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Sustainable Innovation: Design of an Active Adaptive Organization

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Abstract

Sustainable innovation is critical because it is a driver for sustainable development, and it is a core business concept for creating and maintaining a sustainable competitive edge. However, maintaining sustainable innovation over the long run is difficult in the current turbulent and complex environment. The article contributes to the literature by presenting an open system perspective of sustainable innovation with practical applications for organizational redesign. This will require the engagement and the integration of the parts of the organization, its culture, purpose, structure, processes, functions and manner by which it interaction with its containing system. It also necessitates redesigning and transforming organizations from their current deterministic and animated forms into social systems. Directions for further research and theory development are presented.

Keywords: Sustainable innovation; Sustainable development; Open system; Innovative organization; Innovation;

1. Introduction

Sustainability has been an important topic for many years (WCED, 1987), and has become more popular and increasingly important, along with the green, organic, environmental friendly and socially responsibility movements. Innovation was lumped, in the past, with the notion of development but has recently gained its own individual attention and prominence. Sustainable innovation can be found in the early literature embedded within the sustainable development (Fussler, 1996). The importance of sustainable innovation comes also from its potential to create competitive edge for business organizations (Ireland & Webb, 2007; Larson, 2000; Miles et al., 2009; Rodriguez et al., 2002). Since the publication of J. Galbraith (2009) paper on designing innovation companies, there has been an abundance of number of scholarly paper published on the subject (Damanpour & Wischnevsky, 2006; Rodriguez et al., 2002; Tidd & Bessant, 2009); however, most of these publications are part and specific subject oriented and cover sustainability or innovation as separate issues faced by the enterprise.

Although, over the last ten years, a body of literature has developed arguing for the need for sustainable innovation, not much can be found in term of specific design recommendation on firm's structure, process, functions, and culture supportive of sustainable innovation. What exists instead is a non-integrative, part-oriented approach to the process of sustainable innovation. Thus, there is a gap in the literature that focuses on understanding sustainable innovation from the open systems' perspective (Nadim, 2004; Nadim & Singh, 2011; Steiner, 2008). The purpose of this paper is to present an open systems view of sustainable innovation. We also offer practical application for designing creative organizations that are capable of maintaining sustainable innovation over the long run, and to generate directions for further research to lead to theory development.

2. Literature Review

2.1 Sustainability

The concept of sustainability, in its simplest and earliest manifestation, was the sense of a balance between resource consumption and reproduction, addressing the conflict between the need of the present and future generation (Kuhlman & Farrington, 2010). The World Commission on Environment and Development (WCED, 1987), an independent body established by the United Nations in 1980, has defined sustainability as the ability to "meet the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). Further expansion of its scope, the concept of sustainability promoted the idea of "sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace" (Earth Charter Commission, 2002).

Sustainability is said to include three goals, portrayed as pillars or spheres, which are economic development, social development, and environmental protection (United Nations General Assembly, 2005); also referred to as triple bottom line sustainability (Sutton, 2004). Those three goals reflect the current main concerns and challenges facing humanity (Dyllick & Hockerts, 2002). The three sustainable goals breakdown into a set of seventeen

international development targets, relating to issues such as poverty, health, education, energy, economy, consumption, climate and ecosystems (Sutton, 2004; United Nations General Assembly, 2005).

Sutton (2004) pointed out the inconsistency and confusion when using similar terminology, like sustainable development and sustainability development, which can mean different things. His typology of the term suggests that ‘sustainable development’ is development that can be maintained for the longer term, while 'sustaining development’ is development that sustains something, possibly the environment and society (Sutton, 2004).

