results of the examination, which have a direct connection to H1 through H3c and an indirect association to H4a to H4c. Thus, there is a significant link between the SMU and SBP (beta = 0.176; $p \leq 0.05$). Likewise, there is connection between SMU and SCSC H2a (beta = 0.329; $p \leq 0.000$), H2b KSC (beta = 0.515; $p \leq 0.000$), and H2c SC (beta = 0.388; $p \leq 0.000$). Additionally, the investigation's results determine a direct connection between SCSC and SBP H3a (beta = 0.234; $p \leq 0.000$), KSC H3b (beta = 0.165; $p \leq 0.016$), and SC H3c (beta = 0.421; $p \leq 0.000$). Likewise, for mediation,

Table 7 Hypothesis result

Hypothesis	β	STDEV	T values	P values
Social media usage ≥ Sustainable business performance	0.176	0.032	5.460	0.000
Social media usage ≥ Supply chain sensing capability	0.329	0.054	6.091	0.000
Social media usage ≥ Knowledge sharing capability	0.515	0.042	12.147	0.000
Social media usage ≥ Social capital	0.388	0.049	7.953	0.000
Supply chain sensing capability ≥ Sustainable business performance	0.234	0.058	4.011	0.000
Knowledge sharing capability ≥ Sustainable business performance	0.165	0.050	3.294	0.001
Social capital ≥ Sustainable business performance	0.421	0.058	7.216	0.000
Social media usage ≥ Supply chain sensing capability ≥ Sustainable business performance	0.077	0.022	3.467	0.001
Social media usage ≥ Social capital ≥ Sustainable business performance	0.163	0.028	5.897	0.000
Social media usage ≥ Knowledge sharing capability≥ Sustainable business performance	0.085	0.026	3.332	0.001
Environmental dynamism x Social media usage ≥ Sustainable business performance	0.169	0.049	3.473	0.001

