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MANAGEMENT | RESEARCH ARTICLE

The intervention of organizational sustainability in the effect of organizational culture on open innovation performance: A case of thai and chinese SMEs

W. A. Srisathan¹, C. Ketkaew¹ and P. Naruetharadhol^{1*}

Abstract: Small- and medium-sized enterprises (SMEs) are largely encouraged to take an open innovation model as a systematic area for R&D to expand networks in science and technology operation (Sci-Tech), especially in Thailand and China. Our paper examines the relationship between organizational culture (OC) and open innovation performance (OIP) of SMEs and the mediating effect of organizational sustainability (OS). Our investigation of 300 SMEs from different business industries in Thailand and China reveals that organizational sustainability significantly intervenes in the interaction of organizational culture and open innovation performance. From the findings, it is established that organizations should set robust and appropriate strategies for organizational sustainability to have excellent innovation outputs in SMEs' performance. This paper also shows the significant effect of organizational culture on organizational sustainability in that cultural characteristics maintain the core business competencies in terms of marketing, operations, customer orientation, capital management, and monitoring & evaluation for

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PUBLIC INTEREST STATEMENT

The study from a survey of 300 SMEs discovered that organizational culture and organizational sustainability influenced open innovation performance. This study shows the focus of makers and managers and realizes the crucial elements of organizational culture such as leadership, teamwork and organizational climate. From the findings, it is established that organizations should set strong and appropriate strategies for organizational sustainability to have great output performance of SMEs and other companies. This study shows the effect of organizational culture on open innovation performance and finds that there is no significant relationship between them. Organizational sustainability operates in its contribution to innovation performance. Interestingly, involved with organizational culture, the new hypothesized finding makes a mediator contribution of organizational sustainability to the outcomes of open innovation performance. This paper provides implications of findings for theory and management practice, as well as the directions of further research investigation.

sustainability. Such elements of organizational sustainability operate in a significant mediator contribution to SMEs' performance to manage open innovation. As a practical contribution, this paper suggests managers realize the crucial elements of organizational culture, such as leadership, teamwork, and organizational climate, to improve performance by combining organizational sustainability in their strategic decisions made during the open innovation processes.

Subjects: Organizational Communication; Economics; Business, Management and Accounting; Management of Technology & Innovation; Innovation Management

Keywords: Organizational sustainability; organizational culture; open innovation performance

1. Introduction

Recently, the awareness of innovation and creativity are strategic tools to sustain business success and put into the core principle for a successful innovation strategy, shorter product lifecycle, and continuous product development to meet customer needs and market success. This sounds great but not accessible to perform for smaller firms. Hence, open innovation (OI) is a powerful mechanism for the sustainable development of the firms and driving the productivity of all sections in economic development across firm boundaries. Setting the open innovation scoring system in terms of resources, condition, process, and results help a firm's capacity to plan, monitor, and perform open innovation in an appropriate arena (Sivam, Dieguez, Ferreira, & Silva, 2019). That is to say, integrating innovation and creativity occurs as a direct consequence of multiple partners, including public organization, entrepreneurs, university, and community, in an open innovation process by which knowledge sharing and transfer are made across their boundaries (Secundo, Del Vecchio, Simeone, & Schiuma, 2019). Imagine that SMEs seek to develop a new product for innovative solutions through implementing crowdsourcing innovation or from community ideas presented by consumers and suppliers. The entire processes include gathering the search depth and breadth, evaluating the research stage, and becoming aware of the potential market need to help the integrated inside and outside teams to reduce the innovation risk and cost before the development performed. Such activities pertain to the target objectives, expectations, and goals assigned during the open innovation process, that is, the result of them will be provided through the feedback about their performance. This is, therefore, how firms embrace open innovation performance management. However, the open innovation performance management and overall development of the firm's sustainability are committed to the cultural settings.

With the backdrop of the Thai economy, Thai public institution (e.g., National Innovation Agency: NIA) attempts to provide an innovative business opportunity for SMEs to be able to respond consumer needs and to increase their competency in ASEAN level. Moving towards open innovation can be the solution that diverse players (e.g., government, industry, customers, and university) collaborate to enhance competitiveness. Investing in innovation by SMEs themselves may be painful, open to others outside to widen the scope of networking, and diversify the investment risk will be benefited to small scale businesses like SMEs (National Innovation Agency (NIA), 2019). Hence, Thai entrepreneurs aim at searching their collaboration using a creative business plan to be funded and the effectiveness of organizational architecture to be able to contribute employees dedicated to the attainment of open innovation as one of its goals (Phonthanukithaworn, Ketkaew, & Naruetharadhol, 2019). Enterprise or entrepreneurial development creates shared values and regulates the role of individual task-based performance beyond the formal control system, procedures, and authority. In the encounter of declining revenues, shrinking market share, and increasing market competitiveness, a firm spur the performance of innovative task-based activities by clearly introducing new, tangible objectives, goals, and incentives for the team members, by losing enough that team members have autonomy in how to reach those goals, and by assigning the right work to match the individual's interests and demonstrate a positive

challenge (Amabile, Barsade, Mueller, & Staw, 2005; Amabile & Pratt, 2016; Johnson, 2011). With this, having such a positive culture can promote the firm's ability to innovation performance to be measured. From the practitioner's point of view, organizational culture may be an improbable but more forceful obstacle to innovation. Therefore, if innovation is to be successful, organizational culture must adapt to unknown risks and uncertainties. To illustrate, the firm's system must advocate its goals. This means the firm aspires to a culture of innovation; the innovative and risky behavior must be rewarded and recognized even though the consequence may not be immediately positive.

As analyzing the managerial performance of innovation, empirical evidence shows that the effects of organizational culture on innovation performance have been neglected in the past; indeed, organizational culture does theoretically influence the management of innovation performance. However, both results should go together. To understand the role of organizational culture in open innovation, literature will have been reviewed through the previous work as follows. (Hogan & Coote, 2014) consider Schein's model providing an empirical framework for how organizational culture layers, including values, norms, and artifacts, should be in a firm's mind to promote innovative behaviors that sustain firm performance and how cultures of innovation should be fostered. They find that organizational culture's layers (e.g., norms, artifacts, and innovative behaviors) partially mediate the impact on values supporting innovation on measures of firm performance. (Naqshbandi & Tabche, 2018) focus on building upon the resource-based view of the firm, their model being addressed how the interaction of leadership with absorptive capacity and organizational culture affect open innovation outcomes, but their finding does not confirm a significant effect which plays in the interaction of organizational culture and absorptive capacity on open innovation. The problem inherited a misalignment between the intentions of top management and the behavior of involved employees during the implementation of open innovation. Hence, it is important as (Lopes, Scavarda, Hofmeister, Thomé, & Vaccaro, 2017) consider that organizational sustainability increasingly focuses on how to manage whether new knowledge of ideas or not and practices that can expand business model. Based on their case study's results, the firm's experience with the adoption of strategic organizational sustainability can promote open innovation. To distinguish from their work, we hypothesize that organizational culture also influences the management of open innovation performance when organizational sustainability intervenes in their relationship. What's more, we use indicators of performance as the management rather than the measurement, which reflects strategy definition and sub-processes of open innovation.

As the prior studies leave the room, we question (i) does the influence of organizational culture have on open innovation performance management? (ii) If so, can the effect of organizational culture have on the management of open innovation performance when it is intervened by organizational sustainability? and (iii) how does organizational sustainability mediate the effects of organizational culture on open innovation performance management. To fill the gap of knowledge, this paper has two main objectives (i) to investigate how does organizational sustainability mediate the effects of organizational culture on open innovation performance management, (ii) to examine whether the open innovation performance management can be motivated by organizational culture and sustainability, and (iii) to test organizational culture and organizational sustainability as the latent exogenous variables.

Considerably, the scope of the current paper is designed and contributed when a firm adopts or experiences in open innovation as its business model for organizational sustainability that takes into consideration to manage external funding capital sources and operations for this model, thus, the open innovation effectiveness will be performed depending upon the degree of organizational culture and sustainability playing supportive roles in it. Understanding organizational culture (OC) and individual behavior will help team members during the open innovation process convey expectations by how they act and perform the innovation tasks and new product development aiming at inducing a deeper understanding of the problem although there are no particular rules of

what would be the acceptable way to act at the open innovation performance, all team members need to know leadership, teamwork, and their engagement setting the culture. As a result of this, the existence of organizational culture has been sustained the growth and development of a firm. What's more, those team members also need to work on the degree to which the firm focuses on the climate of open innovation. Knowing the effectiveness of how to perform open innovation can help small firms to make decisions about the continuation of this strategy and sustain this business model in the future. Therefore, it is necessary to know the impact of organizational culture on innovation performance. When the internal source of the core competitiveness of a firm plays its role, organizational culture then forms and accumulates in the long-term operation.

The remaining structure of this paper will be explained the importance in each section as follows. Section 2 begins by surveying the review of literature on open innovation, organizational culture, and organizational sustainability, as well as developing the hypotheses through the proposed model. Section 3 addresses how the research methodology has been conducted. Section 4 reports the results using the survey data. Followed by section 5, we conclude by discussing the theoretical and practical implications and recommend the new considerations for future research.

2. Literature review

This paper studies the effect of organizational culture on the management of open innovation performance that can be signed when organizational sustainability obtains the recognition in SMEs. We methodologically and integratively review three areas of research that are involved in the present study include organizational culture, organizational sustainability, as well as open innovation correspondently.

2.1. Organizational culture: a multi-dimensional construct

In this paper, the term "Organizational culture has been defined and addressed by (Schein, 1992, 2010; Schein & Schein, 2016) as 'a pattern of underlying assumptions or values that were shared among the group who learned and used it to solve its problems due to internal integration and external adaptation, that has sufficiently designed and competently worked to be considered valid and, thus, to be taught to new members in the correct ways they can perceive, think, feel about those problems. Organizational culture has a significant impact on determining organizational success and the tendency to innovate. (Schein, 1992, 2010; Schein & Schein, 2016) This definition emphasizes the layers or levels of culture include artifacts, behavioral patterns, norms, and values; this is called "Schein's model of organizational culture." The previous work by (Hogan & Coote, 2014) test the application of Schein's multi-layered model of organizational culture for thinking about processes that foster innovation. Thus, organizational culture plays a critical role in determining the organization's behavior (Herzog, 2011). To increase innovation performance, innovation, (Cooper & Kleinschmidt, 1995) suggest that innovation culture actively pay attention. This paper considers the firm's activities to support the culture of open innovation at the organization level because we aim at understanding how the firm's culture influences innovation performance. In contrast to existing literature, we consider the firm's innovation culture in terms of its focus on four main sub-activities to create an open innovation culture: leadership culture, teamwork, climate, and employee engagement.