In recent years, the pursuance of sustainability by for-profit organizations has gained wide recognition as a good practice that can lead to improved financial performance (Carroll & Shabana, 2010; Dyllick & Hockerts, 2002; Salzmann et al., 2005). The business case for corporate sustainability was investigated in various ways to find out whether there is an economic rationale to include corporate sustainability in strategic management (Epstein & Roy, 2003; Salzmann et al., 2005; Schaltegger et al., 2012). Considerable research has been published on the relationship between corporate sustainability, also dubbed 'corporate social responsibility (CSR), and financial performance; with meta-analysis studies of extant research revealing that the majority of results indicate a positive relationship between the two (Griffin & Mahon, 1997; Orlitzky et al., 2003). Accordingly, it has been concluded that corporate sustainability and financial performance are "generally positively related across a wide variety of industry and study contexts" (Orlitzky et al., 2003, p.406).

The positive impact that corporate sustainability can have on financial performance, has led many to recognize the potential value of integrating corporate sustainability into firms' strategy (Galbreath, 2009; Porter & Kramer, 2006). Executives of firms have adopted sustainability based on the existing evidence that the practice can serve the mission of the business, foster competitive advantage, and thus, lead to improved financial performance (Marom, 2006; Orlitzky et al., 2003). Although sustainability was initially referring to maintaining the natural resources, which is the core of sustainability movement, this reference is not sufficient and is only a special case. In its wider context, sustainability, meaning 'able to be maintained', should refer to the manner by which the organization chooses to function in the long run, such as sustainable profits, or sustainable competitive advantage (Sutton, 2004). Within the corporate sphere, sustainability can also mean growing their social and environmental capital base, because economic sustainability in itself will not be sufficient to create an overall sustainability of the firm (Dyllick & Hockerts, 2002). Thus, for any entity to be sustainable, its parts (it structure, process, functions), its whole, the culture, and its larger (containing system) must be sustainable.

2.2 Innovation

The common meaning of innovation is “doing something different, or new, rather than improvement." In the context of the business world, Innovation is commonly perceived as the successful exploitation and commercialization of new ideas. However, in its broader sense, with regard to organizations, innovation can relate to products, services, processes, business models and organizational culture (Ahmed & Shepherd, 2010; Galbraith, 1982; Tidd &

Bessant, 2009). Alternatively, innovation can be seen as the effort to create purposeful, focused change in an enterprise's economic or social potential (Drucker, 1998).

Baregheh et al. (2009) provided a wider definition of Innovation, as "the multi-stage process whereby organizations transform ideas into new or improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace" (Baregheh et al., 2009, p. 1334). Accordingly, innovation can have different perspectives including types of innovation, aim of innovation, and means of innovation.

Innovation types are categorized either by their relation to the organization internal value chain or to the external influence on the market. In relation to the internal value chain, innovation types include product, process and business model innovation (Afuah, 2015; Tidd & Bessant, 2009). Product innovation is the creation and introduction of a product or service that is either new, or an improved version of previous products or services (Ahmed & Shepherd, 2010; Tidd & Bessant, 2009); and it relates to the outputs of the organization (Cummings & Worley, 2005) or the outbound logistics activity in Porter's value chain model (Porter, 2001). Process innovation means the implementation of a new or significantly improved production or delivery method (Ahmed & Shepherd, 2010; Tidd & Bessant, 2009); and it relates to the transformation part of the organization (Cummings & Worley, 2005) or operations activity in Porter's value chain model (Porter, 2001) within the organization. Business model innovation involves a change in the way the market is addressed, through one or more components of the business model including customer value proposition, market segment, and revenue model (Afuah, 2015). Business model innovation relates to the marketing and sales primary activity in Porter's value chain model (Porter, 2001).

Innovation has also been defined in relation to its' impact on the market, as denoted by sustaining and disruptive innovation (Christensen, 1997). Sustaining innovation is based on improving current products along the same set of values of existing market, and thus sustains its ongoing existence. Sustaining innovation is further broken down into incremental and breakthrough innovation, representing simple and drastic level of improvement and change (Christensen, 2003). Disruptive innovation is an innovation that creates a new market by applying a different set of values, which eventually disrupts and overtakes an existing market (Bower & Christensen, 1995; Christensen, 1997, 2003). The process of disruptive innovation happens when a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors (Bower & Christensen, 1995; Christensen, 1997, 2003).