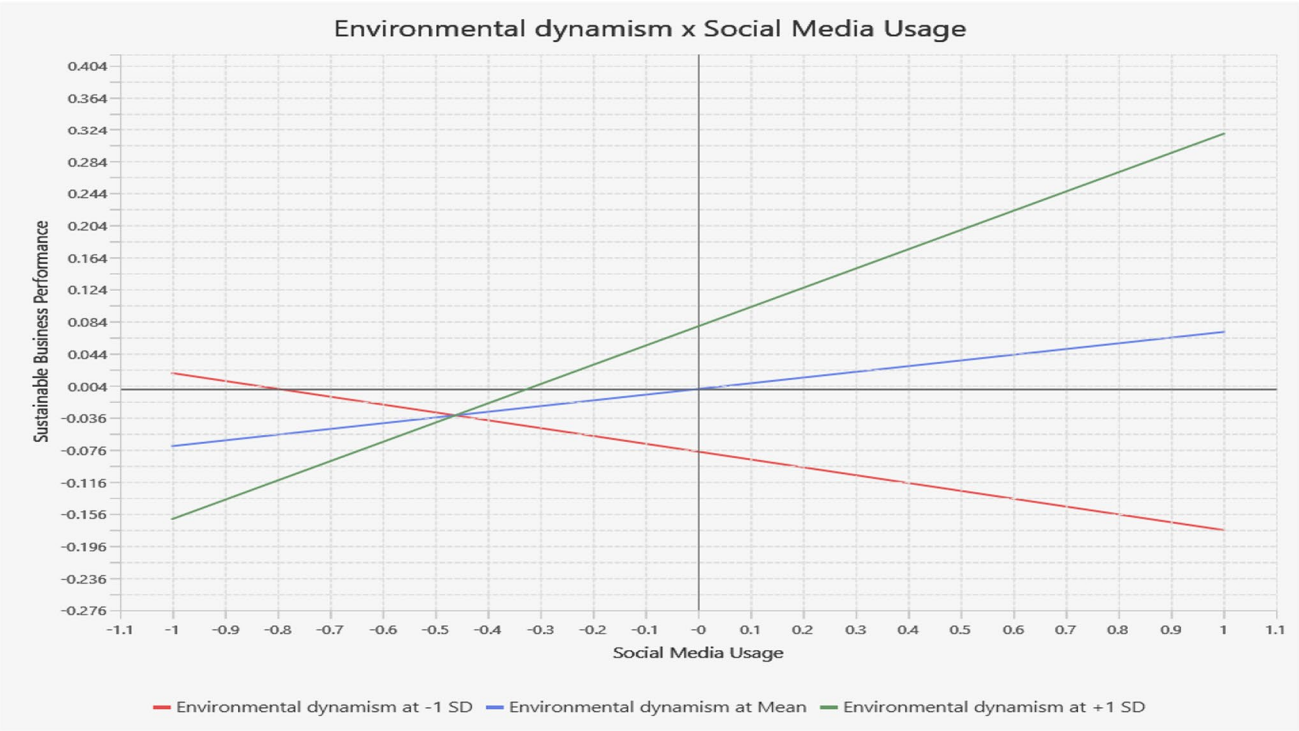


Fig. 4 Moderation analysis of environmental dynamism*social media

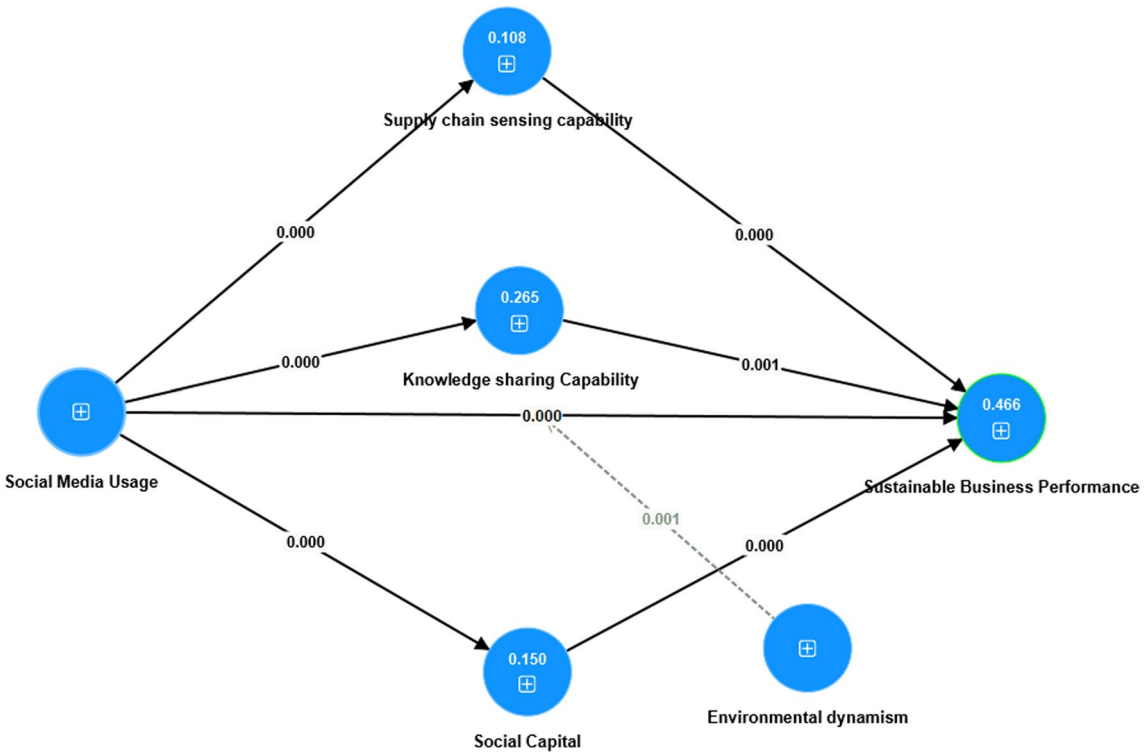


Fig. 5 Structural model

Table 8 Quality of the SEM

	Q2	R2
Knowledge sharing capability	0.017	0.265
Social capital	0.181	0.150
Supply chain sensing capability	0.161	0.108

