Enhancing supply chain innovation and operational agility through knowledge acquisition from the social media: A microfoundational approach

Arsalan Mujahid Ghouri , Pervaiz Akhtar , V. G. Venkatesh , Aniqa Ashraf, Gayane Arsenyan, Shlomo Y. Tarba , and Zaheer Khan

Abstract

This paper presents an examination of the interlocks between knowledge acquisition from social media (KAfSM), organizational microfoundation structure and design (OMFSaD), supply chain innovation (SCI), and operational agility (OA). These interlocks were tested on data collected from 172 managers/directors/CEOs of 96 firms operating in nine manufacturing industry sectors in Malaysia. Our findings suggest that OMFSaD plays a key role when interlinked with KAfSM. Furthermore, OMFSaD is significantly associated with SCI and OA, and SCI significantly correlates with OA and partially mediates the relationship between OMFSaD and OA. Our study's outcomes are consistent with our understanding of IT-enabled organizational capabilities—thus contributing to dynamic capability theory—and suggest that KAfSM helps to revamp processes, routines, and business operations in frequently changing environments. In this paper, we draw implications for research and practice.

Keywords: Knowledge through social media, Microfoundations, Supply chain innovation, Operational agility, Dynamic capabilities, Manufacturing industry

Introduction

One of the best-known market and business axioms is that nothing is permanent except change. In this vein, the famous philosopher Heraclitus also proposed that change is the only reality. Businesses across the globe are continuously looking for ways to manage this 'permanent change' by developing new or leveraging existing capabilities suited to deal with globally preeminent challenges—e.g., volatility, uncertainty, complexity, and ambiguity. In such a context, operational agility (OA) is a vital capability whereby businesses can sense and respond to uncertain and dynamic business environments. In this regard, design, foresight, and systems thinking need to be supported in businesses by new skills and tools (i.e., [1], [2]). OA, which provides the strength and thinking needed to identify and seize any business opportunities, is considered a meta-capability of businesses (e.g., [3],[5]). Speed, accuracy, and cost-effectiveness—which the literature suggests to be integral parts of OA in relation to business success (e.g., [6],[8])—can be achieved by related knowledge, decision-making, networking, and communication. However, the extant literature has hitherto not investigated the benefits of organizational microfoundation structure and design (OMFSaD) and knowledge acquisition from social media (KAfSM), and the role that OA plays in such contexts. Moreover, to the best of our knowledge, no study on OMFSaD, KAfSM and the role played by OA has hitherto been conducted in the Malaysian manufacturing industry context.

OMFSaD refers to the underlying individual- and group-level actions that shape the strategically based partnerships with stakeholders, flexible decision-making, and open communication channels that lead to the emergence of superior organization-level performance (e.g., [9], [10]). [11] suggested that OA involves incremental and continuous change in an enterprise's core and adjacent business. Therefore, independence and skills - e.g., connecting with business partners, empowerment in decision making, and an environment in which all the

necessary information should be shared with all parties in order for them to complete their allocated tasks - could help manage the change and uncertainty present in the business environment. In our study, we addressed the relationship between OA, OMFSaD, and KAfSM in the presence of supply chain innovation (SCI). Some studies have investigated OA in relation to business organizational structure and design. For example, [12] conducted a case study on Haier—a Chinese multinational enterprise—and explained how an IT-based structure enhances the competency of a business in relation to processing information in turbulent business environments. In another IT-based study, [6] explored in depth the IT-enabled relationships among resources, structure, and routines and their effect on operational agility.

Further, [13] suggested that, in relation to stakeholder integration, customer connectivity, collaboration, and coordination, networking capability provides win-win solutions, knowledge creation and sharing, and the definition of new strategic directions. Also, flexible and adaptable behavioral characteristics are key enablers of business resilience, and flexible decision-making is meant to yield strategic crisis readiness (e.g., [14], [15]). Moreover, [8] shared a practical example of open communication. They discussed M.com's 'Big Ears' program, which stimulates open communication and collaboration across departments. This initiative connects line workers directly with senior management and acts as an internal digital channel suited to provide feedback on concerns or to propose innovations. Hence, previous research had hitherto not focused on how OMFSaD affects the extraction of KAfSM, and how it enhances SCI and OA in the context of manufacturing firms operating in emerging markets.

Malaysia is an emerging economy that is currently concentrating on major areas to add more value to business operations (i.e., [16], [17]). The Malaysian government is trying to concentrate on IT infrastructure to help the national industrial sectors (e.g., [18], [20]). Although

the government of Malaysia has introduced a National Policy on Industry 4.0 (Industry4RWD) with the purpose of pushing manufacturing firms toward Industry 4.0, the related initiatives may not at this juncture be very visible among the general public, as the touch base is still rather confined to technocrats [21]. Therefore, research is needed to understand the depth of the initiatives taken by Malaysian manufacturing firms in regard to SCI and OA in the light of OMFSaD and KAfSM.

Digital technologies have transformed business activities and the linkages between all market and economy elements (i.e., 22], [23]), which has led to the evolution of digital supply networks (e.g., [4], [24], [25]). The social media, which have the strength to provide pivotal information in times of uncertainty in the business environment, could also provide scope to strengthen outside partnerships and networking, decision-making, and communication. For example, [7] and [8]—who conducted studies on the Internet of Things, dynamic data and information processing capabilities, and OA—found that resource interdependencies (pooled, sequential, and reciprocal) and IT-enabled capabilities (localized, synergistic, and optimized) are forged during operational processes to realize OA.