The aim of innovation has been linked to the terms of 'differentiate', 'succeed', and 'compete' (Baregheh et al., 2009). It serves companies to "achieve competitive advantage through act of innovation … including both new technologies and new ways of doing things" (Porter, 1990). Innovation can bolster achieving competitive advantage (Fernandes et al., 2013), as suggested also by Schumpeter (1934), through various mechanism such as novelty in product and service offering, complexity, timing, legal protection of intellectual property, and rewriting the rules of trade (Ahmed & Shepherd, 2010; Gilbert, 2003).

Yet another category is 'open innovation', which is defined as the "use of purposive inflows

and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively (Chesbrough, 2003). That is to say that companies should not rely only on their internal capabilities but rather use external knowledge and capabilities to increase success (Alcalde & Guerrero, 2016). The 'openness' can take many forms in terms of relevant stages within the funnel of the innovation process, including idea generation, idea screening, and development and testing. Additionally, open innovation involves a variety of stakeholders outside the firm boundaries, including customers, suppliers, other companies and academic institutions (Chesbrough, 2003; Herskovits et al., 2013; Tidd & Bessant, 2009). Such 'openness' serves to decrease risk in the development process as well as the advantage of reducing time to market (Chesbrough, 2003; Lieberman & Montgomery, 1988).

Organizations must to be able to exploit the various forms of innovation and harness them to achieve competitive edge and financial goals. Galbraith (1982) suggests that "innovation requires an organization specifically designed for that purpose-that is, such organization's structure, process, reward and people must combine in a specific way to create an innovative organization" (1982, p. 5).

Innovation need not be confined to commercial production, marketing, and distribution of goods and services; there could be innovation across the structure, process and functions of every organization irrespective of profit motives. These non-economic arguments for innovation with focus on a better social and environmental corporate performance and an improved market orientation has also been advocated by Elkington (1997) and Larson (2000); and have the potential to contribute later on to the economic bottom line (Carroll & Shabana, 2010).

2.3 Characteristics of an Innovative Organization

There is a large body of research on the determinants of innovation and characteristics of an innovative organization (Nieuwkamp, 2010). It has been argued that several measures should be implemented to create and maintain an innovative organization, including creative organizational climate, shared vision, committed management, appropriate structure, team work, key individuals, openness with external focus and networking (Crielaard & Omta, 2008; Tidd & Bessant, 2009).

Organization structure should be flexible and balanced between organic and mechanistic structure, to enable communication and integration between functions, as well as allowing horizontal communication to allow inter-organizational knowledge sharing and cross-functional cooperation (Calantone et al., 2002; Christiansen, 2000; Nadim, 2004; Swenson, 2013). Work design should be based on cross functional teams, which has been shown to bolster of idea generation and innovation due to cross-fertilization between individuals from different disciplines (Crielaard & Omta, 2008; Tidd & Bessant, 2009). Cultivating shared vision provides a sense of purpose among employees, motivating them to be more creative (Calantone et al., 2002; Crielaard & Omta, 2008).

Commitment of top management and proper leadership is also associated with successful

innovation. Their leadership should promote commitment and strategic intent to be innovative organization (Tidd & Bessant, 2009). Such conduct by top management has a strong positive influence on employee commitment according to the Upper echelons theory (Hambrick, 2007; Hambrick & Mason, 1984). The organization culture should be tolerant to ambiguity and uncertainty, because innovation is inherently uncertain and will often result in failure (Nadim, 2004; Tidd & Bessant, 2009). If the culture does not allow for failure, employees will be reluctant to come up with new ideas, avoiding personal risk taking (Tidd & Bessant, 2009). The organizational culture should be positive toward new ideas by promoting the right space, trust (Christiansen, 2000), excellence, freedom and rewards (Christiansen, 2000; Nadim, 2004); thereby creating climates for initiative and psychological safety (Baer & Frese, 2003; Swenson, 2013).

