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Exploring IT-Enabled Sustainability-Oriented Innovation: A Functional Affordances Perspective

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Exploring IT-Enabled Sustainability-Oriented Innovation: An Affordance Perspective

Research-in-progress

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Abstract

Given the public's increasing concerns about sustainability, organizations are under pressure to promote sustainable development by balancing their environmental, social, and economic impacts. Sustainability-oriented innovation (SOI) provides a strategic way for organizations to address sustainability challenges. Moreover, information technologies (IT) are believed to have a great potential for enabling SOI. However, there is a lack of research providing a comprehensive view of IT-enabled SOI. This study aims to address this research gap by exploring IT-enabled SOI from the perspective of affordance theory. Based on the literature review, this research in progress systematically analyses the role of IT capability in SOI development and propose a preliminary conceptual framework. The IT-enabled SOI development framework portrays how organizational IT capability enables SOI development through affordances. The next steps of this study include multiple case studies to verify and refine the proposed framework.

Keywords Information technology (IT), sustainability, sustainable-oriented innovation (SOI), innovation, affordance theory

1 Introduction

Climate change and frequent occurrences of natural disasters (e.g., Australian bushfires, 2019-2021 locust infestation, hurricane, and flash floods in various regions, etc.) have increased the public's awareness of and concerns about sustainability. The pressure on organizations to promote sustainable development continues to mount. In general, sustainable development refers to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p. 43). Based on this core principle, the triple bottom line (TBL) concept was proposed by Elkington (1994), noting that environmental, social and economic dimensions should be simultaneously considered. Thus, to become sustainable, organizations should balance their environmental, social, and economic impacts, which is challenging.

Innovation has been acknowledged as a strategic way to address the sustainability challenges (Maletič et al. 2016; Silva et al. 2019). Innovations that aim to improve environmental, social, and economic performance are known as sustainability-oriented innovation (SOI) (Bengtsson and Ågerfalk 2011). Many previous studies recognize the positive relationship between SOI and organizations' sustainability performance (e.g., Dey et al. (2019), Maletič et al. (2016), and Wu (2017)). Moreover, information technology (IT) is believed to have a great potential for enabling SOI. Thus, it is important to investigate the role of IT in SOI for organizations to promote sustainable development. Not only can IT "green" itself by reducing its energy consumption and sustainability impacts over its lifecycle, but it can also support other organizational functions to achieve better sustainability performance (Bengtsson and Ågerfalk 2011; Epelbaum and Martinez 2014; Hanelt et al. 2017). In this study, IT is viewed as an organizational capability. IT capability for SOI can be defined as the organization's ability to manage its IT resources to enable innovations that enhances environmental, social and economic performance (Bharadwaj 2000; Melville 2010). Thus, IT as a capability is not limited to IT infrastructure but also includes other related components such as IT strategy and governance, process management and people and knowledge (Bharadwaj 2000; Curry and Donnellan 2012; Rahim et al. 2014; Ross et al. 1996).

Though the role of IT as a capability in SOI development has been investigated in the existing literature (e.g., Bengtsson and Ågerfalk (2011), Hanelt et al. (2017), and Melville (2010)), studies discussing all the components of IT capability and investigating the role of IT capability in the full development process of SOI (from sustainability orientation to sustainability performance) are scarce (e.g., Kurnia et al. (2019)). Therefore, this research in progress addresses the research gap by providing a comprehensive view of how the development of SOI can be enabled by IT capability. The main research question is:

How does organization's IT capability enable the development of sustainability-oriented innovation?

To facilitate the understanding of IT-enabled SOI, we adopt an affordance perspective. Affordances of IT are possible uses that IT can afford to certain users who have specific capabilities and goals (Markus and Silver 2008; Seidel et al. 2013). Affordances help to explain what IT capability may be used for by the organization to support the development of SOI. Thus, by understanding the affordances derived from IT capability, organizations are able to better manage their IT capability (Seidel et al. 2013) for enabling the development of SOI.

We propose a conceptual research framework based on the review of SOI, IT capability and IT affordances literature. The framework portrays how IT as an organizational capability provides affordances for the development of SOI in an organization. Guided by the research framework, we plan to conduct multiple case studies to investigate how IT capability enables the development of SOI in the organizations. An IT-enabled SOI development model will be developed based on the analysis of the multiple case studies. This study contributes to the literature by providing a comprehensive view of IT-enabled SOI development from an affordance perspective. For practice, the IT-enabled SOI development model can serve as a valuable tool for organizations to understand and manage their SOI capability and IT capability synergistically to develop SOI.