2.2. Transformational leadership

The role of leadership is critical not only in creating the employees' motivation to obtain the assigned tasks but also in shaping organizational culture. The theoretical concept of leadership should be paid attention to the style to foster the culture for open innovation. The term "leadership" refers to an influential relationship among leaders and followers, making changes and expecting in outcomes that reflect their shared purposes (Rost, Joseph, & Burns, 1991). This paper focuses on transformational leadership other than transactional leadership. The first introduced concept of transformational leadership was given by (Burns, 1978) as a leadership approach

by which results in the individual and social system change. As (Bass, 1985) extended the work of (Burns, 1978) by explaining transformational leadership can affect followers' motivation and performance through the extent of individualized consideration, intellectual stimulation, inspirational motivation, and idealized influence. (Aragón-Correa, García-Morales, & Cordón-Pozo, 2007) find that leadership has a robust and significant impact on firm innovativeness with a culture that focuses on adaptation, innovation, and learning. Besides, innovation positively impacts performance. Hence, in the relationship between leadership and organizational culture, the empirical study by (Kargas & Varoutas, 2015) indicates the empowerment of their relationship is when a prominent style of leadership interacts with the relative style of culture (for instance, leadership with market-oriented style will associate with market culture). (Tsui, Zhang, Wang, Xin, & Wu, 2006) point out that leadership plays a decisive role in organizational culture. Therefore, transformational leadership can help build a strong organizational culture that helps organize a positive atmosphere for innovation to influence the organization's innovative behavior. Such individual behaviors are empowered to make justifiable decisions when they tend to share and acquire knowledge to team members, whether from inside or outside firms. In addition to transformational leadership, (Naqshbandi & Tabche, 2018) focus empowering leaders also play key role in outbound open innovation, implying that empowering leadership facilitate firms to manage their knowledge outflows more effectively because organizational characteristics and culture facilitate empowerment, along with empowering leadership, those empowered employees are more likely to demonstrate initiative and creativity to achieve goals so that the firm benefits from its empowered employees; such benefits usually arise through the inflows of knowledge exploitation (Naqshbandi & Tabche, 2018; Xue, Bradley, & Liang, 2011). Based on the above, this leads to the following hypothesis:

H1: Leadership positively influences organizational culture

2.3. Organizational climate

A firm's climate for innovation is subject to the openness to change frequently and can be shaped by its upper management. In this paper, we separate organizational climate from organizational culture by reason that organizational climate, as an independent variable, is a firm's mood and atmosphere are created by the culture of firm. The term organizational climate was first appeared and defined by (Lewin, Lippitt, & White, 1939) as the atmosphere of a mutually agreed and shared internal perceptions and attitudes about a firm's practices and procedures. Thus, the emphasis on the culture that actually increases the climate with all the effort to measure and enhance employee engagement. A work of (Schneider, Ehrhart, & Macey, 2013) shows that a positive value can create a culture of happiness, which lays the foundation for achieving strategic goals for organizational success (e.g., firm and innovation performance). At the same time, a positive culture being built upon the climate for the awareness of innovation among employees helps to make the organization an attractive workplace. As a result, attracting and retaining talents also helps to improve innovation and organizational efficiency. To support this, (Kang, Matusik, Kim, & Phillips, 2016) indicate that a firm's innovation is positively related to the culture that supports employees' innovative behavior, subject to the firm climate for innovation. Likewise, (Shanker, Bhanugopan, van der Heijden, & Farrell, 2017) find that the climate for innovation is positively relevant to innovative work behavior and teamwork. To sum up, this can be said that the organizational climate for innovation affects the organizational culture of innovation. Therefore, we hypothesize as follows:

H2: Organizational climate positively influences organizational culture

2.4. Teamwork

Teamwork is an essential element of team performance and explains how a team behaves (Cannon-Bowers & Salas, 1998). During the open innovation process, it's important to work alongside team members in interacting and evaluating information (e.g., external knowledge exploration and exploitation) at the right time to get the most proper decision for improving innovation

performance. By promoting organizational culture, teamwork can be achieved through training and strengthening of the team. Therefore, encouraging and implementing these principles and standards among the organization's employees and management is the primary way to achieve effective performance. According to (Crossman & Lee-Kelley, 2004), their result shows that a firm that provides teamwork, employees tend to have more sense of commitment to their organization, which is a major element of organizational culture. (Shahzad, Xiu, & Shahbaz, 2017) consider teamwork as an aspect of culture promoting innovation performance for sustainable development, but they did not give a clearer and more in-depth interpretation of their findings on how teamwork influences organizational culture. As a result, we come up with the following hypothesis:

H3: Teamwork positively influences organizational culture

2.5. Employee empowerment

Employee empowerment refers to the use of better ways to manage potentially effective self-practices in an organization. As (Thomas & Velthouse, 1990) consider, the climbing rate of inherent task innovation due to competencies and self-determination of employees is reflected in an employee's empowerment. The study by (Seibert, Silver, & Randolph, 2004) considers employee empowerment through work-unit-level construct and empowerment climate as the result was found that empowerment intervened in the nexus between empowerment climate and individual performance as well as job satisfaction. To link empowerment to culture, (Appelbaum, Karasek, Lapointe, & Quelch, 2015) consider the success or failure of empowerment initiatives. They find that a team-oriented structure and a culture orients to trust and open communication can increase the successful implementation of empowerment. While (Shahzad et al., 2017) consider employee empowerment as the cultural aspect that affects an organization's innovation performance, indicating that when an increase in employees' involvement and participation in decision making promotes them to feel more responsible for and importantly valuable to the firm. This allows to make full usage of employee's knowledge and competencies towards innovation. Consequently, we propose the following hypothesis:

H4: Employee empowerment positively influences organizational culture.

2.6. Organizational sustainability: a multi-dimensional construct

When the setup of organizational culture is defined clearly in the above literature of organizational culture. However, (Shahzad et al., 2017) highlight and leave the critical message that is organizational culture continues to urge for sustainable development to be shown in innovation performance. Next, we will review the literature on organizational sustainability and its dimensions. "Sustainability" has been recently gained attention from various sectors whether the government, the economist, environmentalist, enterprise, academic, or even supply chain. Sustainability is, thus, one of the critical drivers for decisions in the management and future development of business. (Colbert & Kurucz, 2007) define sustainable development as "sustained business development." In business terms, organizational sustainability is associated with the continuity of economic, social (including cultural), and environmental issues (Buys, Mengersen, Johnson, van Buuren, & Chauvin, 2014; Ribeiro et al., 2016). It is the manners of how firms have the leadership, talent, insights and change strategies essential to advance the sustainable challenges (e.g., economic, environmental, and societal pillars) facing firms today (Lopes et al., 2017). Organizational sustainability can be a major factor in a company's ability to maintain a competitive advantage (Gimenez, Sierra, & Rodon, 2012). Previously, (Esteves, Santos, & Anunciação, 2012) consider the Direction, Posture, Organization, Behavior, and Evaluation (DPOBE) model which measures as essential pillars of an organization to ensure its sustainability. That is, the DPOBE model for organizational sustainability indicates the joint of several agents such as the management of human and organizational resources and market efficiency, in order to ensure firms consolidated continuity in the community.

Contrary to existing literature, this paper reviews organizational sustainability in case that firms recognize the potential of sustainability as their core business through operation, marketing, capital, customer service, as well as monitoring and evaluation. Thus, we define organizational sustainability as the degree to which firms survive and thrive in the future, together with the mitigating plan of any possible harm to their business and people around them. For example, firms may need to manage how to cultivate and sustain a diversity of income sources; this activity relates to capital management.

2.7. Organizational operations

Organizational operations for sustainability are considered as a firm's operating system and as an important predictor for whether business or innovation performance. (Bettley & Burnley, 2008) point out that sustainability is strongly affected by operations management decisions; that is, the operations management function must embrace the requirements of sustainability management. To manage sustainability, (Gunasekaran & Irani, 2014) analyze that the supply chain network should be considered and it needs to follow the firm's selection and innovation strategies. That is, the operations of supply chain networks must look for feasible innovation strategies to match the niche market ecosystem and carefully for the mechanism of cooperation innovation. Thus, (Opresnik & Taisch, 2015) the management and operational level initially position firm sustainability. When changes may happen in lights of capabilities, work procedures, relationships and technology, (Lopes de Sousa Jabbour et al., 2019) suggest that firms tink on the basis of circular economy and integrate it into operations management. Taking the above into account, we hypothesize:

H5: Organizational operations management positively influences organizational sustainability

2.8. Marketing

Apart from responsible procurement and supply chain which are included in operations for sustainability, (Nawaz & Koç, 2019) indicate the importance of marketing and branding has been focused on organizational sustainability. They find that social activities significantly enhance the firms' marketing and public relations, along with the lift of brand image. These activities allow firms to empower individuals' decisions and protect the environment primarily. At the same time, the positive image of firms elevates their chances to attract new talent, while retaining the existing staff. Likewise, marketing for organizational sustainability should be also considered a reassessment of the existing market systems and a focus of responsibility for sustainable development in the firm environment (van Dam, 2017); transparency and ethical issues (Baldassarre & Campo, 2016); and selective target marketing as a feasible ingredient in current sustainable management (Dolnicar & Leisch, 2008). With the above review, we develop the following hypothesis:

H6: Marketing positively influences organizational sustainability

2.9. Capital management

Our paper uses "capital" as a term for the resources available to a firm based on nature, finance, society, manufacturing, and human. The maintenance of all five kinds of sustainable capital is crucial to sustaining economic development. (Viederman, 1994) consider five capital model links to the ways to define and reflect the firm's sustainability-policied extension to the public. Since open innovation ventures develops venture funds that help to grow industry ecosystems, (Ernst, Witt, & Brachtendorf, 2005) find that firms not only focus on short-term but also long-term financial objectives to achieve the benefits from external innovation because external stakeholders or partners seek to get the return and retain their investment for the extending innovation project. However, (Fili, Berggren, & Silver, 2013) pinpoint that an integration of the social, human, and financial capital among the founding partners of the network. As a consequence, we propose the following hypothesis:

H7: Capital management positively influences organizational sustainability

2.10. Customer-oriented management

The firm needs to become aware of the customer's needs during the purchase and delivery of the product in order to obtain and sustain substantial customer experience. As a result, this also benefits from reducing returns, which means less waste and reduced production of product and service resources that would otherwise replace the returned one. Hence, our paper takes into account how customer orientation contributes to organizational sustainability. (Vimarlund, 2017) uses customer orientation as a critical success factor to commits a government to invest in service innovation (e.g., e-health service) and correspond intermediary platforms which are a part of open innovation through smart service (Abbate et al., 2015). Thus, customer orientation is used to manage the interaction between a firm and its current and future customers, indicating that the firm performance is influenced by customer management (Soltani, Zareie, Milani, & Navimipour, 2018). In interconnection between customer and sustainability, (Lee, Arokiasamy, & Marn, 2018) find that ethical customer management positively affects organization sustainability in that firms can sustain their business and product on the ethical issues in customer management. Similarly, (Cai, Feng, Jiang, & Li, 2017) find that customer orientation of employees, which is the degree to which employees are engaged in manners of customer needs to be identified and met, they may involve "shortcut" behavior which is not likely to conduct the development of organizational sustainability, leading to unethical decisions making. In online terms, (Zhang, Gupta, Sun, & Zou, 2019) suggest that firms manage the effects of social media when they use social media to link between customers and business firms in the new, innovative product development process as well as between co-creation and innovation outcomes. It can be concluded that small firms, to improve the performance, should focus on understanding customers, take notice of competitor behavior who comes up with comparable products, concentrate on inter-functional coordination to enhance the (innovative) product lines (Ho, Nguyen, Adhikari, Miles, & Bonney, 2018), gather timely customer feedback, create personalized customer value (Jiang, Feng, & Lu, 2019), and improve customer service process and strategy (Hsiao, 2019; Thongsri & Chang, 2019); the overall will bring organizational sustainability to firm and innovation performance. Accordingly, we develop the following hypothesis:

H8: Customer-oriented management positively influences organizational sustainability

2.11. Monitoring & evaluation

According to (Nah, Zuckweiler, & Lau, 2003), the performance for sustainability can be monitored and evaluated throughout the firms to earn the benefits. The result of this study shows that monitoring and evaluation can play a decisive role in the utilization of enterprise resources so that the firms can continue to operate. Firms use the aspects of sustainable development in their reports. The evidence of the monitoring and evaluation activities is represented as a sustainability audit (Nitkin & Brooks, 1998) and corporate code of conduct (Bondy, Moon, & Matten, 2012) to improve and innovate in proper behavior. In supply chain terms, (Bai, Sarkis, Wei, & Koh, 2012) analyze that the monitoring and evaluation of supply chain performance are vital to organizational sustainability. While (Eschenfelder et al., 2019) indicate that organizational sustainability discussing in the dimensions of technology, finance, and management should be paid attention to formal evaluation and the need for fund planning and monitoring. Consequently, the hypothesis is proposed as follows:

H9: Monitoring & Evaluation positively influence organizational sustainability.

