

# An Investigation of Sustainable Exploration-Exploitation Influence on Systemic Innovation and Value Constellation for Sustainable Performance

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**Abstract:** This research provides a conceptual view, that simultaneously explore and exploit sustainable knowledge and offers a significance source for systemic innovation. It requires changes to the process that involve multiple organizations and actors to adjust their practices, as such transform the way they manage product, services, behaviors and attitudes among consumers, and affect the whole system, including government, partners, and society. Systemic innovation is in line with value constellation, which develops inter-organizational relationship between actors, their relationship and network, which harvest effectiveness of technical and operational work and enhance efficiency of product/process innovation and development. The author also believed the theory provides a logical tool that creates a strong tie among sustainable knowledge exploration and exploitation, systemic innovations and value constellation, which in turn lead to sustainable performance.

**Keyword:** Knowledge exploration, knowledge exploitation, value constellation, systemic innovation, sustainability.

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## I. Introduction

### 1.1 Background

Growth of human population and economic development require usage of earth's resources and at the same time preserve environments for the benefit of future generation is becoming crucial. A sustainable development for that reason is the key to save the earth ecological system. This has resulted to "going green" phenomenon, which can be shown by many multidisciplinary studies related to green issues (for example [1][2][3][4][5]) and policies developed and implemented by local government or rulers in ensuring long-term sustainability of the country in terms of economically, environmentally and socially [6]. According to [7], among the importance of green policies are utilization of renewable energy, adoption of energy efficiency and promotion of green technology in sustainable development towards environmental protection. Therefore, for the sake of human prosperity and well-being and environment and their ecosystems, we urgently need to innovate a novel approach of performing business that can overcome earlier problem mentioned.

The importance of knowledge is seen as the source of organizational competitiveness and economy growth and promotes the success of sustainable development, by focusing on the progress of society, the economy's competitiveness and the social well-being [8]. Sustainable knowledge is built up from the interaction between external parties such as suppliers, customers, government policy, competitors and higher learning institution and hence produces new knowledge (exploration) and uses (exploitation) existing knowledge to improve existing process or product, which meets the sustainability performance. In this research, the focus is towards the balance effect of sustainable knowledge exploration and exploitation to search a new way of doing business, which will benefit the organization in the long run in terms of sustainability.

In this research, sustainable innovation is characterized by systemic innovation, which goes beyond regular product and process innovation as it includes social and environmental objectives to achieve short or long-term sustainability. Systemic innovation interconnect with other actors, either in the way they interact or in the parts within the system [9]. This allows interaction within the organization and interaction with its suppliers and associates who form a business networks.

### 1.2 Problem Statement

March [10] indicated that both exploration and exploitation have negative effect on organization performance when contributions of both activities are not balanced or ambidextrous, which may lessen an organization's performance due to the possible threat and cost beyond the benefits resulting from it. It is because of both types of learning are inconsistent and conflicting [11][12][13] in which exploitation is formed based on organization's previous achievements and activities, while exploration develops new competences and employs new methods which differ from the past [12]. While other researchers proved the need of equilibrium between the two issues for organization performance are arguable. For example, it was found impossible to

balance between knowledge exploration-exploitation [14][15] probably due to incapability of actor either too strong or too weak interaction between both knowledge [16]. March also noted that imbalance of both learning might occur at a different level, either at an individual, organizational or social level [17]. However, according to the later author, under certain situations, long-term endurance may be possible even imbalance learning; either organization fully focuses on exploration or solely to exploitation. Despite much research has been done on dexterous exploration and exploitation for innovation [14][18][19] a few have emphasized related sustainable knowledge [20] that in turn lead to sustainable innovation [21]. Although [17] also mentioned about knowledge learning specialization is more appropriate for sustainability, this research will focus on both knowledge learning imbalance in terms of level of influence towards systemic innovation, in fact, probably none empirical research has done on the impact of this imbalance learning towards value constellation.