2 Literature Review

We conducted a literature review to understand the current state of art in the related fields including SOI, IT capability and IT affordances. We limited our search to papers published in the key information systems (IS) journals (e.g., the IS senior scholars' basket of eight journals) and conferences (e.g., AIS Conferences) in the past 10 years. We searched for a set of keywords such as sustainability-oriented innovation, sustainab*, innovation, IT/IS capability, affordance? in the abstract. Next, we reviewed the search results' titles and abstracts and restricted the articles by relevance. Backward reference searching was also involved to identify relevant key papers. The selection process resulted in 157 relevant papers in related fields.

2.1 Sustainability-Oriented Innovation

2.1.1 Sustainability Orientation

As indicated in the name of SOI, sustainability orientation of an organization is embedded in SOI. Sustainability orientation is an organization's attitude and commitment to enhance sustainability performance (Hanelt et al. 2017), and it is usually the first move toward sustainability transformation (Tim et al. 2018). Therefore, the development of SOI starts from organizations' sustainability orientation. After the orientation stage, organizations need to acquire sufficient capabilities for SOI to successfully implement SOI practices. For example, sustainability knowledge-processing capability and sustainability R&D capability are required for organizations to involve green suppliers (a practice), which enhance the effect of sustainability orientation on SOI (Cheng 2020). Thus, organizations' sustainability orientation leads to the development of organizational SOI capability.

2.1.2 SOI Capability

We define SOI capability as an organization's ability to continuously transform knowledge and ideas into innovations (Lawson and Samson 2001) that improve sustainability performance. There is a lack of studies providing a clear and comprehensive view of SOI capability (e.g., Dangelico et al. (2017) and Demirel and Kesidou (2019)). Thus, we adapted the capabilities proposed by Zawislak et al. (2018) in the realm of innovation capability as they adopt a comprehensive view of innovation capability.

First, *technological capability* refers to the ability to identify and assimilate needed technologies from the external environment and utilize the technologies (Zawislak et al. 2018) to develop SOI. This capability is different from IT capability. It emphasizes the introduction of new technologies, while IT capability deals with IT function that already exists in the organization. Second, *operational capability* is defined as an organization's ability to effectively organize required skills, knowledge, experience and routines to turn an innovative idea (Zawislak et al. 2018) into SOI. According to Zawislak et al. (2018), operational capability is aimed at producing innovative products. Take account of other kinds of SOI including sustainability-oriented process, marketing, and organizational innovations (OECD and Eurostat 2005), operational capability in this study also refers to an organization's ability to manage the SOI implementation process. Third, *managerial capability* deals with the integration and coordination among different organizational functions (Zawislak et al. 2018) for SOI. This capability aims to ensure the alignment and coordination among different organizational functions and units for SOI. Finally, *transactional capability* is an organization's ability to manage its supplier relationship and customer relationship in order to find the most suitable sources and markets (Zawislak et al. 2018) for its SOI.

2.1.3 SOI Practices and Sustainability Performance

We identify four types of SOI practices, namely, sustainability-oriented product/service innovation, process innovation, marketing innovation, and organizational innovation (OECD and Eurostat 2005). Product/service and process innovation is the development of new or significantly improved product/service or processes that are more sustainable, while marketing and organizational innovations relate to new or significantly improved marketing and organizational methods respectively. Literature analysis indicates that sustainability-oriented product/service, process and organizational innovations have been widely discussed in previous studies (e.g, Bag (2018), Dangelico et al. (2017), and Matzembacher et al. (2020)), while sustainability-oriented marketing innovation seems under investigation. In fact, sustainable marketing innovations have shown its great potential in practice (e.g., Chipotle's 'Scarecrow' campaign, Dr. Bronner's ethical marketing, and Aspire's cricket protein brand).

Sustainability-oriented innovation practices has been found to have a strong positive relationship with organizational environmental, social, and economic performance (i.e., sustainability performance) in many previous studies (e.g., León-Bravo et al. (2019), Maletič et al. (2016), and Silva et al. (2019)). However, most of existing studies on the impacts of SOI on sustainability performance merely consider environmental aspect. Only a relatively small number of papers discuss social, economic or all the TBL dimensions (e.g., Dey et al. (2019), Maletič et al. (2016), and Wu (2017)).