2.12. Open innovation performance management

The term open innovation (OI) was first coined by (Chesbrough, 2003), which is the process or paradigm by which firms open interior ideas to external knowledge in order to create innovation to the market. This can be shaped like a new business model and, therefore, be the answer to

business growth and driving the economy in the digital age. The key impact of open innovation is to increase firm performance (Ahn, Minshall, & Mortara, 2015) and sourcing choices in new product development (NPD) (Thakur-Wernz, Bruyaka, & Contractor, 2019). Open innovation provides the benefit from increasing market share and revenue; expanding external innovation markets; and building ecosystems that provide clients with new experiences and added value. This is, therefore, how small innovative firms gain benefits from interacting with such an ecosystem (Fasnacht, 2018). Recently, (European Commission, 2014, 2015, 2016, 2018) has developed and extended the original work “Open Innovation 1.0” of (Chesbrough, 2003) by explaining a new paradigm based on a Quadruple Helix Model and underlying principles of integrated collaboration, co-creation on shared value, innovation with ecosystems, the relief of exponential technologies, and rapid and sustained adoption (Curley & Salmelin, 2018). Hence, our paper uses the base of “innovation performance” which refers to the continuous improvement of organizational and operational activities (Wang & Lin, 2012) across firm boundaries, in which each can be managed through firm’s capability to perform a sub-process of open innovation with tracking and evaluation. Alternatively, we attempt to propose sustainable growth enabled through open innovation. Next, we will examine the two main streams of our paper. (1) How organizational culture affects organizational sustainability and when we set up their relationship successful, thus, (2) how organizational sustainability interacts well with open innovation performance management.

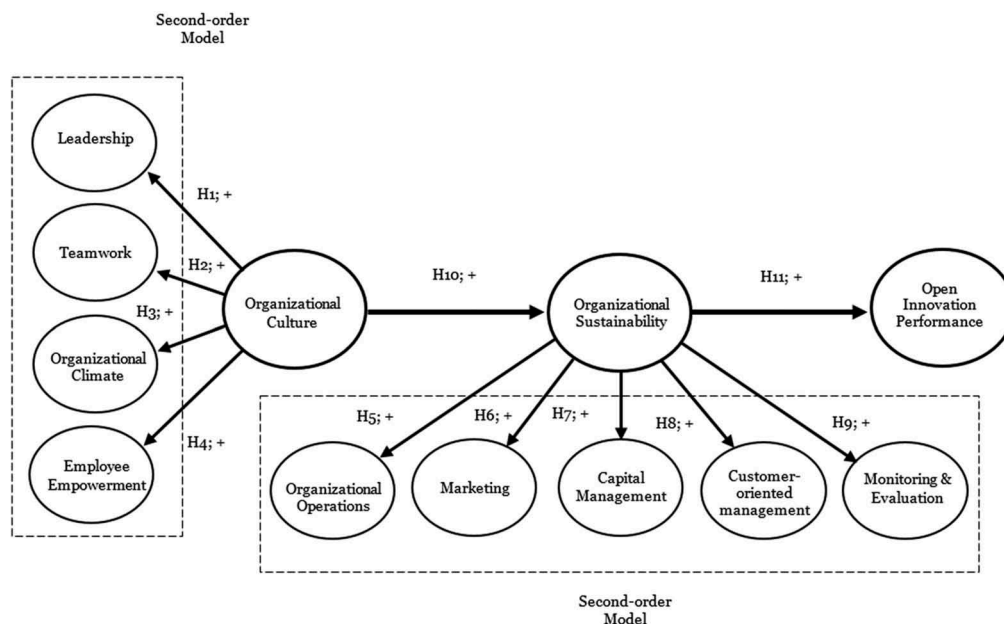
2.13. Organizational culture, organizational sustainability, open innovation performance management

From developing new business model innovation (i.e. open innovation) to designing organizations based on the economic benefits, organizational sustainability and culture are the ways available for enterprises’ growth. (Lewis, 2003) explicates that when the project-based firm takes structures, processes, and resources into account of organizational culture; this can help understand and expose the complex roots of sustainability problems. This means that the firm can see the link between the micro and macro dimensions of the operations of a development project and the actors involved. Meanwhile, (Linnenluecke, Russell, & Griffiths, 2009) indicate that employees who report their high-perceived internal process culture tend to perform and support the economic understanding of sustainability much. A focus on organizational culture, when combined with other areas of organizational analysis into structures and resources, can help to reveal the complex roots of sustainability problems. Alternatively, (Smith & Sharicz, 2011) identify that in case that firms do not take corporate social responsibility (CSR) into account of triple-bottom-line sustainability (i.e., economic, social, and environmental pillars), another critical way is that developing and monitoring the following subsections of sustainability as governance, leadership, business plan, measure and report, organization learning, culture, and information system. In particular, the development of the competencies and knowledge should be related to the adoption of sustainability, and then clarify the cultural characteristics that nurture such attributes or how to motivate all levels to become sustainable practitioners. All things having been considered, we can formulate the following hypothesis:

H10: Organizational culture positively influences organizational sustainability.

Managing organizational culture reveals innovativeness in the case firm that is imperative for sustainability (Matinaro & Liu, 2017). Management innovation and technological innovation positively promote sustainability and firm performance. (Zhang, Khan, Lee, & Salik, 2019) suggest CEOs and top managers involving due consideration to management innovation and technological innovation in order to enhance sustainability and survive the long run. This can be described in that management innovation happens when firms understand their processes for technological innovation well. However, (Bagheri, Mitchelmore, Bamiatzi, & Nikolopoulos, 2019) pinpoint that although technological innovation demonstrates myriad benefits for SMEs, this can be risky as a result of a large amount of investment in R&D and patents, revealing that the linkage may hurt

Figure 1. Conceptual framework.



the adoption of technology, as well as the sub-processes to perform it in a concrete way of innovativeness. To solve this, (Shin, Park, & Park, 2019) show that partnership-based supply chain collaboration (e.g., suppliers, customers, etc.) can increase the level of innovation through various collaborative partners for sustainability, indicating that positive relationships between both investment and contractual-based partnership orientation positively contribute to partnership commitment, innovation, and operational performance. By doing so, an open innovation model of sustainable interrelation to firms represents the promotion of knowledge management (through research and people engagement for a change) and open innovation (through network collaboration, exchange of ideas, and sharing technology).

Therefore, (Lopes et al., 2017) confirm their finding that organizational sustainability and open innovation can be interchanged to interact with one another. They also identify understanding organizational sustainability, coupled with culture alignment efforts, in a broad sense (i.e., the environmental, social, and economic impacts of the company businesses and production processes and products) can posit to apply to the content of activities, structure, and governance of a firm. Based on their study, we can summarize that organizational sustainability occurs within/ during the open innovation process, leading to (1) the sustainable creation and tracking throughout all sub-processes performed and (2) sustainable innovation. We propose that:

H11: Organizational sustainability positively influences open innovation performance management. After all 11 hypotheses, research came up with research conceptual framework shown in figure 1.

3. Research methodology

3.1. Data collection and sample

Our paper is based on primary data sources, where the data were collected in both Thailand and China. The first data source used is the Office of Small and Medium Enterprises Promotion (OSMEP) where the number of SMEs was given, while the data list of SMEs came from the Department of Business Development (DBD) data warehouse. First, the phone calls were made to request for firms' permission. After confirmed, we wrote an email with the study description and

questionnaire. The second data source used in our paper is the China Association of Small and Medium Enterprises (CASME). We used the external reliable business network agent to collect the data from Chinese SMEs.

Since our paper focuses on the small and medium enterprise (SME) sector in Thailand—one of the key contributors to generate income for the country's economic growth. The government has attempted to build an ecosystem for SMEs and startups and to drive SMEs to become smart SMEs, which apply higher technology and innovation in production processes and upgrade their absorptive capability of knowledge to trade in the global market via online channels. This indicates the firm's processes search for business opportunities, technology, knowledge, collaborative partners, and R&D and then expand its market to China, Japan, etc. Such a sector presents innovative product and service orientations. In 2019, 3 million SMEs are making up 99.7% of Thai businesses. Those SMEs employ 10 million people, which the employment opportunity occurs.

The whole population of Thai SME is approximated to 3,013,722 firms and that of Chinese SMEs is about 40,001, 212 firms. Using the structural equation model for empirical analysis, (Nunnally et al., 1994; Wolf, Harrington, Clark, & Miller, 2013) has been suggested ten times a questionnaire item. The number of samples should be 370 (37*10) SMEs from different geographical areas were selected but only 300 SMEs were usable. A sample of 105 SMEs was drawn from Thailand and the remainder of 195 SMEs were selected from China. A response rate of 81.1 % (300/370 = 0.811) for this sample owns to the fact that only top management positions/roles (e.g., the managers, entrepreneurs, or SME owners) fill the questionnaire.

The data has been collected from September 2018 to December 2018. When the survey was conducted during that period, the strong impact supporting this study is that an increase in the number of SMEs which registers and participates in the incentive program by government-and-private funds (e.g., NIA and even SCG) for innovative business development in Thailand. This allows us to examine the interaction of open innovation performance, which may be influenced.

3.2. Measures

We used a seven-point Likert scales, ranging from “mostly disagree” (1), disagree (2), more or less disagree (3), undecided (4), more or less agree (5), agree (6), to mostly agree (7). All key constructs were adapted from prior studies appear in appendix 1.

The latent exogenous variable, organizational culture, is indirectly assessed through its multi-dimensional constructs such as leadership, teamwork, climate, and empowerment. These constructs, defined as the latent endogenous variables, are measured through their indicators or manifest variables in detail below. First, leadership refers to the extent to which leaders influence the efforts of others to achieve objectives and goals. We adapted (Naqshbandi & Tabche, 2018) three-item scale, which measures activities relevant to (1) the strategic decision and positive climate feedback, (2) task-handling, and (3) the promotion of creativity and innovation. Second, teamwork refers to the degree of the collaborative efforts of team members to meet each other's demands and goals. Three items were adapted from (Laforet, 2008, 2009; Naqshbandi & Tabche, 2018; Salas & Cannon-Bowers, 2001) to capture the following activities: (1) the team encouragement to perform tasks, (2) being friendly and approachable, and (3) the creation of explicit practices. Third, organizational climate refers to the extent of internal routines in which organizational members are experiencing the work environment. The three-item scale was based on research by (Naqshbandi & Tabche, 2018), which measures (1) social gathering, (2) listening, and (3) frank discussion and exchange of views. Fourth, employee empowerment refers to the extent of autonomy and responsibility for decision-making regarding specific firm tasks. The activities of employee empowerment, adapted from (Çakar & Ertürk, 2010; Naqshbandi & Tabche, 2018), can be done by (1) the authority to control work, (2) interdependence and freedom do a task, and (3) the encouragement of sharing resources and information.