Innovation is an essential tool for businesses to deal with the dynamic changes in offerings and customer demands and problems (i.e., [26], [27]). Supply chain innovation (SCI) risk mitigation supports taking proactive and post-active measures aimed at supporting business operations (e.g., [28], [29]). Smooth and rich business organizational structure and design may facilitate supply chain innovation (e.g., [30], [31]).

By providing rich insights from firms based in an emerging economy, our study makes significant contributions to the literature by responding to the need for additional empirical research aimed at demonstrating the prominence of OMFSaD in enhancing OA. First, by drawing

key insights from manufacturing firms based in an emerging economy, our study contributes to the OA literature—from the perspective of the manufacturing sector—by proposing a conceptual model of OA that involves KAfSM, OMFSaD, and SCI. Second, it contributes to the SCI literature by confirming the mediating role SCI plays between OMFSaD and OA in the manufacturing sectors of emerging markets. Its findings offer a holistic understanding of the chain of effects that leads to better OA in the context of an emerging economy. Third, our study contributes to the literature by highlighting the key role played by the KAfSM in OMFSaD in the manufacturing sector of an emerging economy. The related findings point to the role played by KAfSM in OMFSaD for manufacturing firm managers, which leads to the enhancement of OA in the manufacturing sector.

The remainder of this paper is structured as follows. Section 2 describes the relevant literature, theory, and underlying concepts. Section 3 presents the methodology and research design. Section 4 describes the empirical results and hypotheses testing. Finally, Section 5 provides conclusions, managerial and policy implications, and directions for future research.

Background Literature

Theoretical foundation

Our study is consistent with the dynamic capability theory (DCT) perspective. Dynamic capabilities contribute to the development of competitive advantages and, as such, they are of assistance in highly turbulent business environments (e.g., [32], [33]). The theory suggests that a business has a competitive advantage when it is able to effectively utilize its internal resources (e.g., employees and information technologies) to enhance its dynamic capability to quickly address changing business environments by sensing and seizing opportunities and accordingly transforming its capabilities [14]. Such capability suggests that social media and business structure

could provide the avenues and tools for businesses to create value and sustain themselves in dynamic and changing environments. To be precise, dynamic capabilities are those whereby businesses manage rapidly changing environments (e.g., [34], [35]). Previous studies have explained that the average period for a firm to sustain its competitive advantage has decreased over time (e.g., [36]-[38]).

The DCT perspective taken by previous studies is related to flexibility, supply chain integration, organizational learning, and knowledge management (e.g., [39]-[43]). [44] posited that dynamic capabilities are rooted in certain microfoundations. They further added that such capabilities enable the achievement of a congruence with technological opportunities suited to align with latent customer needs over time (doing the right things at the right time) by creating, extending, and/or revising ordinary capabilities and resource configurations. Our study built on the DCT literature to conceptualize and theoretically link social media competency, business organizational structure, and design strengths in achieving supply chain innovation and operational agility. The extensive use of social media prompts businesses to consider them as a tool suited to aid them in revamping their overall organizational structure and design to the end of motivating their employees to participate more in organizational routines and processes. [45] argued that the success of businesses relies on their knowledge of their external environments. For instance, businesses can extract from social media valuable knowledge suited to identify potential issues, problems, opportunities, and best practices [46]-[49]. The knowledge gleaned from social media contains information that has the potential to create value for a business [50]. External stakeholders hold valuable market information that could be hidden from businesses; therefore, OMFSaD could enhance SCI and provide steps and solutions suited to deal with disruptive environments. Therefore, businesses need to integrate their functions and processes with the available information

in order to create dynamic capabilities with faster cycles and to ensure that all the data, insights, and intelligence gathered on changing market environments regularly feed their innovation processes in relation to managing dynamic environments (e.g., [1], [51], [52]).

Hypotheses Development

Knowledge acquisition from social media and organizational microfoundation structure and design

Social media is a source of information that covers all aspects of individual and business life. Social media has revolutionized how people share their knowledge, communicate, and collaborate while promptly engaging in conversations in the workplace [53], [54]. Businesses are increasingly and variously using social media tools for information sharing and communication (e.g., [55], [56]). Several organizations are utilizing social media to harness knowledge for value creation. For instance, IBM employs social media tools for knowledge sharing between its employees, thereby helping enhance their collaboration and innovation [57].

Furthermore, [58] posited that social media platforms are regarded as well-known and established venues of information-sharing channels that facilitate business organizational structure and design. Social media provides platforms and opportunities to connect with others who share the same interests and to exchange ideas with them. [59] described how social media fulfills several business functions—including cooperation, broadcast, dialogue, sociability, and stakeholder knowledge management. [60], [61] suggested that any knowledge acquired through social media helps to collaborate with others and facilitates a rapid flow of knowledge between people working across different geographical areas. Social media can change how a business evolves in a dynamic and uncertain economic era and facilitates the sharing of knowledge [62]-[64]. Additionally, social media hold promise as an inexpensive and relatively straightforward tool that can help an

organization become networked with its internal and external stakeholders, and, by so doing, increase its capacity to respond to the ills of society [65], [66]. Several studies have hinted that social media in the workplace enhance colleague relationships and work networks (e.g., [67],[69]).

Microfoundations is not a distinct theoretical or empirical approach per se; rather, it is a broad set of research heuristics and ways of problem-solving that call attention to lower and inter-level mechanisms in the fields of strategy, organization theory, micro organizational behavior, and applied psychology [70]. [71] hinted that microfoundations provide the idea that macro-level phenomena cannot be comprehended without an understanding of the individual-level factors that underpin them. Some studies have suggested that microfoundations pertain to the behaviors of agents in the firm—i.e., structure and design—and facilitate the enhancement or creation of a rigorous and consistent framework for macroeconomic analysis (e.g. [72], [73]). In our study's context, we posited that microfoundational structure and design motivate employees to participate more in organizational routines and processes, thus improving the sharing of knowledge to the end of enhancing supply chain innovation and operational agility.