Many of the literature focus on product or service innovation but few focuses on systemic innovations. Because the importance of organization to adapt dynamic changes [22], radical and incremental innovation receive much attention from many researchers. However systemic innovation needs further research for its complexity. It requires more than radical and incremental innovation effort to improve the three dimensions of economic, social, and ecological performance. Research on sustainable knowledge exploration-exploitation and systemic innovation is currently lacking, compare to study on knowledge exploration-exploitation and radical/incremental innovation or product/process innovation [21]. The author also mentions the interaction of systemic and radical innovations are expected to be more effectively created when implemented on the value constellation and value proposition of business approach into articulated combination to gain sustainable return.

### **1.3 Research questions and objectives**

However, this research focuses on value constellation to reduce complexity. Hence, this research suggests sustainable knowledge exploration and exploitation are the key source of systemic innovation, and hence enhance value constellation. Reinventing value constellation is believed to have a capability to improve economic, environmental and social performance. The following research questions are laid out to guide this research:

- a) How does value constellation works using a systemic approach?
- b) How does systemic innovation works?
- c) How systemic innovations contribute to sustainability?
- d) Which has higher influence towards systemic innovation? Sustainable knowledge exploration or exploitation?
- e) How systemic innovation influence value constellation?
- f) How value constellation influence sustainable performance?

The research aims to:

- a) Explore what value constellation is, and its function towards systemic approach.
- b) Investigate what systemic innovation is and how it contributes to sustainability.
- c) Compare the influence of sustainable knowledge exploration and sustainable knowledge exploitation towards systemic innovation.
- d) Recognize the relationship between the systemic innovation and value constellation
- e) Recognize the relationship between the value constellation and sustainable performance.

### **1.4 Research framework**

The main contribution of this research to the literature is the integration of the four dimensions into a single framework that includes sustainable knowledge exploration-exploitation, systemic innovation, value constellation and sustainable performance that have not previously been framed in a single framework. In this research, sustainable knowledge exploration and exploitation have been recognized as the main contributors to systemic innovation that is the key concept for organization to recreate the existing business process. Ifirst includethe notion of simultaneous exploration and exploitation of sustainable knowledge that shall enhance the creation of systemic innovation. However, since systemic innovation require searching for new knowledge more compare to exploit existing knowledge, therefore, it is argued that sustainable knowledge exploration has higher degree impact on systemic innovation than knowledge exploitation. Next, the research discusses how system innovation and value constellation are parallel in creating new ways to deliver product offering to customers and therefore, contribute to organizational sustainability. The research framework is shown in Fig. 1.

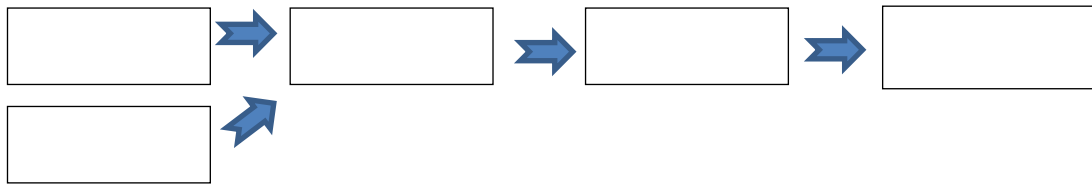


Figure 1: Research Framework[Author].

In this review, the author first embeds the concept about the relationship among four variables sustainable knowledge exploration-exploitation, systemic innovation, value constellation and sustainability performance. The author then reviews the existing literature on those four variables and illustrates how literature review supports the theoretical framework.

## II. Literature Review

### 2.1 What is value constellations?

A value constellation, refer to how does business answer such questions: “How do we deliver product offering to our customers”? This includes not only the company’s own value chain but also its value system with its suppliers and associates [23]. Each organization is part of a value chain. The organization adds value to inputs deliver by suppliers before transfer them to the customer, the next actor in the chain. This process needs a strategy to place an organization strategically on the value chain, business, products and market segments and value adding activities [24]. However, strategy only is not adequate, successful organization reinvent their system instead of add value to the product but add value to the whole systems including all players on the value chain by changing the role of their relationship [24]. [25] highlighted the value chain that could affect the source of competence of an organization are product and its operation system, selling and marketing, technology used, R&D, creative capability, financial transaction, supply-chain management and network.