2.2 IT Capability and IT Affordances

2.2.1 IT Capability

Technology alone cannot produce SOI and lead to improved organizational sustainability performance (Epelbaum and Martinez 2014; Leal-Millán et al. 2016) since it depends on how the organization utilizes its IT capability. In other words, to successfully implement IT-enabled SOI, organizations should view IT as a capability and understand the ways IT capability enables SOI.

By synthesizing previous studies, we have identified four components of IT capability: IT strategy and governance, IT process management, IT people and knowledge, and IT infrastructure. Specifically, *IT strategy and governance* concern the alignment between IT and business and the synergy with other organizational functions within both the organization and supply chain, which leads to shared risk and responsibility (Curry and Donnellan 2012; Rahim et al. 2014; Ross et al. 1996). *IT process management* refers to analysing, defining, implementing, monitoring and optimizing the activities of IT service provision, and establishing measuring and reporting mechanisms to ensure the timely provision of IT services for business (Curry and Donnellan 2012; Rahim et al. 2014; Ross et al. 1996). *IT people and knowledge* include all the people (from both IT and business), along with their technical and managerial skills, involved in the provision of IT services for business. (Bharadwaj 2000; Curry and Donnellan 2012; Rahim et al. 2014; Ross et al. 1996). *IT infrastructure* consists of technical platforms, databases, systems, applications, etc., which form a shared information delivery base for business (Bharadwaj 2000; Curry and Donnellan 2012; Li and Chan 2019; Rahim et al. 2014).

2.2.2 IT Affordances

The concept of affordance was first developed by Gibson (1979) in the field of ecological psychology. In the realm of IT, affordances are defined as “the possibilities for goal-oriented action afforded to specified user groups by technical objects.” (Markus and Silver 2008, p. 622) Therefore, IT affordances reflect what a particular user, who has specific capabilities and goals, can possibly do with a certain technical object (Markus and Silver 2008). The existence of affordances only depends on the object’s features and the user’s capabilities and goals, rather than the user’s perception of action possibilities (affordances) (McGrenere and Ho 2000; Pozzi et al. 2014).

Previous studies have proposed different IT functional affordances (e.g., Conole and Dyke (2004), Tim et al. (2018), and Seidel et al. (2013)). We recognize that Seidel et al.’s (2013) classification is appropriate since it has a similar context to ours and nests the affordances mentioned by other studies into one affordance wherever possible, which is an implied characteristic of affordances theory (McGrenere and Ho 2000). According to Seidel et al. (2013), there are two groups of IT functional affordances: organizational sensemaking affordances (include reflective disclosure affordances and information democratization affordances) and sustainable practicing affordances (include output management affordances and delocalization affordances). *Reflective disclosure affordances* enable an organization to form belief and actions and assess outcomes related to SOI practices (Seidel et al. 2013). *Information democratization affordances* enable an organization to disseminate and interact with internal or external SOI-related information within the organization (Seidel et al. 2013). *Output management affordances* enable an organization to manage the unsustainable results of and related resources used in SOI practices, while *delocalization affordances* enable an organization to perform SOI practices regardless of the limitations of locality (Seidel et al. 2013).

3 The Proposed Framework

Based on literature review, we propose a conceptual research framework (Figure 1) that illustrates how organizational IT capability enables the development of SOI through affordances. This framework is briefly explained below.