Organizational structure and design enable decision-making on several levels. Any information available on specific matters helps to decide among the available choices. [74] proved that decision-making through the lens of information processing involves questions of how decisions emerge from basic cognitive processing—such as attention, memory, and causal reasoning. On the other hand, social media are rich in information and influence attention, memory, and causal reasoning. Therefore, social media can play a pivotal role in relation to decision-making (e.g., [75], [77]). [78] highlighted technological developments—e.g., social media—and suggested understanding how current and new technologies impact individuals, policy-making decisions, and the achievement of organizational objectives. [79] and [80]

recommended that social media in the workplace aid the sourcing of valuable information that can be used to help in decision-making processes. Social media offer continuous and diverse information; hence, they provide scope for flexible decision-making.

In relation to networking and flexible decision-making, social media provide new communication channels linking different stakeholders. This business communication structure enables internal employees to freely access and communicate both inside and outside the business environment. Many businesses encourage their employees to share their knowledge via social media because it facilitates efficient flows of information both within and between teams (e.g., [81], [83], [60]) explained that the benefits of open communication channels through social media enhance the provision of task information and capability, and the capacity to assist others, cooperate with other employees to develop ideas and solve problems or to implement policies and procedures. [84] exemplified that internal social media platforms can improve internal business operations and routines, information and knowledge sharing, and enhance internal open communication practice. [85] posited that open communication channels through social media create trust and diversity in businesses. We thus formulated the following hypothesis.

H1. Knowledge acquisition from social media is positively related to organizational microfoundation structure and design.

Organizational microfoundation structure and design, supply chain innovation, and operational agility

The ingredients of organizational structure and design are important aspects of any business's existence and progress. In regard to innovation, organizational structure and design are supportive pillars of value creation. [86] believed that discussing and thinking about innovation need to

include the recognition of an organization's structure, with its specific configurations and attitudinal orientations that set the business culture in relation to idea generation and risk taking.

The workforce's personal networks enable the input into the business of information and ideas that may be attained through formal or informal communication and observations. They provide the independence and space needed to think and deliberate freely with others on ideas and challenges. [87] explained that personal networks help create future offerings. [88] found that BetaRetail had solved specific issues through the systematic approach of their cross-functional sustainability team, which depended on people and their internal and external networks. [89] understood that the personal networks within a buying firm offer scope for supply chain innovations. These personal networks can focus on the problems and challenges of supply chains and yield solutions through the sharing of insightful thoughts. Additionally, they could help to identify and contact the entities best suited to find innovative solutions. It has been observed that these networks can also initiate inter-business collaboration aimed at developing innovative solutions to the pervasive challenges found in any operating ecosystem.

Data interchanges facilitate the flow of information along supply chains, resulting in knowledge and relational alignment [6], [90]. Flexibility in design gives rise to significant value creation and to the potential for radically changed economic risks [91], [92]. [93] and [94] argued that dynamic issues usually involve many factors and layers and are challenging to understand; therefore, flexible decision-making is a requisite to address those issues. [95] suggested that flexible decision-making styles with a better understanding of the situation are features of aggressive decision-makers with a high tolerance for ambiguity and uncertainty. Flexible decision-making supports different situations under complex structures and offers corresponding advice with structural adjustment (e.g., [96], [97]). Flexible decision-making is open and adaptable and

usually adjusted according to the business environment. Therefore, with such adjustments, businesses can attain relative advantages and compatibility in supply chains—i.e., innovation characteristics.

Further, [98] explained that businesses should maintain trust and open communication with their partners as essential ingredients of innovation. [99] elaborated that businesses should be able to use their innovation skills if they comply with their process requirements because employees can access and share information effortlessly and effectively through established rules, systems, processes, and procedures. [100] posited that SCI results from the improved business processes (as part of business organizational structure and design) required for effective supply chain management through collaborations between distributors, manufacturers, customers, and suppliers. Open communication facilitates collaboration between supply chain stakeholders, resulting in supply chain innovation. Additionally, an open communication environment empowers employees, which stimulates supply chain innovation. [101] and [102] discussed the role played by open communication in problem identification and in eliciting a sense of ownership of the supply chain process, which leads to problem-solving supply chain innovation. Based on this discussion, we proposed that:

H2. Organizational microfoundation structure and design positively relate to supply chain innovation.

OA focuses on quick responses, legitimate actions, and cost efficiency [7]. It is a capability whereby businesses sustain themselves and grow in their specific industry sectors, each in its specific environment and on the basis of different routines, processes, policies, and information flows. One of the components and characteristics of an agile business is large scale cooperation across several internal and external teams—i.e., personal networking (e.g., [103], [104]). [105]

explained that businesses may deal with agile environments through networked and empowered communities. Successful business executives and employees need to communicate effectively with both internal and external stakeholders (e.g., [106]). This improves communication and benefits businesses by enhancing relationships between them and their many stakeholders. Besides enabling businesses to share and adopt best practices, such relationship networks provide opportunities for supply chain innovation. [107] emphasized that production efficiency resources (i.e., structure and design) help to manage market dynamics and minimize environmental impact.