### 2.2 How does value constellation works using a systemic approach?

The old style of selling products should be replaced by focusing on selling the desired outcome that fulfills customer needs [26]. This sells approach needs an integrated solution called a systemic approach. The author [26] explored an example of the potential benefit using the systemic approach. Product-service systems (PSS) is used as an example which refers to “a system of products, services, networks of actors and supporting infrastructure that continuously strives to be competitive, satisfy customer needs and have a lower environmental impact than traditional business models” [pg.5]. Through systemic approaches, products and services and its production systems are optimized and found new ways to meet the customer needs. Those success organizations do not just sell products but also change its process or system related to all business actors, for example: a counter service transforms to an Internet system (such as banking, selling product or services), an information search transforms from hardcopy sources to electronic source using the Internet and their search engine such as Google; and data saved on local computer transform to handy chips resides in small size card, which contains information on user identification, medical information, and driving license records; and selling final product transforms to do-it-yourself product or match and make our own product based on various product offerings. Such sustainable development needs radical and systemic innovation and can be more effective when build upon the concept of a business model, which provides a universal framework to foresee and implement sustainable innovation [21]. A business model concept is for an organization to be successful, through a combination of several elements into a logical mixture of environment, social and economic, which is undeniably substantial for sustainability [16]. As suggested by [23], social business models are to generate new sources of revenue by combining value propositions, value constellations and sustainable profit equation. However, to reduce complexity of this research, only an element of the business model that is value constellation and its contribution to sustainable performance is highlighted.

### 2.3 How do systemic innovation works?

Systemic innovation aimed “at increasing customer value; developing a skilled, loyal and highly engaged workforce; and offering quality products, services and solutions” [28, pg. 5] and strengthen existing product but require changes to the process that involve multiple organizations to adjust their practices [9] whereas [29] treated systemic innovation as “a set of interconnected innovations, where each is dependent upon the other, with innovation both in the parts within the system and in the ways that they interact.” The author also elaborates on how systemic innovation transforms the way we manage waste, new services, new technologies, behaviors and attitudes among consumers. It affects the whole system, including, government, business, civil society and the household. As such it takes longer time and difficult to accomplish as it calls for change in structures, processes and consumer behavior. Although systemic innovation is complicated, it gets

attention from all sectors to come up with coherent action rather than solution [29]. The idea underlying the systemic innovation is aiming at the problem arises on the innovation system level and reduces the speed and interrupts the innovation process [30]. Systemic innovation will require for new setups, incentive system and spatial arrangement to promote a more sustainable way of life.

#### **2.4 How systemic innovations contribute to sustainability?**

It is commonly accepted that, in order to achieve sustainability, there is a need for societal transformation, which requires an institutional, social/cultural, organizational and technological change. This societal transformation will involve all aspects of society working together toward and aligning with sustainability goals and is defined as sustainability transition or system innovation for sustainability [31]. Most of the organization even though related to sustainability, but it is fallen under compliance and efficiency categories. There are various models and management of innovation strategies, which can cover products, process and environmental management systems for sustainability, and it is impossible to generate generic strategy, which is applicable to all organizations. However, the challenge is the organizational contextual as it is unique. Therefore, organization needs to develop their systemic understanding about their role and impact on the society and start to align their product's strategies and business model with long-term sustainability vision in a systemic way [31]. Products or technologies could not be referred to "sustainable" themselves because they may be an element of sustainability of the whole system [31].

#### **2.5 Which knowledge exploration or exploitation has higher influence towards systemic innovation?**

In order to develop a sustainable and innovative product, a strong foundation of knowledge exploration and exploitation interplay is required, while a group of organizational members exploiting prior knowledge and the other group exploring knowledge to create more knowledge [32]. Both exploration and exploitation are related with knowledge and innovation, in spite of, they fit to different types [33]. Both types of learning will affect innovation [34][19] and lead into new market innovation. Knowledge has its own distinguish characteristic, which can multiply itself by consuming or sharing with others. Therefore, sustainable knowledge needs new thoughtful related to ecological, social and economic sustainability [35]. Sustainable innovation can be described by system ness and radical ness of an organization, which includes social objectives and long-term objectives of sustainability [21]. The sustainable innovation is a process of considering sustainability elements such as environmental, social and financial into an integrated system through R&D and commercialization [21].