The organization should also operate in an open innovation paradigm, which permits inflow of external idea and technologies (Chesbrough, 2003; Chesbrough et al., 2006; Wagner, 2009) as well as networking (Ornetzederand Suschek-Berger, 2008; Rogers, 2004; Schilling & Phelps, 2007), R&D collaborations, cooperation and alliance with other entities to enhance innovation (Christiansen, 2000; Rogers, 2004; Sampson, 2007), spreading risk and cost of new development (Sampson, 2007) reduce risk, gain path to new markets, shorten development time and reduce time-to-market (Chesbrough, 2003; Chesbrough et al., 2006).

It is extremely difficult to imagine an innovative culture by looking at these characteristics one at a time and in isolation. It is another manifestation of non-systemic, part orientation of academic view of the phenomena in the literature. Nadim (2004), from a systemic perspective, suggests four co-producers of successful innovation namely:

1. top management support,
2. existence of an entrepreneur to champion the effort,
3. synergy between the new business and the current line of operation,
4. culture supportive of innovation.

Nadim then introduces the model of simultaneous high differentiation and high integration, which is required to "allow the new business unit to be different from the ongoing business" (Nadim, 2004, p. 232), as an integrative view of a supportive culture for innovation.

However, even in this model, the interaction of the system with its external environment and the external stakeholders is not a significant factor. A suggested categorization may include the system - structure, process, function, and the culture; the parts, and the larger containing system (Gharajedaghi, 2006).

2.4 Sustainable Innovation

Sustainable innovation, and several parallel concepts like eco-innovation and sustainability-driven innovation, has been defined in many ways. Carrillo-Hermosilla et al. (2010) cite numerous different definitions to demonstrate the diversity in viewpoints. Some of these assert that sustainable innovation is:

- any form of innovation aiming at significant and demonstrable progress towards the

goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy" (European Commission, 2007).

- the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for all, with a life-cycle minimal use of natural resources per unit output, and a minimal release of toxic substances (Europa INNOVA, 2006).
- the process of developing new products, processes or services which provide customer and business value but significantly decrease environmental impact (Fussler & James, 1996).
- the creation of new market space, products and services or processes driven by social, environmental or sustainability issues (Little, 2005).
- a process where sustainability considerations (environmental, social, financial) are integrated into company systems from idea generation through to research and development (R&D) and commercialization. This applies to products, services and technologies, as well as new business and organization models (Charter & Clark, 2007).
- is the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives (Kemp & Pearson, 2007).

The core of those definitions boils down to addressing innovation that is driven by sustainability considerations - environmental, social and financial. Therefore, semantic wise, the expression of 'sustainability-driven innovation' is more accurate in conveying the essence of the concept, than 'sustainable innovation' which can be also interpreted as 'innovation that can be maintained' (Sutton, 2004); although the latter is more commonly used.

The need for sustainable development has been present in the history of human existence, from the ancient to present time, in the form of many communities being self-sustaining and not merely a consuming segment of the society. This notion has had the central role in the European forestry (Finn, 2009) and the report of the Club of Rome (Ehnert, 2009). The need for sustainable development over time and the progress made in stating the need for sustainable development and triple bottom line (Elkinton, 1997) has had major impact in advancement of the process of innovation in the for profit companies in specific, and society in general.

It has been suggested that sustainability-driven innovation requires a somewhat different set of capabilities than innovation that is focus solely on competitive edge (Hansen et al., 2011); with emphasis on the need for a broader participation of stakeholders in the process (Larson, 2000; Van Kleef & Roome, 2007). Similarly, Ayuso, et al. (2006) advocated a stakeholders' dialogue and stakeholder knowledge integration, as a foundation for a dynamic capability underlying sustainable innovation.