Speed and efficiency, as the ingredients of flexible decision-making, are considered critical components of lean and agile thinking. In agile business practice, employees are encouraged to communicate openly. Team transparency and openness and individual communication enable employees to quickly obtain the knowledge they need to make intelligent decisions [108]. Flexible decision-making procedures are iterative in making business practice evolve from generation to generation (e.g., [109], [110]. [111] and [112] hinted at establishing an environment that encourages interaction and mutual learning from experience to deal with agile conditions. A culture of open workplace communication may benefit employee morale and team cohesiveness [113]. Open communication provides employees with clarity in regard to their roles in high-pressure and dynamic situations. [114] explained that information flows induce change and make it possible to respond to new challenges. [105] argued that comfortable information-sharing practices enable the exploration of new opportunities aimed at continuous improvement within the scope of wider shared goals. Therefore, open communication delivers up-to-date information and provides room for improvement and adequate decision-making in an industry's/market's current situation. Hence, we proposed the following hypothesis.

H3. Organizational microfoundation structure and design positively relate to operational agility.

Supply chain innovation and operational agility

SCI involves changes in supply chain networks, technologies, or processes (or combinations thereof) to enhance the creation of new value for stakeholders. Thus, SCI provides new ways to deal with daily routines, operations, processes, and decision-making. [115] explained that SCI is a process whereby a customer-oriented business adapts to environmental change. Businesses engage in SCI to pursue new ideas relating to products, services, processes, etc. This exploitation of new ideas pushes the boundaries of the capabilities of businesses. SCI could be about the adoption or creation of new software platforms and automation tools or the implementation of more sustainable and eco-friendly practices (i.e., [116], [118]). OA is a business's capability to improve its operations and processes to seize opportunities or sustain itself in the industry. OA covers an array of activities carried out by firms to create value in turbulent and unpredictable environments and enables them to identify opportunities early and mitigate any challenges presented by changes in external markets (e.g., [119], [121]). This requires flexible and adaptable supply chains capable of adjusting quickly to disruptions, shifts in demand, and other unexpected events. [107] and [122] illustrated that operational agility is an integral component of competitiveness, as it enables firms to swiftly and uninterruptedly adapt and react to any market fluctuations and helps organizations expand the variety of their offerings. Businesses need to embrace supply chain innovation and leverage cutting-edge technologies and practices in order to streamline their operations and improve their responsiveness in agile situations or environments.

Hence, we suggested the following hypothesis.

H4. Supply chain innovation is positively related to operational agility.

The literature hints at the fact that, by mediating between OMFSaD and OA, SCI may enhance the latter, and suggests that SCI is positively correlated with OMFSaD and OA. OMFSaD provides businesses with access to a plethora of information that can be useful to improve their SCI. Such information can help businesses to identify opportunities for SCI and enhance their OA. SCI can serve as a mediator between the OMFSaD and OA. By implementing innovative supply chain practices and social media technologies, businesses can improve their ability to respond quickly to changing market conditions. Thus, it can enhance the operational agility of businesses. Therefore, we proposed the following hypothesis.

H5: Supply chain innovation mediates the relationship between organizational microfoundation structure and design and operational agility.

Figure 1 depicts the model and hypotheses we developed based on the relevant literature.