Adaptive organization in a dynamic and turbulent environment requires interrelationships of its subparts [14] between exploiting, exploring and the surroundings which exists on different levels of analysis at different time scales [36]. However both activities are essentially inconsistent and conflicting, in which exploitation is formed based on organization's previous achievement and activities; exploration develops new competences and employs new methods, which differ from the past [12]. Exploration comprises of the word such as "search, variation, risk taking, experimentation, play, flexibility, discovery and innovation" and exploitation includes the word such as "refinement, choice, production, efficiency, selection, implementation and execution" [10, pg.71]. Organization needs to develop knowledge exploration on certain knowledge, while at the same time exploit another area of knowledge [23]. Knowledge flows from the organization level from one activity to another are considered as duplication or extension of existing knowledge (exploitation) whereas, knowledge exploitation at the organization level may be treated as knowledge exploration at business unit or individual level as it is considered a finding of new knowledge [37][38]. Therefore, the authors also noted treating of new knowledge at the different level might not be the same treating the same knowledge at another level. In summary, many authors define exploration related to redeploying or utilize existing knowledge [39][40][41][42] to achieve targeted goals whereas exploration occurs when existing knowledge is not adequate to solve identified problems [42], search for new market with new develop a product [35] or apply knowledge in an innovative way [40].

Existing knowledge that uniquely balances newly attained knowledge to create more valuable knowledge can create sustainability. In order to be sustainable an organization is required to become an explorer or exploiter or both. [36] explained the relationship between "exploration of new possibilities and exploitation of old certainties," and examine the investment on resources between the two ideas of two separate cases. Ideally, organization needs to maintain both knowledge exploration and exploitation within a certain area of knowledge for sustainability. [43] suggest that there's connection between explorative and exploitative learning, and thus organization have to retain equilibrium between exploration and exploitation dynamically for endless innovation [43]. Ambidextrous organization is anticipated to retaining a high degree of both exploration and exploitation simultaneously [10] for cost, efficiency, and incremental innovation and develop new products and services for emerging markets where experimentation, speed, and flexibility are critical. In fact, ambidexterity is more relevant to high-technology organizations, as both exploration and exploitation learning are inseparable from remain competitive [44]. Furthermore, previous research discovers that ambidexterity



contributes to increase in performance in high-technology organization. However, Gupta et al. [17], claim that it is difficult to integrate both exploration and exploitation simultaneously to improve efficiency in short-term and innovation in long-term as different organization has a different way of thinking and routines for exploration compared to those needed for exploitation. The authors also state, in a multiple or loosely system, interaction exploration and exploitation is conceptualized as orthogonal as exploitative versus explorative pursuit does not compete the same scarce resource [17]. Both knowledge exploration and exploitation are connected via learning and innovation [45][46][17], those organizations that engages too much on knowledge exploration or creating new idea will lead to extra cost in experimenting new ideas without guarantee against the return. On the other hand, if organization keeps using existing knowledge, it will reduce return in the long run [27]. However, both knowledge exploration and exploitation may influence organization performance. Focusing on exploration and exploitation only is not adequate because those activities must be linked and reinforce one another. New finding gained from the new field is integrated into existing methods to close the exploitation and exploration loop. Combining knowledge exploration and exploitation from internal and external knowledge source formed an organization's knowledge strategy [27] in an environment that constitutes by high levels of robustness of a product development tasks, in which lead to sustainable knowledge [42].