While, over the last ten years, there has been a comprehensive body of literature arguing the need for sustainable innovation and its contribution to sustainable development, not much can be found in term of specific design recommendation on firm's structure, process, functions, and culture supportive of sustainable innovation. What exists instead is a non-integrative, part-oriented approach to the process of sustainable innovation (Nadim, 2004; Nadim & Singh, 2011; Steiner, 2008).

We concur with Sutton (2004) in our definition of sustainable innovation as the structure, process and culture of an organization that will enable it to innovate in the long term - innovation as a fabric of an organization. Thus, we propose the use of an open systems' view of sustainable innovation.

3. Open Systems' View of Sustainable Innovation

Bradbury (2003) advocated a whole systems approach to developing sustainable business practices in management. System thinking could provide better understanding of concept and practices associated with sustainable development by providing a conceptual framework that considers the internal and external interdependence of phenomena. Moreover, system thinking, which considers all three aspects of sustainability, also helps shift the focus from the technological aspect of sustainability, to a more balanced consideration with emphasis on the human aspects including individuals, groups, organizations and societies; which are responsible for sustainable development. This is increasingly important when dealing with great complexity such as creating and managing sustainable innovation.

Having a systems' view of a concept calls for understanding the definition of open system, its principles and how it is constructed. Ackoff (1999) provided a comprehensive definition of open system to be:

"A system is a whole consisting of two or more parts that satisfies the following five conditions:

a. The whole has one or more defining properties or functions
b. Each part in the set can affect the behavior of properties of the whole
c. There is a subset of parts that is sufficient in one or more environment for carrying out the defining function of the whole; each of these part is necessary but insufficient for carrying out this defining function
d. The way that each essential part of a system affects its behavior or properties depends on (the behavior or properties of) at least one other essential part of the system
e. The effect of any subset of essential parts on the system as a whole depends on the behavior of at least one other such subset.

In summary, a system is a whole that cannot be divided into independent parts without loss of its essential properties or functions" (Ackoff, 1999, pp. 5-8).

Gharajedaghi (2006, p. 29) asserts that there are five systems principles - openness, purposefulness, multidimensionality, emergent property, and counter intuitiveness; acting together to define the characteristics of the whole system.

1. Openness means that the performance of the system is affected by the environment, including all critical stakeholders; but on which it does not have control.
2. Purposefulness means that the system has choice selection, and can produce different outcomes in both the same and different environment.
3. Multidimensionality is the ability to create a feasible whole with unfeasible parts that can complement each other although having opposing tendencies.
4. Emergent Property refers to the property of whole system the result of the interaction between the parts, and that cannot be deduced from the separate action of the parts individually.
5. Counter intuitiveness means that actions produce opposite results from what was intended.

Thus, systems' view of sustainable innovation is predicated on the systemic behavior of the organization in pursuit of innovation. It necessitates a flexible, modular and multidimensional structure, a culture of curiosity and creativity, and "highly differentiated and integrated at the same time" (Nadim, & Singh, 2011). It also requires openness to new ideas from all sources, including stakeholders inside and outside of the organization. These requirements are further discussed and elaborated in the following segments.

4. Design of an Active Adaptive Organization capable of Sustainable Innovation

Gharajedaghi (2006) introduces the elements of the design of a system's architect as: Systems boundaries and business environment, its purpose, functions, structure, and processes. To this we add the culture i.e. the mental images of the organization maintained by its stakeholders - its shared image. The organization's purpose, its function, must have strategic intent as a core competency. It should allow the organization to simultaneously differentiate - variety increasing and advancement of innovative ideas, and integrate - incorporate the new ideas in the core of the business activities (Nadim & Singh, 2011). High differentiation alone leads to wasteful resources and chaotic conditions, as the organization struggles with prioritizing the new ideas for market introduction. High integration stifles the culture of creativity and leads to dominance of the existing products and services over new ideas and their champions.