we applied the approach of [42], the outcomes of this study confirmed that SCSC successfully meditate the association between SMU and SBP (beta = 0.077; p ≤ 0.000); KSC successfully mediated the link between SMU and SBP (beta = 0.163; p ≤ 0.000), and SC successfully meditate the association between SMU and SBP (beta = 0.085; p ≤ 0.000). This investigation confirmed the moderating effects of environmental dynamism. Table 7 and Fig. 4 demonstrate the findings of the analysis: ED plays a moderating role between SMU and SBP (beta = 0.169; p ≤ 0.000).

Third, the R2 serves as an indicator of how effectively the manipulated variable explains the variance observed in the explained variable. Figure 5 and Table 8 illustrate the R^2 value corresponding to each dependent variable. For SBP, the R2 value is 0.466, denoting that four additional variables—SMU, SCSC, KSC, and SC-collectively contribute to 46.6% of the variability in SBP [43]. proposed that R2 values must be at least 0.10 or higher to determine that an endogenous construct accounts for a satisfactory amount of variance.

Additionally, this research evaluates the comparative predictive significance of the structural model utilizing the Stone–Geisser criterion (Q2), established through the blindfolding technique in PLS-SEM. Each of the Q2 values exceeds zero substantially, indicating the model's predictive significance regarding reflective endogenous latent variables. Detailed findings are presented in Table 8.

5 Discussion

The findings of this study provide empirical validation for the proposition that SMU within supply chain entities fosters the cultivation of sensing capabilities, knowledge-sharing practices, and social capital. These capabilities, in turn, contribute to developing resilient and agile supply chains, ultimately resulting in a notable enhancement of SBP. This underscores the pivotal role played by SMU in facilitating the adaptation and responsiveness of supply chains to dynamic and uncertain environments, thereby contributing to the long-term sustainability and competitiveness of organizations. Furthermore, the result of H1 indicates that SMU is positively correlated with SBP. Our outcome support with prior literature [2] revealed a positive relationship between SMU and a firm's sustainable performance by suggesting that recently, SMU has increased a business's two-way communication with customers to assist and interact with them easily to communicate lucrative offers such as discounts and exclusive coupons which builds trust, customer loyalty and customer satisfaction which heightens sales volume and ultimately improves sustainable performance.

Moreover, the H2a outcome indicates that SMU is positively association with supply chain sensing capability. Our results support a previous study [6], which highlights that social media by supply chain members is used to develop supply chain intelligence through conducting market research and gathering information related to consumer behavior, they specifically revealed how textual sentiment analysis being used to identify contents on social media and how their association and collaboration positively affects supply chain performance. Likewise, H2b results show that SMU is positively correlated with knowledge-sharing capability. Our result, support by a previous study [5], indicated that increased SMU provided supply chain partners a medium to communicate, to exchange information, and facilitates knowledge acquisition, accumulation and sharing with each other to smooth supply chain operations.

Furthermore, the H2c outcome highlights that SMU has a positively relationship with social capital. Our outcome align with a previous study [15] examines the impact of social media usage by B2B sales professionals on collaborative value generation and performance in cross-selling and up-selling endeavors. Moreover, leveraging social media enhances the social capital of sales representatives, consequently leading to direct and cooperative enhancements in value generation and the promotion of complementary and supplementary products. Moreover, the H3a result indicated that supply chain sensing capability positively affects sustainable business performance. Our results supported by a previous study [12], revealed that enhancing sensing capabilities, which entails evaluating

and recognizing technological opportunities and learning from the market environment, can lead to improved operational performance. Likewise, the H3b outcome revealed that knowledge-sharing capability positively affects sustainable business performance. Our findings align with a prior investigation [4], which indicated that information and knowledge which is created through the SMU is easily accessible to all supply chain members, eliminates irregularities, improves the social networks of members, thereby creates social and intellectual capital, improves learning and exploitation of this intense and quality knowledge ultimately improves operational excellence and business performance. Moreover, H3c result highlights that social capital is positively related with sustainable business performance. Our findings corroborate a prior investigation [18] exploring the positive correlation between social capital and sustainable business performance, specifically concerning profit, market share, turnover, and employment.