Therefore, in this research, the author argues that knowledge exploration and exploitation influence the success of systemic innovation. Clearly knowledge exploration will have a highly positive degree on systemic innovation which also refers to social innovation requires radical innovation and co-operation between and across organizations and sectors because systemic change rarely affected by single organization and often business, government, civil society and household [29]. Therefore, to be radical, organization must always search or explore new knowledge. However, as mentioned earlier both types of learning must be balanced [10][43][44] to maintain high performance. Therefore, previous knowledge is important to recombine with partners into new disruptive innovations, outstanding products, and services. Even though knowledge exploitation may contribute positive impact on systemic innovation, but the impact is not as significant as knowledge exploration. Knowledge exploitation may increase in productivity for individual components but does not guarantee an increase in overall productivity, decline, or remain unchanged. Knowledge exploitation reinforced the existing process and provides a measurable impact on productivity. In this research, the author hypothesized that organization must explore and exploit simultaneously, but the degree of explorative and exploitative is not balance as mentioned by [17], in a multiple or loosely system, interaction exploration and exploitation is conceptualized as orthogonal as exploitative versus explorative pursuit does not compete the same scarce resource. This mean organization may concentrate more on explorative than exploitative or vice versa at a particular time utilizing different types of resources. As such, the author argues that high degree of exploration is required to successfully innovate a new systemic approach that involves multiple organizations, and actors compare to exploitation activities. With that discussion, the author formulates the following hypothesis:

H1: Sustainable knowledge exploration has a high degree of impact on systemic innovation compare to knowledge exploitation.

## **2.6 How systemic innovation is related to valuing constellations?**

In competitive business environment, value creation is changing and becoming more important and difficult. Systemic innovation will create different value propositions with the same resources and such competitors, and customers will perceive it as a different value, although for the same product [47]. Therefore, it is crucial how the business model shapes the value to the product through its new systemic approach. Transformation to systemic innovation must cover three sustainability aspects, profit, tangible or intangible value or both to each member of the ecosystem, and value return to all parties that invested into the business [48]. As mentioned earlier, value constellations, refer to how does business deliver their offering to their customers. Value constellation can be described as inter-firm relationships in a stable and dynamic state, either relationship among other competitors, and partnership members [49]. This will create a value not from a single perspective but as the cumulative effort from network partners. This is a different concept with value chains in such a way value chain aim delivering value from time to time, whereas value constellations reinvented the whole system, reconfigure organization roles and their relationship [50]. As a result, the outcome of value constellations is determined on the constellation level not at the organization level [50].

Value constellation concept is described based upon an article by [50]. According to the author, value constellations are functionalized in terms of value outcomes in business networks and value recipients who represent different value levels. The main players in the business network in terms of a value recipient involve three levels, which are actors, relationship and network. Firstly, from the perspective of actor levels, example on the question of value is associated with market creation activities that market actors are engaged in: "building network positions, attempting to create exchange, and influencing other actors in the market (potential

customers, providers, and competitors) to start to view the suggested market configurations as an attractive source of resources for their future value creation” [pg. 59]. An actor’s satisfaction increases when perceived value increase, hence the possibility of alleviating the relationship is also increased. Secondly, the actor value is directly connected to the relationship perspective through four types of relationship outcomes that adds to relationship value creation: “personal value (customer retention, referral), financial value (efficiency, share of business, share of market, being paid more), knowledge value (market intelligence, idea generation, innovation) and strategic value (long-term planning, extended network”) [pg. 59]. Network relationship arises not only from the quality of actors are bond together but also from the decision-making capability of inter-firm contacts. In summary, the value recipients described earlier are clearly interconnected by how organization combines value in a network is basically affected by the relationship nature of two groups that organization poses and by the value created on the business network and taken by everyone actor involve. Value outcome of business networks is constructed using two concepts: rationalization and development function. Rationalization refers what is achieved by doing the right thing about the relationship or simply “effectiveness.” Whereas development function described performing in the best possible manner within the relationship or “efficiency” [pg. 60]. In general, rationalization refers to cost efficiency in terms of technical and operational, while the development function role can be shown through innovation in products or process and development relatedness issues either through new machines, software, customized a product, reduce time to market and etc.