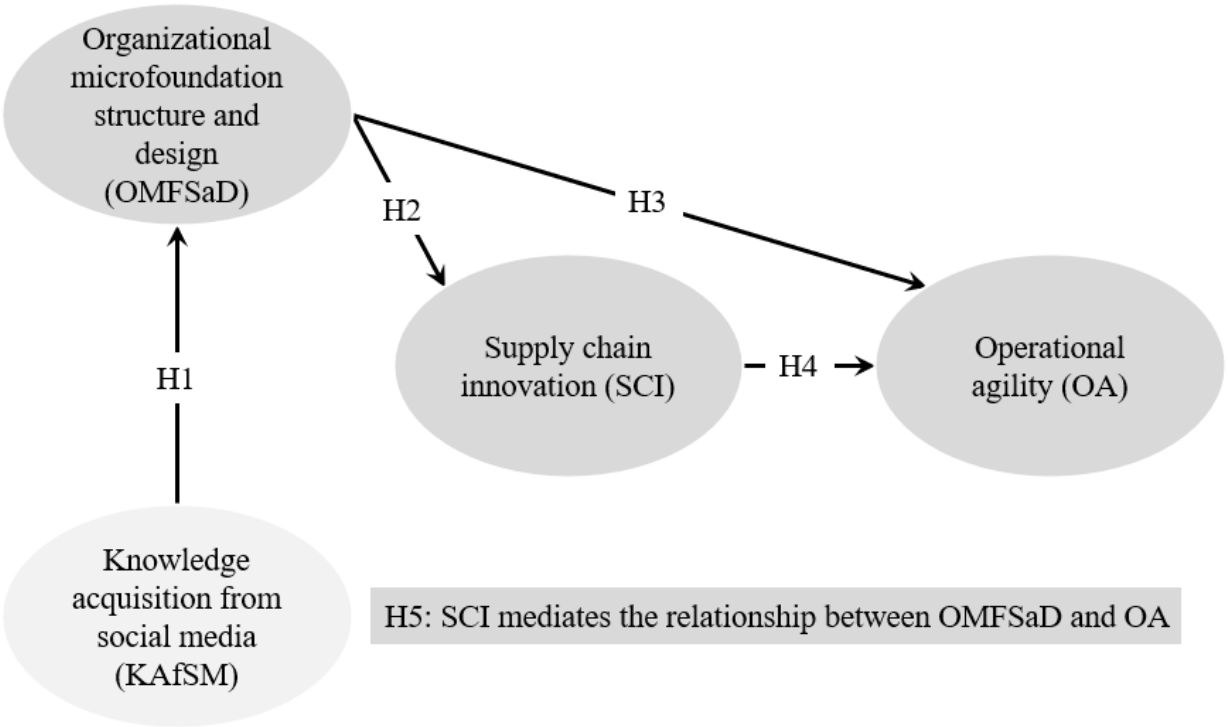

Figure 1: Proposed conceptual framework

Methodology

Data collection and quality checks

Although the Malaysian government has been taking policy initiatives aimed at dealing with volatility, uncertainty, complexity, and ambiguity since 2019, local businesses had started considering it since 2018. The manufacturing sector is one of the most important ones in Malaysia; as stated by [123], it accounted for 22.3% of the country's GDP in 2019. That year, the Malaysian government introduced its National Inclusive and Sustainable Economic Policy (NISEP) to prepare the sector to face volatility, uncertainty, complexity, and ambiguity. A few local studies have hinted at the fact that Malaysian businesses had already started to think about facing uncertainty and unexpected challenges prior to 2019 and were ready to adapt their practices and routines as per a dynamic environment's requirements (i.e., [124], [125]). Thus, during the first half of 2022, we collected data from 172 managers/directors/CEOs of 96 firms operating in nine manufacturing industries connected with global value chains to understand their stance toward their respective industries' volatility, uncertainty, complexity, and ambiguity. To do so, we used an offline method that involved personal and colleagues' contacts, and personal visits to distribute a self-administered survey questionnaire that consisted of close-ended questions. We initially circulated 798 copies of our questionnaire (an average of 5.96 copies for each business). We received 185 responses—a 23.1% response rate. We retained 172 of these for the data analysis. We discarded the remaining 13 because they had either not been completed or more than one option had been chosen for one or more items. Our justification for collecting data at a single point of time was that it provided a snapshot of the Malaysian manufacturing context in the light of SCI and OA, as the aim of our study was to provide researchers with an understanding of the construct in its current form and to identify any patterns or trends that may be present in it. The other

justification of our one-time data collection was to focus on specific aspects of OA at specific point in time. The demographic details of our final sample are presented in Table 1.

In order to maintain data quality, we checked for non-response bias by performing an independent t-test that involved comparing the first and last 20 respondents on all constructs (e.g., [126], [127]). The test results showed no significant difference between the early and late respondents. Therefore, the data was shown to be free from non-response bias. Furthermore, we also performed Harman's single-factor test to assess the potential for common method bias [128], which can cause systematic measurement errors that either inflate or deflate the observed relationships between constructs, generating both Type I and Type II errors (e.g., [129], [130]). The result of the variance explained by a single factor was 57.4, which implied the absence of any common method bias issues [131]. This showed us that our study's findings may be replicated in the future and enabled us to assume their generalizability (e.g., [132], [133]).

Table 1: Demographic details of respondents and businesses

Category		Frequency	%
Gender	Male	101	58.72
	Female	71	41.28
Designation	Manager	92	53.49
	Director	45	26.16
	CEO	35	20.35
Education Level	Never attended school	0	0
	Attended school	1	0.01
	Diploma	4	0.02
	Degree	33	19.19
	Masters	132	76.74
	PhD	2	0.01
Business Age	Less than 10 years	29	30.21
	10 years – 20 years	41	42.71
	More than 20 years	26	27.08
Industry Type	Food, Beverages & Tobacco	21	21.88
	Electronics	15	15.63
	Electrical	14	14.58
	Wood Furniture, Paper Products & Printing	12	12.5
	Transportation equipment	11	11.96
	Textiles, Wearing apparel, Leather & Footwear	8	8.33
	Motor vehicles	6	6.25
	Petroleum, Chemical, Rubber & Plastic	6	6.25
	Non-metallic minerals products, Basic metal & fabricated metal products	3	3.22

Operationalizing constructs

The KAfSM, OMFSaD, SCI, and OA constructs were obtained from existing studies. [10] defined the three items we adopted for OMFSaD, and [134], [136] identified the five for KAfSM. [137], [139] helped to finalize the five items for SCI, and [7] the eight for OA (refer to Appendix A for the questionnaire).

Control variables

We added business age (BA) and Industry Type (InT) as control variables for our study. Some previous studies have used BA as a control variable (e.g., [141], [143]), as businesses of

different ages may have different capabilities to deal with uncertain environments. [145] hinted at the fact that young businesses usually have less experience from which to learn. [146] also found that younger and older businesses may vary in how and what they learn. These variations in learning capacity impact the promptness of businesses' responses to the speed and rate of the changes they face. [146] further added that younger businesses are more agile and 'fit' for change (e.g., reconfiguring their routines) than older ones.

InT has also been adopted as a control variable (e.g., [147], [149]) in the literature. [150] showed that industry type moderates the effects of public concern, regulatory forces, top management commitment, and competitive advantage on environmental orientation and strategy. Businesses operating in different industries face unique external environmental conditions and internal contingencies (e.g., technological ones) [151]. [151] provided further evidence that a business's success is related to its ability to select a business-level strategy that maximizes the available resources in a specific industry setting. An industry's characteristics thus affect the nature of the competitive actions undertaken by businesses within it.

For the BA variable, we assigned values ranging from 1 to 3 to represent business ages of less than 10 years, between 10 and 20 years, and more than 20 years, in ascending order. For the InT variable, we assigned values from 1 to 9 denote the ‘food, beverages & tobacco’, ‘electronics’, ‘electrical’, ‘wood furniture, paper products & printing’, ‘transportation equipment’, ‘textiles, wearing apparel, leather & footwear’, ‘motor vehicles’, ‘petroleum, chemical, rubber & plastic’, and ‘non-metallic minerals products, primary metal & fabricated metal products’ sectors, in order. As advocated by [140], we justified the addition of control variables to our study as they would enable us to isolate any selection bias in a specific observation group and to control for variations

in R^2. Table 2 shows the details of the constructs, each of which was measured on a five-point Likert scale.