The latent exogenous variable, organizational sustainability, is a composite of five latent endogenous variables such as organizational operations, marketing, capital management, customer-oriented management, and monitoring & evaluation. First, we define the scope of organizational operations as the extent of day-to-day business routine activities to achieve core objectives. Three items of sustainable operations were modified and adapted from the previous study of (Machado, Pinheiro de Lima, Gouvea da Costa, Angelis, & Mattioda, 2017), which measures activities are involved in (1) reverse logistics and closed-loop supply chain, (2) information, health and safety, quality, and environmental management systems, and (3) suppliers development program and stakeholder engagement. Second, we adopted three items of marketing from (Tollin & Christensen, 2017), which refers to the degree of marketing capabilities oriented on exploration. The measures are based on (1) integrating knowledge of consumer values and processes, (2) integrating strategic value chain partners into innovative projects, and (3) developing new products and services in conjunction with our customers. Third, capital management refers to the degree of resources managed in terms of financial, human, and social capital. The measurement activities that we modified based on research (Fili et al., 2013; Gannon & Roberts, 2018; Maack & Davidsdottir, 2015) include (1) reasonably allocating human resources into a project, (2) attending education/training course, and (3) wisely managing diverse sources of fund in innovative project. Forth, customer-oriented management was measured with three items adapted from (Jeong, Pae, & Zhou, 2006), including (1) understanding our customers' need and behavior, (2) monitoring our level of commitment and orientation toward customers, and (3) focusing on customer satisfaction to drive firm's objectives. Fifth, monitoring & evaluation modified with three items from (Nah et al., 2003; Nitkin & Brooks, 1998), which measure activities associated with (1) collecting and analyzing relevant progress and performance information on a regular basis, (2) a sound regulatory system, and (3) an information gathering system.

The endogenous/dependent variable, open innovation performance management, refers to the intensity of outside-in and inside-out flows of knowledge and technology. Ten items adapted from (Lichtenthaler, 2009; Naqshbandi & Tabche, 2018) reveal the tendency of open innovation can be performed as follows: (1) the introduction of new products/services to the market, (2) the introduction of new concepts and ideas in the product development process, (3) the continuous search for the external environment, (4) the use of external sources, (5) active participation in other's innovation projects, (6) technology commercialization to outside firms, (7) technology or intellectual property or know-how, (8) changes made in existing processes and technologies, (9) cost reduction, and (10) selling existing products in the new market.

The targeted SMEs were controlled by using seven criteria: firm size, firm age, regional areas, country, types of industry, and seniority. The first, firm size by the number of employees, is classified into 0–10 employees (micro-enterprises), 11–50 employees (small-sized enterprises), 51–250 employees (medium-sized enterprises), which all sizes are associated with innovation performance. The second, firm age, was measured in years. A range of age was controlled the length which firms mitigate any effects of their establishment over time. The third, regional areas, was used to ensure a wide range of questionnaire distribution. The forth, country, included Thailand and China. The fifth, type of industry, was used to check what industry SMEs operates their businesses in. The sixth, respondents' position, was associated with Confirm how the person responding to the survey was selected, and the type of role they have in the firm. The final factor, seniority, are measured the length of service with a respondent.

3.3. Descriptive statistics

Table 1 shows the characteristics and distribution of the targeted sample. We attempt to see the distribution in each size of SMEs: a majority of firm size ranging from 51 to 250 employees (medium-sized enterprises) accounts for 36% (108 firms), ahead of micro-enterprises containing less than 10 employees, in second place on 34.33% (105 firms). The small-sized enterprises are far behind on 29.67% (89 firms). The table also provides information on firm age. Firms operating less than 10 years is the highest distribution of 149 firms (49.67%), less than 20 years but more than

Table 1. Characteristics and distribution of the sample (n = 300)

	Frequency	(%)
Firm size		
1–10 employees	103	34.33%
11–50 employees	89	29.67%
51–250 employees	108	36%
Firm Age		
0–10 years	149	49.67%
11–20 years	68	22.66%
21–30 years	38	12.67%
31–40 years	12	4%
Above 40 years	33	11%
Regional areas		
The North Region	34	11.33%
The Northeast Region	79	26.33%
The Central Region	58	19.34%
The East Region	41	13.67%
The West Region	12	4%
The South Region	76	25.33%
Country		
Thailand	105	35%
China	195	65%
Types of industry		
Food/beverage	63	21%
Plastic	13	4.33%
Textile/fiber	15	5%
Machinery	19	6.33%
Chemistry	8	2.67%
Papermaking	2	0.67%
Steel	8	2.67%
Rubber	2	0.67%
Transportation	10	3.33%
Electronics	17	5.67%
Electric equipment and cable	3	1%
Others	140	46.66%
Respondents' position		
CEO, Entrepreneurs, Business owners, managers, or other top or middle positions	300	100%
Lower than positions mentioned above	0	0%
Seniority		
0–5 years	185	61.66%
6–10 years	71	23.67%
11–15 years	14	4.67%
Above 15years	30	10%

10 years in second place on 68 firms (22.66%). The next two years incorporated around 21–30 years (38 firms) and more than 40 years (33 firms) are 12.67% and 11% respectively. There are 12 firms with around 31–40 years of operation that are far behind on 4%. For firms' location, 26.33% of the firms are located in the Northeast region, followed by The South region (25.33%). The other 4 regions are The Central Region (19.34%), the East region (13.6%), the North region (11.33%), and the West Region (4%). When looking at the business industry that firms are profiled, the biggest portion of firms (46.66%) are classified in the “others” category. Those are such as pharmaceutical products, software, ceramic, waste segregation, healthcare products and services, science services, cosmetic products, agricultural products, tourism, trading, consultants, retailing, and others). The next five largest industry types firms are as follows; the food and beverage (21%), machinery (19%), electronics (5.67%), textile and fiber (5%), and plastic (4.33%). The remaining was dominated by transportation (3.33%), chemistry and steel both on (2.67%), and electric equipment and cable (1%). The last two types of business industry, paper-making and rubber, are far behind on 0.67% each. Of the highlighted respondents' position, they totally match 100%, being CEOs, Entrepreneurs, Business owners, managers, or other top executive positions. The last factor, seniority, provides information on the majority of top management respondents who have time on their specific job are 0 to 5 years (61.66%), 6 to 10 years (23.67%), more than 15 years (10%), and 11 to 15 years (4.67%) respectively. However, in terms of results, additional analysis will be conducted to see the association between firm size and geographical region.

With sets of such categorical data to evaluate how likely it is that any observed difference between the sets arose by chance, cross-tabulation by geographical regions and firm size is shown in Table 2. For instance, to test the assumption that a random sample of 300 SMEs has been drawn from a population in which firm size and geographical locations are slightly distributed in the close frequency, giving a chi-squared probability of less than 0.001 (Pearson, 1900). To gain more insight, this result can be implied that firm sizes are associative with geographical regions. To run the business, the sizes are an important dimension reviewed by business owners or managers when assessing the locations for business. Hence, the attempt of cities and towns to attract new businesses into their areas needs to consider the factors that are crucial to firms planning to relocate or open up new branches. For example, the central region still experienced an impact from the world economy; however, several industries saw a positive trend (Karakaya & Canel, 1998; The Office of Small and Medium Enterprises Promotion [OSMEP], 2017). Therefore, the size of the firm may be bigger than that of other regions.

Table 2. Cross-tabulation showing the characteristics of various variables (n = 300)

		Firm Size			Total
		1–10 employees	11–50 employees	51–250 employees	
Geographical Region	The North Region	12 (11.6%)	7 (7.87%)	15 (13.8%)	34
	The Northeast Region	46 (44.6%)	27 (30.3%)	6 (5.56%)	79
	The Central Region	16 (15.5%)	18 (20.2%)	24 (22.2%)	58
	The East Region	6 (5.82%)	13 (14.6%)	22 (20.4%)	41
	The West Region	3 (2.91%)	5 (5.61%)	4 (3.7%)	12
	The South Region	20 (19.4%)	19 (21.3%)	37 (34.3%)	76
	Total	103 (100%)	89 (100%)	108 (100%)	300

Note: Pearson Chi-Square = 48.764 (P ≤ 0.001); Df = 10

3.4. Measurement model: validity and reliability

We performed (1) descriptive statistics of key constructs, (2) bivariate correlation analysis based on Spearman, (3) intraclass correlation coefficient, (4) confirmatory factor analysis (CFA), (5) convergent validity and reliability, (6) discriminant validity, and (7) structural measurement model and regression path analysis using SPSS Statistics 26 and SPSS Amos 26 software. Initially, we conducted descriptive statistics for key constructs, followed by Spearman rank-order correlation analysis to test the relationships among the key constructs measuring through the ordinal scale. Therefore, the Spearman correlation coefficient allows us to test the ranked values for each variable other than the raw data (Spearman, 1904). Next, we conducted the intraclass correlation coefficient to determine the reliability of self-reporting using the Likert scale or measures taken to address known biases (Bartko, 1966). We performed confirmatory factor analysis to determine whether leadership, teamwork, climate, employee empowerment, operations, marketing, customer orientation, capital management, and monitoring & evaluation were distinct constructs. After confirming all distinct constructs, convergent validity and reliability were conducted to measure factor loadings, the average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha. However, to ensure measures of constructs should not be highly related to each other, discriminant validity was performed. Lastly, Multicollinearity tests to determine the degree to which the score of each construct relies on that of the other constructs.

Table 3 shows the average for different variables range from ($x = 5.42$ to 5.74) and the standard deviation range between 1.28 to 1.45 . The range of Max and Mode is 7 . Each variable had a Median of 6 and Minimum value of 1 . All variables have Skewness between -0.80 to -1.09 (negative). The kurtosis value ranges from 0.26 to 1.27 , which is positive. All elements represent a small distribution. Moreover, the distribution of data is higher than the normal one. However, when considering skewness and kurtosis, they differ slightly but are all close to zero.

Necessarily considered in the evidence where the mode and median are the same for all the questions shows the results indicate that the response category exists to the right side of the scale. However, all types of data inevitably contain bias. Response bias shows up in many fields of behavioral and healthcare research where self-reported data are used. Thus, (Friedman, Herskovitz, & Pollack, 1993) have convinced that this is because of the effect of acquiescence bias in which the responses' cognitive effort to favorably worded scale (e.g., mostly agree or just agree) required some extent at which their effort to agree on the questions (when in doubt). To reflect the extent of reliability of self-report data among the sample of 300 SMEs, Table 5 exhibits intraclass correlation coefficient of this study is 0.654 for single measure, at which indicates moderate reliability (ranges from 0.50 and 0.75), while looking at average measure of the sample, its value is 0.983 indicating excellent reliability as suggested by (Koo & Li, 2016). To

Table 3. Descriptive statistics for key constructs (n = 10)

Variance	Mean	S.D.	Max	Min	Mode	Median	Skewness	Kurtosis
TL	5.54	1.40	7	1	7	6	-0.94	0.52
OCC	5.42	1.45	7	1	7	6	-0.80	0.26
TW	5.53	1.37	7	1	7	6	-0.89	0.57
EE	5.62	1.34	7	1	7	6	-1.08	1.14
OOP	5.64	1.31	7	1	7	6	-1.01	0.99
MK	5.74	1.28	7	1	7	6	-1.08	1.24
CM	5.53	1.35	7	1	7	6	-0.87	0.53
CS	5.71	1.29	7	1	7	6	-1.09	1.27
ME	5.59	1.35	7	1	7	6	-0.95	0.64
OIP	5.59	1.35	7	1	7	6	-0.97	0.79

Table 4. Bivariate correlation matrix for key constructs (n = 10)

	OIP	OOP	ME	CS	CM	MK	EE	TW	OCL
OIP	0.82**								
ME	0.93**	0.89**							
CS	0.91**	0.92**	0.94**						
CM	0.92**	0.87**	0.92**	0.94**					
MK	0.88**	0.91**	0.90**	0.95**	0.91**				
EE	0.80**	0.85**	0.83**	0.84**	0.82**	0.85**			
TW	0.78**	0.85**	0.80**	0.84**	0.82**	0.81**	0.82**		
OCL	0.77**	0.83**	0.79**	0.82**	0.81**	0.79**	0.78**	0.93**	
TL	0.77**	0.81**	0.81**	0.83**	0.80**	0.81**	0.78**	0.85**	0.84**

**Correlation is significant at the 0.01 level.

Note: Spearman ranked correlation coefficients

Table 5. Intraclass Correlation Coefficient

	Intraclass Correlation	95% Confidence Interval		F Test with True Value 0			
		Low Bound	Upper Bound	Value	Df1	Df2	Sig
Single Measures	0.654	0.617	0.691	71.921	299	10,764	0.000***
Average Measure	0.986	0.983	0.988	71.921	299	10,764	0.000***

***P-value ≤ 0.001

confirm the inter-construct correlations, the discriminability of items phrasing is provided through the correlation matrix and discriminant validity. Table 4 shows that all variables have a significant Spearman correlation with each other because all of the P-values are below ($p < 0.01$). These correlations can be explained as positively strong since all of the Spearman rank correlation coefficients (ρ) of 0.50 and above, indicating a strong monotonic association between all key variables. For discriminant validity, Table 7 shows that an inference error of multicollinearity is likely to occur in the construct of organizational culture, that is to say, organizational culture (OC) to open innovation performance (OIP) outperform the constrained models of open innovation performance itself since diagonal elements (in bold) should not be over off-diagonal elements, giving the result of $0.934 > 0.858$. However, this may imply that plugging in the interaction in Structural Equation Modeling (SEM) is probably unrelated between them, and this may cause a high chance of type 2 error.