In summary, a systemic innovation requires a need for societal transformation, organizational, social and cultural, and technological change, which leads to change in structures, processes, roles of organization and partners, including consumer behavior. This element shows that systemic innovation is parallel with value constellation, which develops inter-organizational relationship among actors, their relationship and network, which harvest effectiveness of technical and operational work and enhance efficiency of product/process innovation and development. Therefore, the author formulates the following hypothesis:

H2: Systemic innovation is positively influence value constellations.

## **2.7 How value constellation is related to sustainable performance?**

As mentioned in the earlier section, value constellations refers to process delivery of product offerings to customers who include both organization value chain and external value chain among organizations, suppliers, partners, industries, experts, and universities, which form network complexity. More knowledge is gathered through actors, its relationship and network which allow improvement on new process development. This section tries to answer how this process will influence sustainable performance. Prior studies demonstrate how the network complexity circumstances among inter-organizational boost information sharing, closeness to main issues and all actors involve, which in turn affects organizational performance [50] in terms of sustainability. The author also stresses, on another important aspect towards sustainable performance. It is the business network relationship that enhances technical and operational work of new product or process innovation. In order to offer more values to the product, organization must always reevaluate and reinvent their capabilities and relationship with actors in the network link [13]. This process will continue which in the end improves the network relationship and sustainable performance. Sustainable performance refers to performance that includes three main pillars, economic, social and environmental criteria. [51] and [52] both agree that sustainable performance search for a balanced among the three dimensions. Organization does not seek for profit but ensure product sales will cover their full costs and deliver profits earn to customers in terms of low price, better service and accessibility. Sustainability protects environment, maximize social profit equations, and enhance economic performance. In summary, the connectedness between value constellations and sustainable performance can be seen through value outcomes in business networks (actors, relationship and business network formed) and its value recipients (efficiency and effectiveness). With that the author posits the following hypothesis:

H3: Value constellations positively influences sustainable performance.

There are many sustainable performances measuring instruments suggested by scholars such as the system model, the quality approach, Triple Bottom Line, Balanced Score Card, and sustainable BSC. [53] suggests Organizational Performance Sustainable Index (OPSI), a simplified version of Sustainable BSC which can be easily understood by leaders and analysts and shall probably be accepted as a performance measurement instrument. OPSI uses six elements as measurement instrument's financial performance, customer/market performance, internal process performance, learning and development performance, social performance and environmental performance. Whereas, [54] under the sustainable performance measurement view, the author uses sustainable economic performance criteria, sustainable social performance criteria, and sustainable environmental performance criteria. The sustainable resource usage criteria are evaluated under the environment

dimension as discrete sustainability criteria for measuring sustainability performance [54]. Similarly, this research will utilize the three important pillars (economic, social and environmental) to measure sustainable performance using measuring instruments by [53] and exclude other dimensions. Economic performance is evaluated by sales growth, productivity, return on sales, return of assets, and return on equity. Social performance can be measured by employee satisfaction, social performance of suppliers, community relationship, philanthropic investment, and industry-specific factor. Finally environmental performance is based on by key material use, water use, emissions, effluent and waste and industry-specific factor.

### III. Future research

The study is intended to address the factor that triggers performance in organization that practices of Environmental Management System - ISO14001, the most widely used standard for Environmental Management Systems internationally in Malaysia. By implementing the standard, organization should be able to manage the environmental impacts of its business activities, better compare with other organizations. Unit of analysis for this research is an organization rather than personal or employee performance. To date, there are 698 active organizations certified ISO14001 by SIRIM [55] in Malaysia. The research shall use a questionnaire method to obtain information related to four variables mentions.

### IV. Conclusion

The principle contribution to this research in the literature is the integration of the four dimensions into a single framework that includes sustainable knowledge exploration-exploitation, systemic innovation, value constellations and sustainable performance that have not previously been framed in a single framework. This research explores the impact of sustainable knowledge exploration and exploitation on systemic innovation that is the key concept for organization to create new process of doing things and how it is related to value constellation – deliver product offerings and finally contributes to organizational sustainability.

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