This study reveals the outcomes concerning the mediation effects of hypotheses H4a, H4b, and H4c. The analysis discovered the mediation role of SCSC, KSC and SC between SMU and SBP. Concerning supply chain sensing capability, sensing heavily depends on digital technologies, playing a crucial role in bolstering the flexibility and resilience of supply chains. Moreover, it is essential for enhancing supply chain adaptability and resilience, consequently leading to an improvement in overall business performance [21]. Regarding knowledge-sharing capability, the company strategically pursued the acquisition, transfer, and assimilation of market knowledge by investing in digital technologies and unique resources. As a result, this strategic initiative enabled the establishment of a robust supply chain framework adept at efficiently managing logistical and delivery obstacles during times of unpredictability and urgency [17]. Regarding social capital, [25] highlights the importance of adopting online business networks and utilizing digital social capital to improve the overall efficiency of small and medium-sized enterprises owned by families. Through active involvement in social media business platforms, family-owned enterprises can potentially stimulate economic expansion, foster creativity, and maintain competitiveness in the modern digital environment. Lastly, the moderating effect of environmental dynamism is positively moderation between SMU and SBP. Our result is align with prior literature, [29] findings indicate a favorable impact of digital marketing capability on the performance of MSMEs. Moreover, the presence of environmental dynamism further enhances this relationship, thereby underscoring its significance in facilitating organizational success in dynamic market conditions.

5.1 Theoretical implications

This research offers several theoretical contributions. First, this study is a pioneer which investigates the impact of social media usage on developing those dynamic capabilities that build agile and resilient supply chains to respond to dynamic and turbulent environments. Existing literature of social media adoption benefits for business performance is limited [10], and specifically, its usage in the supply chain is nascent [7], therefore our research bridges the gap in current literature. There is very limited research that explores the implications of SMU in an emerging economy, so this study offers implications in developing and emerging country's context and renders a new research direction for academicians. We opened new horizons by conceptualizing how social media, even though being a disruptive technology, can dig deeper insights from turbulent environments to develop supply chains that remain resilient even in adverse market situations. Second, this study tests first time supply chain sensing capability, knowledge sharing capability and social capital between social media usage and sustainable business performance. Third, this study test the moderation role of environmental dynamism in the relationship between social media usage and sustainable business performance.

5.2 Practical implications

Practical implications of this study are multifold. SMU now changing the way of supply chain practitioners handle their operations [7]. Firms need to keep a constant eye on market dynamics in this turbulent and ever-changing environment to seize opportunities and to remain competitive in the market. Supply chain managers are advised to utilize social media tools to uncover latent customer needs by increasing their sensing capability because SMU would develop increased customer market intelligence by gaining insights related to customer opinions, semantics to identify opportunities quickly. Moreover, SMU offers a firm quick access to customer profiles and to address their

grievances. Firms can implement SMU for multiple purposes, including understanding market trends, planning production, and inventory management, controlling the processes across supply chain, and integrating with supply chain partners. So, this is an effective way of developing business intelligence. Our findings suggest that practitioners and policymakers need to incorporate social media applications that are most popular in that geographical area to formulate their business strategies related to external communication with their consumers. Merely adoption of social media due to the reason that everyone else in the industry using it wouldn't result in desired outcomes [10]. Therefore, for its effective use to attain enhanced performance, businesses need to adopt a clear plan for how SMUs will be strategically linked to improved decision-making. SMU is described as a successful central strategy by [2] to build long-term relationships with customers, suppliers and stakeholders, which improves competitive position. Moreover, findings of this research provide diverse implications for other sectors as well, because use of social media is gaining importance in every sector to attain sustainable performance over the long run.