Analysis and Results

Measurement model

We obtained our results through confirmatory factor analysis (CFA), and tested our hypotheses through mediation analysis. As a statistical approach suited to validate how well a proposed model matches the data, we performed CFA to determine the hypothesized model's validity, reliability, and fitness. Compared to its analytical counterpart—i.e., exploratory factor analysis—CFA confirms the relationship between the observed and the underlying latent factors for the instruments already tested (e.g., [152]). CFA belongs to the broader family of methods known as Structural Equation Modeling (SEM) and plays a vital role in validating and evaluating measurement models [153].

One of the prominent features of CFA is its ability to reliably and accurately evaluate highly complex theories. These theories are first transformed into models and then tested statistically. Along these lines, [154] suggested that the model to be assessed should be explicitly defined, estimated, and validated. Then, model fitness can be evaluated through derived model estimates. Apart from chi-square fitness scores, several global fitness indices have been proposed, such as the *Tucker-Lewis (TLI), comparative fit (CFI), and root mean square error of approximation (RMSEA) indices* [155]. The following section reports the model fit indices results, which are presented in Table 2.

As per measurement model results, the CMIN/DF is the chi-square value divided by the degrees of freedom—also known as relative chi-square. CMIN/DF values lower than 3 indicate a good model fit. The value for the current model was found to be 1.533, thus confirming model fit.

The TLI and the CFI values were found to be 0.962 and 0.974, respectively. As they fell above the minimum threshold value of 0.95, they were found to support an acceptable range of model fit. Finally, the RMSEA value (0.049, lower than the 0.07 maximum threshold) was found to also suggest that the model was a good fit. To summarize, the hypothesized model was a good fit and thus suitable for further analysis.

Table 2 further demonstrates the reliability and validity of each of our four constructs—i.e., IDE, KAfSM, SCI, and OA. We determined convergent validity through factor loadings and AVE values. According to [156], factor loadings are good if 0.70 or higher, acceptable between 0.5 and 0.7, and unacceptable if lower than 0.5. Additionally, convergent validity is indicated by a construct's average variance extracted (AVE) value higher than 0.5, as specified by [157]. In our study, the factor loadings and AVE values of all the individual factors were found to satisfy those criteria, confirming acceptable convergent validity.

In line with the above, the reliability statistics for the IDE, KAfSM, SCI, and OA constructs were found to have Cronbach's Alpha coefficient values of 0.799, 0.817, 0.889, and 0.767, respectively. This was a measure of the good reliability of the items used in the instrument, as all those values were more significant than the minimum threshold of 0.7 [158]. Consequently, the hypothesized model was found to be free of reliability and convergent validity issues.

Table 2: Construct details, loading, reliability, and convergent validity

Construct	Item Code	Loadings	Cronbach's Alpha	Average Variance Extracted
KAfSM	KAfSM_3	0.88	0.831	0.631
	KAfSM_4	0.79		
	KAfSM_4	0.76		
	KAfSM_5	0.71		
	KAfSM_1	0.66		
OMFSaD	MFO_2	0.92	0.843	0.561
	MFO _1	0.82		
	MFO _3	0.78		
SCI	SCI_1	0.89	0.772	0.727
	SCI_2	0.72		
	SCI_4	0.66		
	SCI_5	0.65		
	SCI_3	0.62		
OA	OA_2	0.78	0.788	0.536
	OA_5	0.88		
	OA_1	0.81		
	OA_7	0.77		
	OA_6	0.71		
	OA_8	0.68		
	OA_3	0.64		
	OA_4	0.60		

Note: KAfSM = Knowledge Acquisition from Social Media, OMFSaD = Organization's microfoundation structure and design, SCI = Supply Chain Innovation, OA = Operational Agility

Regarding discriminant validity, the approach proposed by [157] suggests that the correlation value must be lower than the AVE values between the constructs. In order to confirm discriminant validity, the square root of AVE must be higher than the correlations between the factors [159]. Table 3 shows the appropriateness of discriminant validity as each construct was found to account for more variance in its own associated indicator variable than in those shared with other constructs.

Table 3: Discriminant validity

Constructs	KAfSM	OMFSaD	SCI	OA
KAfSM	0.788			
OMFSaD	0.211	0.772		
SCI	0.092	0.122	0.866	
OA	0.357	0.389	0.091	0.754

Note: KAfSM = Knowledge Acquisition from Social Media, OMFSaD = organization's microfoundation structure and design, SCI = Supply Chain Innovation, OA = Operational Agility

Hypotheses testing

We formulated and tested five hypotheses. The detailed results of the path and mediation analyses are presented below in Table 4.

The first hypothesis was related to the direct impact of KAfSM on OMFSaD. The estimated coefficient between KAfSM and OMFSaD was found to be 0.246 and significant ($p > 0.01$). According to [160], if the calculated critical value is higher than 1.96 (i.e., $p > 0.05$), a hypothesis will be considered supported. Therefore, the impact of KAfSM on OMFSaD was found to be significant and positive, and H1 was supported. KAfSM thus has an affirmative relationship with OMFSaD in the Malaysian manufacturing industry context.

The second hypothesis considered the direct impact of OMFSaD on SCI. The estimated coefficient between OMFSaD and SCI was found to be 0.398 and significant ($p > 0.01$). Therefore, the impact of OMFSaD on SCI was found to be significant and positive, and H2 was supported. OMFSaD thus has an assenting relationship with SCI in the Malaysian manufacturing industry context.