3.5. Confirmatory factor analysis and its thresholds

Considered in the indices are CMIN/df, RMSEA, GFI, AGFI, NFI, CFI, IFI, TLI, and RMR. At first, (Bollen, 1989; Civelek, 2018) identify an acceptable value of CMIN/df is preferred not over 3.00. For Root mean square error of approximation (RMSEA), (MacCallum, Browne, & Sugawara, 1996) recommend below 0.08 represents a good fit. To measure the fitness of the hypothesized model and the observed covariance matrix, (Jöreskog & Sörbom, 1993) suggest the Goodness-of-Fit statistic (GFI) and the adjusted goodness-of-fit statistic (AGFI) values are over 0.9 generally indicating acceptable model fit. To analyze the discrepancy between the chi-squared value of the hypothesized model and the chi-squared value of the null model, (Bentler & Bonett, 1980) recommend a value of the normed fit index (NFI) be higher than 0.90 indicating a good fit. Revised from NFI, (Bentler, 1990) indicates the Comparative Fit Index (CFI) to measure the non-centrality measure, given a good model fit would provide a result at over 0.90. For the Tucker-Lewis index (TLI), Tucker and

Table 6. Psychometric properties of CFA: convergent validity and reliability

Constructs	Indicators	Loadings	AVE	CR	alpha
Organizational culture			0.916	0.975	
Leadership	TL3	0.924			
	TL2	0.912			
	TL1	0.902	0.833	0.926	0.937
Organizational climate	OCL3	0.888			
	OCL2	0.897			
	OCL1	0.818	0.754	0.874	0.899
Teamwork	TW3	0.93			
	TW2	0.882			
	TW1	0.897	0.816	0.916	0.930
Employee empowerment	EE3	0.855			
	EE2	0.875			
	EE1	0.906	0.772	0.887	0.907
Organizational sustainability			0.958	0.991	
Marketing	MK1	0.814			
	MK2	0.899			
	MK3	0.905	0.763	0.881	0.898
Customer-oriented management	CM1	0.871			
	CM2	0.916			
	CM3	0.834	0.764	0.882	0.905
Capital management	CS1	0.897			
	CS2	0.858			
	CS3	0.833	0.745	0.867	0.897
Monitoring & Evaluation	ME1	0.907			
	ME2	0.884			
	ME3	0.888	0.798	0.904	0.921
Organizational operations	OOP1	0.896			
	OOP2	0.831			
	OOP3	0.864	0.747	0.868	
Open Innovation performance	OIP10	0.861			
	OIP9	0.786			
	OIP8	0.888			
	OIP7	0.867			
	OIP6	0.891			
	OIP5	0.859			
	OIP4	0.878			
	OIP3	0.82			
	OIP2	0.882			
	OIP1	0.843	0.736	0.954	0.965

Table 7. Discriminant validity				
Construct	AVE	OC	OS	OIP
OC	0.916	0.957		
OS	0.958	0.926	0.979	
OIP	0.736	0.934	0.846	0.858

Lewis (1973) recommend a cutoff of 0.95 or higher indicating a good model fit. The Root Mean Square Residual (RMR) is recommended that a good-fit model obtain values less than 0.08 (Civelek, 2018). Lastly, to evaluate how relatively insensitive sample size is, values of Incremental Fit Index (IFI) that exceed 0.90 are regarded as acceptable (Jöreskog & Sörbom, 1993).

A confirmatory factor analysis (CFA) was used to evaluate the validity of the project, and the nine factors in the measurement model were evaluated for validity. Furthermore, Confirmatory factor analysis (CFA) is applied to determine how fit a set of observed variables (i.e., indicators of each variable) are presented as evidence of one or more pre-determined latent factors in this study as exhibited in Figure 2, plus, the overall measurement model indices are exhibited in Table 8. Next, construct validity was evaluated to use the test for convergent and discriminant validity. Convergent validity estimated factor loading, average variance extracted (AVE), and construct reliability (CR). This part shows a confirmatory factor analysis (CFA) on fit index model. Table 6 Factor Loadings, AVE, item reliability, and construct reliability of the Nine-Factor CFA Model. Since all factor loads are above the threshold of 0.70, all ratio terms, including CR, are above 0.70, indicating good reliability and convergence validity. Besides, we assessed reliability of the scales using Cronbach’s alpha, to be greater than 0.80 for the variables, indicating that the scale items are dimensional (Hair, Black, Babin, & Anderson, 2010). All AVE values for the nine factors in the model are above 0.50, and the reliability of each indicator’s project. The AVE and Squared Correlation Estimates are posted in Table 7.

Figure 2. The analysis result of a confirmatory factor analysis (CFA) fit index model.

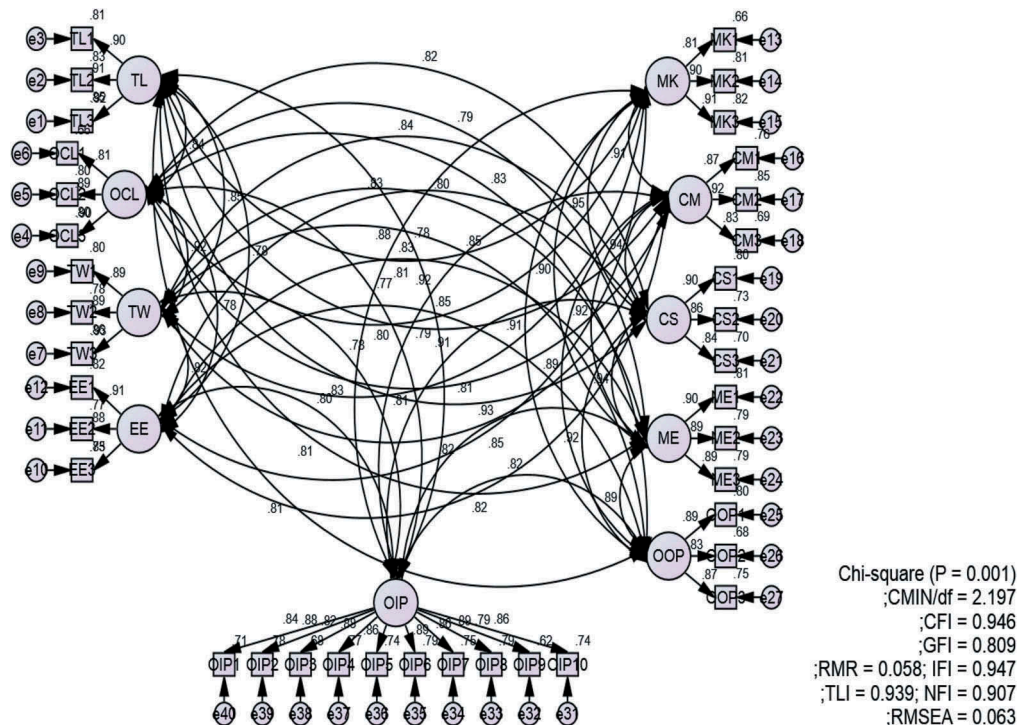


Table 8. The overall measurement model for CFA

Fit Indices	Recommended value	Measurable Index
CMIN/DF (χ^2/df)	$\chi^2/df < 3$	2.197
Incremental Fit Index (IFI)	IFI ≥ 0.90	0.947
Comparative Fit Index (CFI)	CFI ≥ 0.90	0.946
Tucker Lewis Index (TLI)	TLI ≥ 0.95	0.939
Root Mean Square Error of Approximation (RMSEA)	RMSEA < 0.08	0.063
Root Mean Square Residual (RMR)	RMR < 0.08	0.058

3.6. The analytical results of a structural equation modeling

The researcher also analyzed data for a causal relationship between organizational sustainability, organizational culture, and open innovation. Figure 3 and Table 9 shows relationship models that organizational sustainability mediates the effect of organizational culture on open innovation. However, there is a fit with empirical approach based on the statistical values $\chi^2/df = 2.259$, CFI = 0.940, AGFI = 0.837, RMR = 0.070, TLI = 0.936, RMSEA = 0.065. They have 6 fit index that meet the criteria; $\chi^2/df = 2.259$, CFI = 0.940, AGFI = 0.837, RMR = 0.048, TLI = 0.973, and NFI = 0.936. It can be concluded that all indices suggest a good fit.

3.7. Hypotheses testing

Table 10 presents the results of the regression path. From the hypothesis 1 to 4, these hypotheses have been supported that leadership ($\beta = 0.90$; $t = 15.167$; $p < 0.001$), organizational climate ($\beta = 0.93$; $t = 15.167$; $p < 0.001$), teamwork ($\beta = 0.95$; $t = 15.055$; $p < 0.001$), and employee empowerment ($\beta = 0.88$; $t = 14.588$; $p < 0.001$) positively influence organizational culture. On the other hand, these hypotheses represent that organizational culture is a second-order factor, consisting of the sub-dimensions of leadership, teamwork, organizational climate, and employee empowerment. Likewise, since organizational sustainability has five dimensions, we found that organizational operations ($\beta = 0.93$; $t = 15.292$; $p < 0.001$), marketing ($\beta = 0.95$; $t = 15.292$; $p < 0.001$), customer-oriented management ($\beta = 0.98$; $t = 15.688$; $p < 0.001$), capital management ($\beta = 0.96$; $t = 15.468$; $p < 0.001$), and monitoring & evaluation ($\beta = 0.96$; $t = 15.443$; $p < 0.001$) relate positively and significantly to organizational sustainability. However, we decided to delve more in-depth and understand how organizational culture relates to organizational sustainability, given to

Figure 3. Structural model.