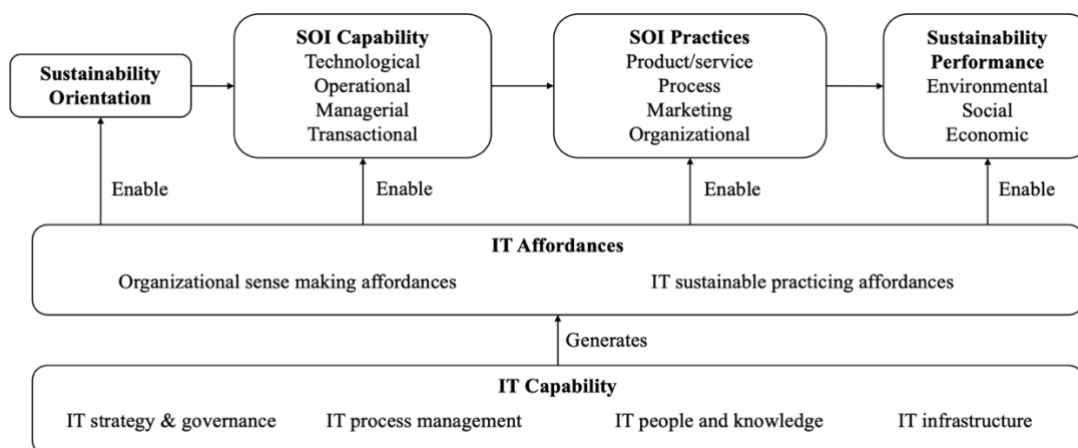


Figure 1: Conceptual Research Framework

At the top of the framework, there are four stages of SOI development, namely, sustainability orientation formation, SOI capability development, SOI practices implementation, and sustainability performance improvement. At the very beginning, organizations form the belief in sustainability and thus have sustainability orientation (Tim et al. 2018). Sustainability orientation drives organizations to develop SOI capabilities which are required for implementing SOI practices (Cheng 2020). As an outcome, organizations' sustainability performance is expected to be enhanced through the SOI implementation Maletič et al. (2016).

The bottom of the framework is IT capability, consisting of IT strategy and governance, IT process management, IT people and knowledge, and IT infrastructure. To explore how IT enables SOI development, we adopt an affordance perspective. According to affordance theory, IT affordances derive from the features of IT infrastructure and subject to the organization's management and usage of the IT infrastructure (i.e., IT strategy and governance, IT process management, and IT people and knowledge). Therefore, IT capability generates IT affordances for enabling SOI development.

IT affordances are shown in the middle of the framework, linking IT capability and SOI development. As discussed earlier, organizational sensemaking affordances can help with the formation of sustainability orientation and SOI practices as well as the measurement of sustainability performance (Seidel et al. 2013). Sustainable practicing affordances particularly enable the implementation of SOI practices by managing the inputs and outputs and promoting collaboration (Seidel et al. 2013). Other studies also examined the enablement of IT affordances. For example, Bose and Luo (2011) found that the virtualization technologies can help organizations assess their readiness for implementing SOI practices, and thus influence organizations' sustainability orientation and the development of SOI capability. Overall, IT affordances can enable a) the establishment of sustainability orientation, b) the development of SOI capability, c) the implementation of SOI practices, and d) the realization of improved sustainability performance.

4 Proposed Method

This study aims to explore a real-world social phenomenon regarding how organizations utilise IT to enable SOI development. Based on the nature of this study, it favours interpretivism paradigm (Goldkuhl 2012). In this study, qualitative research method is more appropriate than quantitative research method because a) this research is still at the exploration stage, 2) requires an in-depth investigation of the development of IT-enabled SOI, and 3) lack of established quantitative measurement for all the constructs. Specifically, we intend to adopt a multiple case study design, which is widely used in the SOI literature (e.g., Hanelt et al. (2017)).

The proposed research design is as follows: First, a conceptual research framework is developed based on literature review. Then, guided by the framework, multiple case studies involving 3-4 organizations (Schoch 2020) will be conducted to empirically investigate in depth how IT capability enables the development of SOI in each of case organizations. The exact number of cases will be determined when data saturation has been reached. For triangulation purpose, multiple sources of data will be collected. Then the findings of each case are compared to identify patterns of relationships among the constructs and to gain insights into the development of IT-enabled SOI. In the last phase, an IT-enabled SOI development model and a number of propositions will be developed.

5 Conclusion

This research in progress proposes a preliminary IT-enabled sustainability-oriented innovation (SOI) development framework, which provides a comprehensive view of how IT capability enables SOI development from an affordance perspective. To complete this research, we will conduct case studies with organizations to gain insights into the development of IT-enabled SOI and to further verify the framework. This study is expected to contribute to the SOI literature by systematically analysing the role of IT capability based on affordances theory, which leads to a comprehensive understanding of IT-enabled SOI development. For practice, the framework facilitates organizations' understanding about how to improve IT and SOI capabilities systematically for the development of IT-enabled SOI. Besides, the framework provides organizations with a way to measure and evaluate their IT capability and SOI capability. Consequently, this framework is expected to facilitate organizations' decision-making on the development of SOI and predict how their sustainability performance will be improved.

This project has limitations. First, apart from affordances theory, other theories such as dynamic capabilities theory could provide new insights into IT-enabled SOI. Second, future research can extend

the unit of analysis by adopting, for example, a supply chain view and further refine the framework to fit interorganizational context.

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