5.3 Limitations and future research directions

Despite its theoretical and social significance, this research has some limitations. Firstly, we collected data from a sample of manufacturing firms operating in Pakistan, so the applicability of results to other settings may not be well suited due to the diverse nature and market dynamics. Secondly, we used only close-ended questions in the survey, and future researchers are recommended to use open-ended questions to fully identify the social media contents used by supply chain members.

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Data availability The datasets that support the findings of this study are provided within the manuscript and any further details will be made available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Review Ethics Board of University of Okara, with ethical approval no. Uo-1763-24. Respondents, and key participants were informed and verbal consent was made before involving them in the survey.

Competing interests The author(s) declare no competing interests.

Appendix A

See here Table 9.

Table 9 Research questionnaires

Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree	1	2	3	4	5	
How much social media usage impact on sustainable business performance during COVID-19?						
1. The company uses social media to advertise their products and promote its brand?						28
2. The company systematically collected customer feedback on social media sites						
3. The company develops its relationship with customers through constant communication with them through the means of social media?						
4. The company operates through the means of social media in the search for general information about the target market?						
5. The company provides through the means of social media full information about the cost and the expected date of delivery?						
How much supply chain sensing capability impact on sustainable business performance during COVID-19?						
1. To what extent does your organization utilize real-time data analytics to detect supply chain disruptions?						29
2. How proactive is your organization in sensing potential disruptions in the supply chain?						
3. How responsive is your organization in adapting to changes detected in the supply chain?						
4. How confident are you in your organization's ability to sense and respond to supply chain disruptions in a timely manner?						
5. How frequently does your organization review and update its sensing capabilities to stay aligned with changing market conditions?						
How much knowledge management capability impact on sustainable business performance during COVID-19?						30
1. Employee's ability to collaborate, combine and exchange ideas among themselves to diagnose and solve problems and create opportunities						
2. Share their own ideas to formulate new product or service ideas						
3. Share their experiences to successfully implement new projects or initiatives						
4. Learn to share their ideas and knowledge and the commonality of sharing and exchanging ideas to find solutions to problems						
5. Our organization structure facilitates the creation of new knowledge						
How much Social Capital impact on sustainable business performance during COVID-19?						31
1. Our organization fosters strong relationships and networks with stakeholders (e.g., employees, customers, suppliers)?						
2. Our organization actively participates in community engagement and social responsibility initiatives?						
3. Our company effectively integrates social responsibility into its business practices?						
4. Our organization actively participates in industry associations, coalitions, or partnerships focused on sustainable business practices?						
5. We regularly engage in networking activities to build connections with other businesses and organizations in our industry or community?						
To what extant impact of Social Capital and Environmental Dynamism on Sustainable Business Performance During COVID-19						25
1. Our company culture of resilience and adaptability has helped us navigate the uncertainties brought about by COVID-19?						
2. We have proactively addressed ethical and social responsibility concerns related to COVID-19 in our business operations?						
3. Despite the challenges posed by COVID-19, we have continued to collaborate with external partners to achieve our sustainability goals?						
4. We have adapted our sustainability strategies to align with the changing environmental conditions resulting from COVID-19?						
5. We have monitored and adjusted our sustainability performance metrics in response to the evolving impacts of COVID-19 on the environment?						
To what extent sustainable business performance performance effect during Covid-19?						32
1. To what extent has your organization continued to prioritize sustainability goals during the COVID-19 pandemic?						
2. How has COVID-19 impacted your organization's ability to implement sustainable practices?						
3. Has your organization adopted any new sustainable practices or initiatives in response to the COVID-19 pandemic?						
4. To what extent has your organization maintained or improved its environmental performance (e.g., energy efficiency, waste reduction) during the COVID-19 pandemic?						
5. Has your organization faced any challenges in maintaining ethical and socially responsible practices during the COVID-19 pandemic?						

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