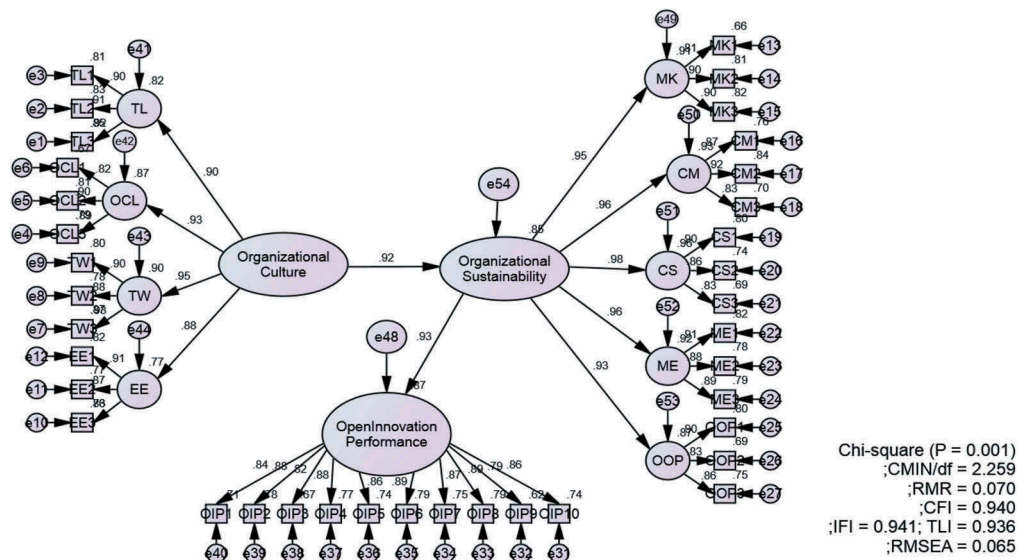


Table 9. Overall measurement model indices for SEM

Fit Indices	Recommended value	Measurable Index
CMIN/DF (χ^2/df)	$\chi^2/df < 3$	2.259
Incremental Fit Index (IFI)	IFI ≥ 0.90	0.941
Comparative Fit Index (CFI)	CFI ≥ 0.90	0.940
Tucker Lewis Index (TLI)	TLI ≥ 0.95	0.936
Root Mean Square Error of Approximation (RMSEA)	RMSEA < 0.08	0.065
Root Mean Square Residual (RMR)	RMR < 0.08	0.070

Table 10. Regression path

Path	Path coefficient	Critical Values (P-value)	Hypothesis	Results
TL→OC	0.90	15.167 (P ≤ 0.001)***	H1	Supported
OCL→OC	0.93	15.167 (P ≤ 0.001)***	H2	Supported
TW→OC	0.95	15.055 (P ≤ 0.001)***	H3	Supported
EE→OC	0.88	14.588 (P ≤ 0.001)***	H4	Supported
OOP→OS	0.93	15.292 (P ≤ 0.001)***	H5	Supported
MK→OS	0.95	15.292 (P ≤ 0.001)***	H6	Supported
CO→OS	0.98	15.668 (P ≤ 0.001)***	H7	Supported
CM→OS	0.96	15.488 (P ≤ 0.001)***	H8	Supported
ME→OS	0.96	15.443 (P ≤ 0.001)***	H9	Supported
OC→OS	0.92	13.463 (P ≤ 0.001)***	H10	Supported
OS→OIP	0.93	15.243 (P ≤ 0.001)***	H11	Supported

***p < 0.001

Hypothesis 10 tests the effect of organizational culture on sustainability. It is also supported ($\beta = 0.92$; $t = 13.463$; $p < 0.001$). After confirming H10, Hypothesis 11 ($\beta = 0.93$; $t = 15.243$; $p < 0.001$) was supported to investigate the influence of organizational sustainability on open innovation performance.

4. Discussion

Transformational leadership, as a factor, greatly influences OC. In this study, the outcomes of SEM point to transformational leadership positively and correlate with OC. The respondents in this study believe that leaders are critical to the organization as leadership influence employees' perceptions of the importance of work, to instill positive enthusiasm, and to promote mutual trust and cooperation between employees and management, which leaders create an organizational culture and shape organizational culture (Tsui et al., 2006). Through transformational leadership, leaders help the company to build an influential culture and a positive organizational climate. Organizational climate, as a factor, greatly influences OC.

Regardless of how well an organization does in hiring employees, new employees are not fully responsive to organizational culture, perhaps because they are the least familiar with the organizational culture. The potential of new employees is enough to disrupt the beliefs and customs that prevail in the organization, so the management needs to help new employees to adapt to the existing culture. It establishes and strengthens organizational culture behavior, so the organizational climate has a significant impact on employee performance because it has a significant impact on employee motivation and job satisfaction. The organizational climate determines the

work environment in which employees are satisfied or dissatisfied. This is in line with the research by (Schneider, Ehrhart, & Macey, 2010). The findings of the research showed that organizational climate determines the collective attitudes and behaviors of employees in organizational culture, which leads to organizational success.

Teamwork, as a factor, greatly influences OC. In this study, the outcomes of SEM point to Teamwork positively and correlate with OC. The Respondents in this study held the opinion that teamwork is a factor within an organizational culture that values collaboration. Such collaboration assists in understanding and trusting colleagues in a team-based environment. Organizational culture plays an important role. This finding is in line with the study by (Crossman & Lee-Kelley, 2004). The survey results show that in organizations that value teamwork, employees have more sense of commitment to their organization. The findings of this research showed a positive correlation between teamwork and organizational culture.

Organizational operation principle as a factor greatly influences organizational sustainability. In this study, the Organizational operation principle was found to relate to organizational sustainability positively. Organizational, operational principles integrate ideas, values, and cultural systems into business processes and maximize organizational profitability. The second sample consisted of 154 start-up management teams from Dun and Bradstreet, who compiled the most extensive database. The result of the study found that organizational operation principles provide enterprises with a full range of operational directions and influence organizational sustainability positively.

Marketing, as a factor, influences organizational sustainability. It was found in this study that marketing has a positive relationship with organizational sustainability. In a study conducted by Kalyan Sengupta and British Chattopadhyay (1984), appropriate marketing strategies play a role in organizational sustainability.

Capital management is another factor that influences organizational sustainability. The result of this study reveals that capital management influences organizational sustainability positively. The finding is related to the research of Hatch and Dyer. The research adopts the triangulation process combined with other channels. By calculating the primary descriptive statistical data of each variable, they show that human capital can be used as scarce resources of an organization and become an essential factor of organizational sustainability. On the other side, capital management plays a direct or indirect role in enterprise strategy.

Customer-oriented management is yet another factor that influences organizational sustainability. It was found in this study that customer satisfaction and service quality have a positive relationship with organizational sustainability. Service quality can serve as an organization's competitive advantage to better meet customer needs and expectations, revealing that customer orientation leads to firm and innovation performance and has a positive relationship with organizational sustainability.

Monitoring & Evaluation is also a factor that influences organizational sustainability. The result of this research revealed that monitoring and evaluation influence organizational sustainability positively. This finding is related to ERP implementation and assesses the key success factors for CIO's implementation of the ERP view. In the Zuckweiler, and Lau study, monitoring and evaluation can play a decisive role in the utilization of corporate resources. The research results show that the successful implementation of enterprise resource planning has an inseparable relationship with supervision and evaluation.

Organizational sustainability is a factor that influences open innovation performance. The result of this study reveals that OS has a positive relationship with open innovation performance. From this study, organizational sustainability can influence the performance of open innovation,

representing that there is a close relationship between organizational sustainability and open innovation performance. Besides, the triple bottom line concept also refers to organizational sustainability, new product development related to organizational sustainability, including innovation, organizational sustainability that hinders open innovation, and a positive impact on organizational performance.

5. Theoretical and managerial implications

The purpose of this study was to provide insights into how organizational sustainability and organizational culture drive the performance of open innovation. The implication of this study is based on the empirical evidence that the dynamic interaction of organizational culture dimensions mediates the contribution of organizational sustainability towards open innovation performance. To obtain the high performance of open innovation, the innovation-project managers need to pay attention to the internal climate of the OC concept within the organization to support a particular goal such as performing an innovation-project with external players (e.g., university, governmental institution etc.). Managers and their staff, at marketing levels, should operationalize the market-oriented values and ensure that such innovative ideas/products/services can provide the pain-point solution, in particular being tailored with the change of customer needs while firms perform their innovation project, which helps to sustain organizations.

6. Conclusion and recommendation

In this study, an analysis the interplay between organizational sustainability (OS), organizational culture (OC) and open innovation performance (OIP) reports the results of study about OIP of SME identifies the factors influence that can be classified into the major categories organizational sustainability are operational operation principle, marketing, customer service, capital management and monitoring & evaluation in the company that have positively and directly the relationship to OIP. Moreover, organizational culture has an indirect relationship with OIP through organizational sustainability is the mediator supported by transformational leadership, organizational climate, and teamwork and employee empowerment.

As pointed out in the section of method and analysis, the most striking differences in SMEs size in terms of the number and employment of employees is a significant determinant of performance. While their located areas of business matter in creating and commercializing innovative ideas. This is how the cluster-specific environment, which is the geographic location of interconnected SMEs, supporting the innovation performance in terms of competitiveness.

Recommendations of this study are beneficial in SMEs for improving and developing of OIP. The research recommended to the organization. Firstly, a company should focus on organizational culture on the Theory of Organizational citizen behavior about leadership that Leaders behave as role models as confidence, communication, and performance and have a broad vision and can convey to employees. Organizational climate should have social gatherings where everyone in the firm comes together and take the time to listen to each other. Teamwork, a member should help each other to get the work and encourage each other to succeed when performing the task. Employee empowerment, a leader, considers the appropriate decisions to the employee and allows interdependence and freedom to the employee. Moreover, a company should pay attention and realizes the other crucial elements of organizational culture. Secondary, a company should develop organizational sustainability in the firm that leading to have an excellent output of performance for SME, organization or company. Operational operation principle that an organization should have a common goal and clear responsibilities and obligations. The company should accurate market positioning, create, communicate and deliver value to customers in marketing and customer service, Capital management the organization needs a clear reward and punishment system, human resources and organization should have excellent talents and monitoring & evaluation, organizations need to collect and analyze relevant progress and performance information on a regular basis.

The OIP's organization gain a competitive advantage in the company to develop processes, products, services, and technologies and assist market business development, the business models for current and future. With the focal scope of this study, it inevitably contains some limitations. First, this study provides a size of 300 SMEs as shown in the recent findings; therefore, the team intends to develop cross-sectional data to panel data in a longitudinal study on this field for future validation. Consequently, this study takes into consideration the context of the effect of inter-firm competition which may reveal the effect of organizational sustainability. This is encouraged to consider in further research. What's more, the further researcher creates the measurement of parameters of the results of open innovation performance. It is also encouraged to take sustainability accounting as opportunity costs in contrast to the field of firm operations have largely ignored practice within firms with detrimental results.