The third hypothesis pertained to the direct impact of OMFSaD on OA. The estimated coefficient between OMFSaD and OA was found to be 0.429 and significant ($p > 0.05$). Therefore, the impact of OMFSaD on OA was found to be significant and positive, and H3 was supported.

OMFSaD thus has a positive relationship with OA in the Malaysian manufacturing industry context.

The fourth hypothesis focused on the direct impact of SCI on OA. The estimated value between SCI and OA was found to be 0.338 and significant ($p > 0.01$). Therefore, the impact of SCI on OA was found to be significant and positive, and H4 was supported. SCI thus has an affirmative relationship with OA in the Malaysian manufacturing industry context.

Hypothesis 5 reflected the mediating effect of SCI between OMFSaD and OA. The critical value of the link was found to decrease but to still be significant, and thus to partially mediate. SCI was thus found to partially explain the relationship of OMFSaD and OA in the Malaysian manufacturing industry context.

Table 4: Path results of the model

Paths	Estimate	S.E.	C.R.	Hypotheses
Direct Effects				
KAfSM => OMFSaD	0.246	0.145	3.388**	H1
OMFSaD => SCI	0.398	0.267	7.117***	H2
OMFSaD => OA	0.255	0.037	4.002***	H3
SCI => OA	0.338	0.061	6.653***	H4
Indirect Effect				
OMFSaD => SCI=> OA	0.154	0.041	3.307**	H5
	KAfSM	OMFSaD	SCI	
R^2	0.224**	0.1455**	0.3117**	

*Note: statistically significant at *** ($p < 0.01$), and ** ($p < 0.05$)*

Discussion and Implications

The main aim of our study was to understand the role played by the acquisition of knowledge from social media on organizational microfoundation structure and design and that of the latter on

operational agility (with the mediating effect of supply chain innovation) in the context of emerging markets' manufacturing firms connected with global value chains. Our study provided an insight into how firms achieve operational agility through innovation and firm structure and design, and by harnessing knowledge from social media. Our findings contributes to the literature in the following manner. First, we checked for the impact of knowledge acquisition from social media on organizational microfoundation structure and design in key sectors of the manufacturing industry and found that a rich knowledge acquisition from social media strengthens organizational microfoundation structure and design. Second, we tested for the impact of organizational microfoundation structure and design on operational agility. We also checked for the role played by supply chain innovation, confirming that it is integrated between organizational microfoundation structure and design and operational agility. Several studies have concluded that social media enhance business capabilities and provide a competitive advantage [161, 162]. Conversely, organizational microfoundation structure and design had not hitherto been checked with operational agility in the manufacturing sector in the presence of supply chain innovation, specifically in an emerging market context. Organizational microfoundation structure and design provide the bases and strength to prepare a business to face an uncertain environment. The manufacturing sector literature does not clearly show the benefits of organizational microfoundation structure and design in regard to enhancing operational agility capability. Our results support the theoretical framework and related hypotheses and confirm the relationship between organizational microfoundation structure and design, supply chain innovation, and operational agility in emerging markets. Our study provides an understanding of the importance of organizational microfoundation structure and design for businesses and of the extraction of

knowledge from social media in building/sustaining their capabilities (i.e., operational agility). These findings offer important implications.

Theoretical contributions

Our study is aligned with the DCT perspective that technology and firm infrastructure provide grounds to develop competitive advantages by enhancing a firm's dynamic capability. Our findings imply that social media avenues and resources enable businesses to build value across intermediate organizational capabilities—e.g., operational agility (e.g., [39], [163], [164]). Recently, several studies have taken the DCT perspective to examine the business organizational structure and design capabilities integration with social media (e.g., [165], [166]).

Our study provides the following theoretical implications. The first is that organizational microfoundation structure and design enable emerging market firms to develop capabilities that enhance the forecasting and preparatory skills they need to deal with volatile, uncertain, complex, and ambiguous environments. The acquisition of knowledge from social media offers opportunities to streamline and improve organizational microfoundation structure and design, which, in turn, enhances innovation and operational agility. The acquisition of knowledge from social media favors the prospects of strengthening organizational microfoundation structure and design.

The second implication is linked to our finding that the information extracted from organizational microfoundation structure and design helps revamp business processes, routines, and operations in challenging situations through the acquisition of vital knowledge from social media [161]. Besides, organizational microfoundation structure and design can add value to customer offerings, as our results indicate that organizational microfoundation structure and design are positively linked with supply chain innovation, structure, and design in relation to proposing

new ideas and inputs to be shared by internal stakeholders, and subsequently adds value to the supply chain processes.

The third implication is that organizational microfoundation structure and design help businesses deal with their competitors, predict and respond to market changes, bring fast and flexible offerings, and quickly respond to marketing opportunities. Businesses endowed with effective organizational microfoundation structure and design can identify any potential issues, problems, opportunities, and best solutions and practices, as per their industry's requirements (e.g., [167]).

Practical implications

Our study provides business managers and policymakers with several implications and further insights into operational agility. The first implication for managers is that acquiring knowledge from social media can assist in organizational microfoundation structure and design, a perspective that turns personal networks, flexible decision-making, and open communication into business assets. The results of our study provide managers with empirical evidence that knowledge sourced from social media can aid businesses in achieving effective structure and design which can be conducive to enhancing their innovation and operational agility. At the same time, our results show policymakers that relevant knowledge sourced from social media enables businesses to identify opportunities to improve. Therefore, policymakers should work to establish an IT-enabled environment across society at large, so that employees can benefit from it and help to enhance their existing organizational microfoundation structure and design.