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References

- Abbate, T., De Luca, D., Gaeta, A., Lepore, M., Miranda, S., & Perano, M. (2015). Analysis of open innovation intermediaries platforms by considering the smart service system perspective. *Procedia Manufacturing*, 3, 3575–3582. doi:10.1016/j.promfg.2015.07.719
- Ahn, J. M., Minshall, T., & Mortara, L. (2015). Open innovation: A new classification and its impact on firm performance in innovative SMEs. *Journal of Innovation Management*, 3(2), 33–54. doi:10.24840/2183-0606_003.002_0006
- Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. (2005). Affect and creativity at work. *Administrative Science Quarterly*, 50(3), 367–403.
- Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior*, 36, 157–183. doi:10.1016/j.riob.2016.10.001
- Appelbaum, S. H., Karasek, R., Lapointe, F., & Quelch, K. (2015). Employee empowerment: Factors affecting the consequent success or failure (Part II). *Industrial*

- and Commercial Training*, 47(1), 23–30. doi:10.1108/ICT-05-2013-0034
- Aragón-Correa, J. A., García-Morales, V. J., & Córdón-Pozo, E. (2007). Leadership and organizational learning's role on innovation and performance: Lessons from Spain. *Industrial Marketing Management*, 36(3), 349–359. doi:10.1016/j.indmarm.2005.09.006
- Bagheri, M., Mitchelmore, S., Bamiatzi, V., & Nikolopoulos, K. (2019). Internationalization orientation in SMEs: The mediating role of technological innovation. *Journal of International Management*, 25(1), 121–139. doi:10.1016/j.intman.2018.08.002
- Bai, C., Sarkis, J., Wei, X., & Koh, L. (2012). Evaluating ecological sustainable performance measures for supply chain management. *Supply Chain Management: An International Journal*, 17(1), 78–92. doi:10.1108/13598541211212221
- Baldassarre, F., & Campo, R. (2016). Sustainability as a marketing tool: To be or to appear to be? *Business Horizons*, 59(4), 421–429. doi: 10.1016/j.bushor.2016.03.005
- Bartko, J. J. (1966). The intraclass correlation coefficient as a measure of reliability. *Psychological Reports*, 19(1), 3–11. doi:10.2466/pr0.1966.19.1.3
- Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York: Free Press.
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238–246. doi:10.1037/0033-2909.107.2.238
- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588–606. doi:10.1037/0033-2909.88.3.588
- Bettley, A., & Burnley, S. (2008). Towards sustainable operations management integrating sustainability management into operations management strategies and practices. *Handbook of performance engineering* (pp. 875–904). doi:10.1007/978-1-84800-131-2_53
- Bollen, K. A. (1989). *Structural Equations with Latent Variables*. John Wiley & Sons. doi:10.1002/9781118619179
- Bondy, K., Moon, J., & Matten, D. (2012). An institution of Corporate Social Responsibility (CSR) in Multi-National Corporations (MNCs): Form and implications. *Journal of Business Ethics*, 111(2), 281–299. doi:10.1007/s10551-012-1208-7
- Burns, J. M. (1978). *Leadership*. Harper & Row. *The leadership quarterly*, 5(3-4), 271–276.
- Buys, L., Mengersen, K., Johnson, S., van Buuren, N., & Chauvin, A. (2014). Creating a sustainability scorecard as a predictive tool for measuring the complex social, economic and environmental impacts of industries, a case study: Assessing the viability and sustainability of the dairy industry. *Journal of*

- Environmental Management*, 133, 184–192. doi:10.1016/j.jenvman.2013.12.013
- Cai, J., Feng, T., Jiang, W., & Li, J. (2017). Is customer orientation of employees sustainable? A moderated mediation analysis. *Sustainability*, 9(7), 1211. doi:10.3390/su9071211
- Çakar, N. D., & Ertürk, A. (2010). Comparing innovation capability of small and medium-sized enterprises: Examining the effects of organizational culture and empowerment. *Journal of Small Business Management*, 48(3), 325–359. doi:10.1111/j.1540-627X.2010.00297.x
- Cannon-Bowers, J. A., & Salas, E. (1998). Team performance and training in complex environments. *Current Directions in Psychological Science*, 7(3), 83–87. doi:10.1111/1467-8721.ep10773005
- Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boston, Mass.: Harvard Business School Press.
- Civelek, M. (2018). Essentials of structural equation modeling. *Zea E-Books*. Retrieved from <https://digitalcommons.unl.edu/zeabook/64>
- Colbert, B. A., & Kurucz, E. C. (2007). Three conceptions of triple bottom line business sustainability and the Role for HRM. *Human Resource Planning*, 30(1), 21–29.
- Cooper, R. G., & Kleinschmidt, E. J. (1995). Benchmarking the firm's critical success factors in new product development. *The Journal of Product Innovation Management*, 12(5), 374–391. doi:10.1016/0737-6782(95)00059-3
- Crossman, A., & Lee-Kelley, L. (2004). Trust, commitment and team working: The paradox of virtual organizations. *Global Networks*, 4(4), 375–390. doi:10.1111/j.1471-0374.2004.00099.x
- Curley, M., & Salmelin, B. (2018). *Open innovation 2.0: The new mode of digital innovation for prosperity and sustainability*. doi:10.1007/978-3-319-62878-3
- Dolnicar, S., & Leisch, F. (2008). Selective marketing for environmentally sustainable tourism. *Tourism Management*, 29(4), 672–680. doi:10.1016/j.tourman.2007.07.010
- Ernst, H., Witt, P., & Brachtendorf, G. (2005). Corporate venture capital as a strategy for external innovation: An exploratory empirical study. *R and D Management*, 35(3), 233–242. doi:10.1111/j.1467-9310.2005.00386.x
- Eschenfelder, K. R., Shankar, K., Williams, R. D., Salo, D., Zhang, M., & Langham, A. (2019). A nine dimensional framework for digital cultural heritage organizational sustainability: A content analysis of the LIS literature (2000–2015). *Online Information Review*, 43(2), 182–196. doi:10.1108/OIR-11-2017-0318
- Esteves, F. M., Santos, J. R., & Anunciação, P. F. (2012). Sustainability in the information society: A proposal of information systems requirements in view of the DPOBE model for organizational sustainability. *Procedia Technology*, 5, 599–606. doi:10.1016/j.protcy.2012.09.066
- European Commission. (2014). *Open innovation 2.0 Yearbook 2014*. doi:10.2759/32049
- European Commission. (2015). *Open innovation 2.0 Yearbook 2015*. doi:10.2759/92658
- European Commission. (2016). *Open innovation 2.0 Yearbook 2016*. doi:10.2759/061731
- European Commission. (2018). *Open innovation 2.0 Yearbook 2017-2018*. doi:10.2759/36087
- Fasnacht, D. (2018). *Open innovation ecosystems*. doi:10.1007/978-3-319-76394-1_5
- Fili, A., Berggren, B., & Silver, L. (2013). The impact of financial capital, human capital and social capital on the evolution of Business Angel networks. *International Journal of Corporate Governance*, 4(3), 209. doi:10.1504/ijcg.2013.056259
- Friedman, H. H., Herskovitz, P. J., & Pollack, S. (1993). The biasing effects of scale-checking styles on response to a Likert scale. In *Survey research methods section* (pp. 792–794). American Statistical Association annual conference: survey research methods (Vol. 792).
- Gannon, B., & Roberts, J. (2018). Social capital: Exploring the theory and empirical divide. *Empirical Economics*. doi:10.1007/s00181-018-1556-y
- Gimenez, C., Sierra, V., & Rodon, J. (2012). Sustainable operations: Their impact on the triple bottom line. *International Journal of Production Economics*, 140(1), 149–159. doi:10.1016/j.ijpe.2012.01.035
- Gunasekaran, A., & Irani, Z. (2014). Sustainable operations management: Design, modelling and analysis. *Journal of the Operational Research Society*, 65, 801–805. doi:10.1057/jors.2014.26
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th). Retrieved from <https://books.google.co.id/books?id=VvXZnQEACAAJ>
- Herzog, P. (2011). *Open and closed innovation: Different cultures for different strategies*. Gabler: Springer Science & Business Media.
- Ho, K. L. P., Nguyen, C. N., Adhikari, R., Miles, M. P., & Bonney, L. (2018). Exploring market orientation, innovation, and financial performance in agricultural value chains in emerging economies. *Journal of Innovation and Knowledge*, 3(3), 154–163. doi:10.1016/j.jik.2017.03.008
- Hogan, S. J., & Coote, L. V. (2014). Organizational culture, innovation, and performance: A test of Schein's model. *Journal of Business Research*, 67(8), 1609–1621. doi:10.1016/j.jbusres.2013.09.007
- Hsiao, Y. C. (2019). Exploring service innovation and value creation: The critical role of network relationships. *Journal of Management and Organization*, 25(1), 4–25. doi:10.1017/jmo.2017.40
- Jeong, I., Pae, J. H., & Zhou, D. (2006). Antecedents and consequences of the strategic orientations in new product development: The case of Chinese manufacturers. *Industrial Marketing Management*, 35(3), 348–358. doi:10.1016/j.indmarm.2005.06.010
- Jiang, S., Feng, D., & Lu, C. (2019). A sustainable innovation—Additional services for products based on personalised customer value. *Sustainability*, 11(6), 1763. doi:10.3390/su11061763
- Johnson, S. (2011). *The innovator's cookbook: Essentials for inventing what is next*. Riverhead Books/Penguin.
- Jöreskog, K., & Sörbom, D. (1993). LISREL 8: Structural equation modeling with the SIMPLIS command language. Retrieved from <https://books.google.com/books?hl=en&id=f61i3quHvc4C&oi=fnd&pg=PR15&ots=uiEpBe3B2s&sig=0Xy21natse488afe13LwOdg4PyE>
- Kang, J. H., Matusik, J. G., Kim, T. Y., & Phillips, J. M. (2016). Interactive effects of multiple organizational climates on employee innovative behavior in entrepreneurial firms: A cross-level investigation. *Journal of Business Venturing*, 31(6), 628–642. doi:10.1016/j.jbusvent.2016.08.002
- Karakaya, F., & Canel, C. (1998). Underlying dimensions of business location decisions. *Industrial Management and Data Systems*, 98(7), 321–329. doi:10.1108/02635579810205395
- Kargas, A. D., & Varoutas, D. (2015). On the relation between organizational culture and leadership: An empirical analysis. *Cogent Business and Management*, 2(1). doi:10.1080/23311975.2015.1055953

- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, 15(2), 155–163. doi:10.1016/j.jcm.2016.02.012
- Laforet, S. (2008). Size, strategic, and market orientation affects on innovation. *Journal of Business Research*, 61(7), 753–764. doi:10.1016/j.jbusres.2007.08.002
- Laforet, S. (2009). Effects of size, market and strategic orientation on innovation in non-high-tech manufacturing SMEs. *European Journal of Marketing*, 43(1), 188–212. doi:10.1108/03090560910923292
- Lee, Y. H., Arokiasamy, L., & Marn, J. T. K. (2018). A study on ethical customer management and organizational sustainability in pharmaceutical industry in Malaysia. *SHS Web of Conferences*, 56, 04007. doi:10.1051/shsconf/20185604007
- Lewin, K., Lippitt, R., & White, R. K. (1939). Patterns of aggressive behavior in experimentally created “Social Climates”. *The Journal of Social Psychology*, 10, 269–299. doi:10.1080/00224545.1939.9713366
- Lewis, D. (2003). NGOs, organizational culture, and institutional sustainability. *The Annals of the American Academy of Political and Social Science*, 590(1), 212–226. doi:10.1177/0002716203256904
- Lichtenthaler, U. (2009). Outbound open innovation and its effect on firm performance: Examining environmental influences. *R and D Management*, 39(4), 317–330. doi:10.1111/j.1467-9310.2009.00561.x
- Linnenluecke, M. K., Russell, S. V., & Griffiths, A. (2009). Subcultures and sustainability practices: The impact on understanding corporate sustainability. *Business Strategy and the Environment*, 18(7), 432–452. doi:10.1002/bse.609
- Lopes, C. M., Scavarda, A., Hofmeister, L. F., Thomé, A. M. T., & Vaccaro, G. L. R. (2017). An analysis of the interplay between organizational sustainability, knowledge management, and open innovation. *Journal of Cleaner Production*, 142, 476–488. doi:10.1016/j.jclepro.2016.10.083
- Lopes de Sousa Jabbour, A. B., Rojas Luiz, J. V., Rojas Luiz, O., Jabbour, C. J. C., Ndubisi, N. O., Caldeira de Oliveira, J. H., & Junior, F. H. (2019). Circular economy business models and operations management. *Journal of Cleaner Production*, 235, 1525–1539. doi:10.1016/j.jclepro.2019.06.349
- Maack, M., & Davidsdottir, B. (2015, June 15). Five capital impact assessment: Appraisal framework based on theory of sustainable well-being. *Renewable and Sustainable Energy Reviews*, 50, 1338–1351. doi:10.1016/j.rser.2015.04.132
- MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130–149. doi:10.1037/1082-989X.1.2.130
- Machado, C. G., Pinheiro de Lima, E., Gouveia da Costa, S. E., Angelis, J. J., & Mattioda, R. A. (2017). Framing maturity based on sustainable operations management principles. *International Journal of Production Economics*, 190, 3–21. doi:10.1016/j.ijpe.2017.01.020
- Matinaro, V., & Liu, Y. (2017). Towards increased innovativeness and sustainability through organizational culture: A case study of a Finnish construction business. *Journal of Cleaner Production*, 142, 3184–3193. doi:10.1016/j.jclepro.2016.10.151
- Nah, F. F. H., Zuckweiler, K. M., & Lau, J. L. S. (2003). ERP implementation: Chief information officers’ perceptions of critical success factors. *International Journal of Human-computer Interaction*, 16, 5–22. doi:10.1207/S15327590IHC1601_2
- Naqshbandi, M. M., & Tabche, I. (2018). The interplay of leadership, absorptive capacity, and organizational learning culture in open innovation: Testing a moderated mediation model. *Technological Forecasting and Social Change*, 133, 156–167. doi:10.1016/j.techfore.2018.03.017
- National Innovation Agency (NIA). (2019). *Thailand future of innovation*. Bangkok, Thailand: National Innovation Agency (NIA).
- Nawaz, W., & Koç, M. (2019, August 1). Exploring organizational sustainability: Themes, functional areas, and best practices. *Sustainability (Switzerland)*, 11. doi:10.3390/su11164307
- Nitkin, D., & Brooks, L. J. (1998). Sustainability auditing and reporting: The Canadian experience. *Journal of Business Ethics*, 17(13), 1499–1507. doi:10.1023/A:1006044130990
- Nunnally, J. C., Bernstein, I. H., St Yorl, N., San, L., Auckland, F., & Toronto, S. T. (1994). *Psychometric theory* (3rd ed.). New York, NY: McGraw-Hill.
- Opresnik, D., & Taisch, M. (2015). The conceptualization of sustainability in operations management. *Procedia CIRP*, 29, 532–537. doi:10.1016/j.procir.2015.01.038
- Pearson, K. (1900). X. On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 50 (302), 157–175. doi:10.1080/14786440009463897
- Phonthanukitthaworn, C., Ketkaew, C., & Naruetharadhol, P. (2019). Relevant factors for success as an online entrepreneur in Thailand. *SAGE Open*, 9(1), 215824401882175. doi:10.1177/2158244018821757
- Ribeiro, I., Kaufmann, J., Schmidt, A., Peças, P., Henriques, E., & Götze, U. (2016). Fostering selection of sustainable manufacturing technologies - A case study involving product design, supply chain and life cycle performance. *Journal of Cleaner Production*, 112, 3306–3319. doi:10.1016/j.jclepro.2015.10.043
- Rost, J. C., Joseph, C., & Burns, J. M. (1991). *Leadership for the twenty-first century*. Praeger: Greenwood Publishing Group.
- Salas, E., & Cannon-Bowers, J. A. (2001). Teamwork and team training. *International encyclopedia of the social & behavioral sciences* (pp. 15487–15492). doi:10.1016/b0-08-043076-7/01436-4
- Schein, E. H. (1992). *Organizational culture and leadership* (2nd ed.). Jossey-Bass. John Wiley & Sons.
- Schein, E. H. (2010). *Organizational culture and leadership* (4th ed.). Jossey-Bass A Wiley Imprint. John Wiley & Sons.
- Schein, E. H., & Schein, P. A. (2016). *Organizational culture and leadership* (5th ed.). Hoboken, New Jersey: John Wiley and Sons, Inc.
- Schneider, B., Ehrhart, M. G., & Macey, W. H. (2010). Perspectives on organizational climate and culture. *APA handbook of industrial and organizational psychology, Vol 1: Building and developing the organization* (pp. 373–414). doi:10.1037/12169-012
- Schneider, B., Ehrhart, M. G., & Macey, W. H. (2013). Organizational climate and culture. *Annual Review of Psychology*, 64, 361–388. doi:10.1146/annurev-psych-113011-143809
- Secundo, G., Del Vecchio, P., Simeone, L., & Schiuma, G. (2019). Creativity and stakeholders’ engagement in open innovation: Design for knowledge translation in technology-intensive enterprises. *Journal of Business Research*. doi:10.1016/j.jbusres.2019.02.072

- Seibert, S. E., Silver, S. R., & Randolph, W. A. (2004). Taking empowerment to the next level: A multiple-level model of empowerment, performance, and satisfaction. *Academy of Management Journal*, 47(3), 332–349. doi:10.2307/20159585
- Shahzad, F., Xiu, G. Y., & Shahbaz, M. (2017). Organizational culture and innovation performance in Pakistan's software industry. *Technology in Society*, 51, 66–73. doi:10.1016/j.techsoc.2017.08.002
- Shanker, R., Bhanugopan, R., van der Heijden, B. I. J. M., & Farrell, M. (2017). Organizational climate for innovation and organizational performance: The mediating effect of innovative work behavior. *Journal of Vocational Behavior*, 100, 67–77. doi:10.1016/j.jvb.2017.02.004
- Shin, N., Park, S., & Park, S. (2019). Partnership-based supply chain collaboration: Impact on commitment, innovation, and firm performance. *Sustainability*, 11(2), 449. doi:10.3390/su11020449
- Sivam, A., Dieguez, T., Ferreira, L. P., & Silva, F. J. G. (2019). Key settings for successful open innovation arena. *Journal of Computational Design and Engineering*, 6(4), 507–515. doi:10.1016/j.jcde.2019.03.005
- Smith, P. A. C., & Sharicz, C. (2011). The shift needed for sustainability. *The Learning Organization*, 18(1), 73–86. doi:10.1108/09696471111096019
- Soltani, Z., Zareie, B., Milani, F. S., & Navimipour, N. J. (2018). The impact of the customer relationship management on the organization performance. *The Journal of High Technology Management Research*, 29(2), 237–246. doi:10.1016/j.hitech.2018.10.001
- Spearman, C. (1904). The proof and measurement of association between two things. *The American Journal of Psychology*, 15(1), 72. doi:10.2307/1412159
- Thakur-Wernz, P., Bruyaka, O., & Contractor, F. (2019). Antecedents and relative performance of sourcing choices for new product development projects. *Technovation*, 102097. doi:10.1016/j.technovation.2019.102097
- The Office of Small and Medium Enterprises Promotion (OSMEP). (2017). SME 4.0 the next economic revolution. Retrieved from http://www.industry.go.th/psd/index.php/2016-05-02-05-17-59/item/download/4061_06092e25c38dc85a170c6bde4a26ddf
- Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment: An "Interpretive" model of intrinsic task motivation. *Academy of Management Review*, 15(4), 666–681. doi:10.5465/amr.1990.4310926
- Thongsri, N., & Chang, A. K.-H. (2019). Interactions among factors influencing product innovation and innovation behaviour: Market orientation, managerial ties, and government support. *Sustainability*, 11(10), 2793. doi:10.3390/su11102793
- Tollin, K., & Christensen, L. B. (2017). Sustainability marketing commitment: Empirical insights about its drivers at the corporate and functional level of marketing. *Journal of Business Ethics*, 156(4), 1165–1185. doi:10.1007/s10551-017-3591-6
- Tsui, A. S., Zhang, Z. X., Wang, H., Xin, K. R., & Wu, J. B. (2006). Unpacking the relationship between CEO leadership behavior and organizational culture. *The Leadership Quarterly*, 17(2), 113–137. doi:10.1016/j.leaqua.2005.12.001
- Tucker, L.R & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, 38, 1–10
- van Dam, Y. K. (2017). Sustainable Marketing. In *Reference module in food science*. doi:10.1016/b978-0-08-100596-5.21247-x
- Viederman, S. (1994). Five capitals and three pillars of sustainability. *The Newsletter of PEGS*, 4, 5. doi:10.2307/20710641
- Vimarlund, V. (2017). The future of two-sided E-Health markets. *E-Health two-sided markets: Implementation and business models* (pp. 189–195). doi:10.1016/B978-0-12-805250-1.00020-4
- Wang, R. T., & Lin, C. P. (2012). Understanding innovation performance and its antecedents: A socio-cognitive model. *Journal of Engineering and Technology Management - JET-M*, 29(2), 210–225. doi:10.1016/j.jengtecman.2012.01.001
- Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement*, 73(6), 913–934. doi:10.1177/0013164413495237
- Xue, Y., Bradley, J., & Liang, H. (2011). Team climate, empowering leadership, and knowledge sharing. *Journal of Knowledge Management*, 15(2), 299–312. doi:10.1108/1367327111119709
- Zhang, H., Gupta, S., Sun, W., & Zou, Y. (2019). How social-media-enabled co-creation between customers and the firm drives business value? The perspective of organizational learning and social Capital. *Information and Management*, 103200. doi:10.1016/j.im.2019.103200
- Zhang, Y., Khan, U., Lee, S., & Salik, M. (2019). The influence of management innovation and technological innovation on organization performance. A mediating role of sustainability. *Sustainability*, 11(2), 495. doi:10.3390/su11020495

Appendix 1. The survey questions

Leadership

We often consult individuals on the strategic decision and give positive-climate feedback during the open innovation process

- We often make decisions to handle tasks with individuals involved in the open innovation project
- We often promote creativity and innovation within our firms

Teamwork

Our team members encourage each other to succeed when performing the task.

- Our team members are friendly and approachable
- Creating and preserving clear and explicit practices are essential to us

Organizational climate

We have social gatherings where everyone in the firm comes together.

We take the time to listen to each other.

We are frank with each other (i.e., a frank discussion, a frank exchange of views, frank advice, etc.).

Employee empowerment

We give individuals the authority for the appropriate decision makings on their task.

We give considerable opportunities for interdependence and freedom to do their tasks.

We encourage the sharing of resources and information.

Organizational operations

We prioritize reverse logistics and closed-loop supply chain

We prioritize information, health and safety, quality, and environmental management systems

We prioritize suppliers development program and stakeholder engagement

Marketing

We integrate the knowledge of consumer values and processes into the innovative project

We integrate strategic value chain partners into innovative projects

We keep developing new products and services in conjunction with our customers

Capital management

We reasonably allocate human resources into a project

We often attend education/training courses

We often manage diverse sources of funds in the innovative project wisely.

Customer-oriented management

We create our competitive advantage strategy by understanding our customers' need and behavior

We constantly monitor our level of commitment and orientation toward customers.

Customer satisfaction primarily drives our objectives

Monitoring & Evaluation

We often collect and analyze relevant progress and performance information on a regular basis.

We have a sound regulatory system.

We have an information gathering system.

Open Innovation Performance

Our firm often introduces new products/services to the market.

Our firm often introduces new concepts and ideas in the process of product development.

Our firm continually scans/search for the external environment for inputs such as technology, information, ideas, knowledge, etc

Our firm often uses external sources (e. g., research groups, universities, suppliers, customers, competitors, etc.) to complement our own R&D.

We actively participate in other's innovation projects.

Generally, we perform to commercialize all technologies to outside firms

Our firm often seeks out technologies or intellectual property or know-how

Our firm often makes changes and improvements in existing processes and technologies.

Our firm is committed to reducing the cost of existing products/services.

Our firm seeks to sell our existing products into new markets.



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