The second implication is that organizational microfoundation structure and design enhance supply chain innovation. [42] demonstrated that organizational microfoundation structure and design facilitate supply chain innovation. Our study’s findings advise managers to engage both

themselves and employees in the use of personal networks, encourage flexible decision-making when needed, and facilitate open communication in order to deal with the marketplace and business environment and achieve supply chain innovation. Based on our study's findings, organizational microfoundation structure and design should cater to the attainment of competitive differential advantages, like differentiating processes or products. These differentiations could be based on the information and material flow, intra- and inter-business coordination, and collaboration.

Furthermore, organizational microfoundation structure and design are pivotal for managers in their management of specific product lifecycle phases, which is an integral part of supply chain innovation. Before or after the launch of a new product, managers seek different types of information (e.g., [168], [170]). [171] believed that supply chain innovation helps to launch new products more effectively. In the growth phase, managers seek employee involvement in product enhancement or management, which is crucial to improve a company's product offerings. In the maturity phase, managers need the information to increase the appeal of their products, and thus maintain/increase market share. Additionally, any market and competitor information gathered internally is more crucial in the maturity phase. Finally, during the decline phase, managers would become aware internally (through their personal networks) that a product needs to be replaced with a newer or related offering.

The third implication is that organizational microfoundation structure and design enhance operational agility. This also highlights the effect of supply chain innovation as a mediator. Managers usually operate according to specific business and operational models; therefore, we posit that, in the presence of supply chain innovation, the inputs gained from organizational microfoundation structure and design help transform processes and operations in uncertain

environments. Managers should pay careful attention to the criticisms and observations expressed by employees. In the current environment, customers evolve faster than businesses (e.g., [172]), and employees can share or extract the related information from the outside world. Hence, managers need to gain the ability to overcome any deficiencies in competitive environments. Personal networks, flexible decision-making, and open communication enable B2C businesses to achieve an understanding of their customers. This understanding, which enlists the help of organizational microfoundation structure and design (in the presence of supply chain innovation), makes room for the process and operational flexibility needed to adjust to different goals, as per the environment's requirements. At the same time, organizational microfoundation structure and design (in the presence of supply chain innovation) afford managers and businesses the responsiveness they need regarding market requirements. Last but not least, organizational microfoundation structure and design (in the presence of supply chain innovation) provide businesses with the robustness they need to develop the ability to absorb or address the effects of environmental uncertainty. In uncertain situations, businesses are deemed to need support that varies with age, experience, and type of business. Therefore, policymakers should enact policies or frameworks suited to address the possible issues and solutions that may present themselves in certain situations.

Conclusion

Operational agility is considered one of the capabilities vital to sense and respond to dynamic and unseen challenges. Our study provides evidence that organizational microfoundation structure and design play a part in helping businesses to attain a competitive advantage through the acquisition of knowledge. We thus proposed five hypotheses and tested them on a sample of 172 managers/directors/ CEOs from 96 firms operating in nine manufacturing industries in Malaysia—

one of the most important emerging markets. All five hypotheses were found to be supported. [6] stressed the importance of operational agility and provided evidence for the role played in its improvement.

Limitations and future directions

With its key contributions to the literature and its implications for theory and practice, our study opens up several future research avenues associated with its limitations in terms of methodology and boundaries. First, we used data collected from nine prominent manufacturing sectors in Malaysia. Hence, future studies could test our proposed framework in other geographical contexts and other industries of the manufacturing sector. This approach could involve comparative studies between sectors and economies (i.e., developed, emerging, and transitional ones.). Second, future studies could include other potential mediating (e.g., sustainable supply chain) and moderating (e.g., institutions) variables. Third, a qualitative or mixed approach (with a proposed framework) could also be an option suited to extend our study's findings. Fourth, future studies could target customers to perform an in-depth analysis aimed at understanding why and under which circumstances they share vital information with businesses on social media. Customer behavior tends to vary under dynamic circumstances; examining the role of customers in enhancing supply chain innovation operational agility could thus provide important insights. Fifth, collecting data on a similar model at two different points in time could provide the opportunity to understand how knowledge acquisition from social media evolves and leads to innovation and operational agility. Dynamic capabilities—e.g., operational agility—vary quickly in market and industry environments; future studies could thus examine different sets of dynamic capabilities and microfoundations and their role in supply chain innovation and operational agility across developed and emerging markets.

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Appendix A:
Questionnaire item description.

Knowledge acquisition from social media:

1. Our company uses a system to continuously collect information from customers through social media.
2. Our company uses a system to continuously collect information about competitors' activities through social media.
3. Our company uses a system to continuously collect information from suppliers through social media.
4. Our company uses a system to continuously collect information from intermediaries through social media.
5. Our company uses a system to continuously collect information from governments through social media.

Organizational microfoundation structure and design:

1. Our company's employees utilize personal networks with our strategic partners.
2. Our company uses flexible decision-making structures to understand key factors.
3. Our company uses open communication channels with our partners and managers

Supply chain innovation:

1. We pursue a cutting-edge (leading technology) system that can integrate relevant information.
2. We consider modern transport systems (e.g., trucks, vans) for supply chain innovation.
3. We pursue continuous innovation in our core supply chain processes.
4. We pursue agile supply chain processes against market changes.
5. In our organization, creative methods are taken into account for supply chain operations.

Operational agility:

1. The reliability of our offerings has increased.
2. Our day-to-day operations are flexible enough to deal with customized demand.
3. Our offerings are more cost-efficient than those of our competitors.
4. We are very quick in delivering our offerings.
5. Our responses to market changes are very reliable.
6. We are very flexible in our offerings in order to adapt to market changes.
7. We promptly redesign our offerings to adapt to market changes.
8. We are very quick in exploiting market opportunities