The design of the functions must incorporate a competitive advantage through its products and services (the core of sustainable innovation), the structure must be flexible and modular and systemic (input, output and market dimensions); as opposed to the traditional tree like centrally governed hierarchies. Within the structure the issue of proper corporate governance for sustainable innovation must be addressed. "The better the system of corporate governance, the greater the chance that we can build towards genuinely sustainable capitalism. To date, however, most TBL (triple bottom line) campaigners have not focused their activities at boards, nor, in most cases, do they have a detailed understanding of how boards and corporate governance systems work." (Elkington, 1997, p.6). The processes should contain the throughput, integration, alignment, and synergy among the organization's purposeful parts (Gharajedaghi, 2006).

There is a growing body of literature advocating the involvement of stakeholders in the innovation process (Clarke & Roome, 1999; Fowler & Hope, 2007; Reed, 2008). Open

source and platform innovation (Chesbrough, 2011) further refine the ability of the firm to take innovative ideas from all sources, inside and outside of the organization, and incorporate them in their sustainable innovation process. However, while highly desirable and very effective [it will positively enrich the firm's pool of innovative ideas], not very practical given the traditional hierarchies and command and control structures of the prevailing deterministic and animated organizations, which are incapable of accepting any new ideas, unless they are flowed from the top.

Only an active adaptive organization, designed on the foundation of a social systems are capable of open source innovation. The culture should be built around creativity by questioning the conventional wisdom and the implicit assumptions on how things are done in the given firm. It is only through this process of cultural transformation that these assumptions are negated and new ideas come around (Ackoff, 1999). In essence the organization must create and maintain a culture of excellence for sustainable innovation, which includes the following characteristics:

- Inclusive of all genders, races, sexual orientation, origin, and beliefs
- Having a fair and operational performance measurement system
- Developmental
- Team Oriented
- A fund place to work
- Creates a balance between work and life
- Self-selecting
- Collaborative
- Make Champion of our Innovator
- Innovative and Creative

Over all, a culture of excellence must respect the purposefulness of all the employees working for the organization in alignment with the purposefulness of the organization itself and its containing system. To sustain innovation, the innovators motivated and appreciated for who they are and their contribution to the long-term competitive advantage of the organization.

The uniqueness of the proposed systems' view approach draws on integrating both internal and external environment and stakeholders to construct an innovative organization, rather than dealing with different characteristics of innovation one at a time and in isolation. This will enable on-going sustainable innovation that will contribute to the long-term competitive advantage of the organization.

5. Conclusion and Recommendations

Innovation is not a new concept, but it has gained new prominence as a more effective mean to create and maintain a sustainable competitive edge as well as doing everything better. It has gone through the evolution of (NIH: Not-Invented-Here) mentality to open sources, boundaryless and platform innovation, but it must be *sustained!*

Sustainable innovation is a new concept that has not moved from combining innovation with

the old notion of (physical environment) sustainability. In today's highly complex and chaotic competitive environment, innovation is the key to long term viability and sustainability. This would be best achieved by designing an innovative organization that integrates internal characteristics that support innovation together with internal and external stakeholders based on an open systems view of an enterprise.

Sustainability, in the literature and business practice, is a newer concept and still evolving. It is gradually moving away from the quest for sustaining the physical environment to sustaining more acceptable business practices that propel the organization to a more secure, viable and desirable future. We have just begun and additional research and innovating thinking are needed to move it forward.

Some specific and new concepts to explore in further sustainability research and practice include:

1. Sustainability training and certification for all organization and their stakeholders similar to ISO.
2. Incorporating the choice and purposefulness of the parts, the system and the external environment, not just the system.
3. Providing more secure employment and less turnover and desire to leave - the organization must sustain its innovators. A new trend in balancing between work and life will go a long way to secure long-term employment and loyalty of the innovators.

However, to achieve sustainable innovation, the organization must be sustainable as a whole, contain sustainable parts, and interact with a sustainable larger system. It must behave in an active adaptive mode, change its environment and create its desirable future. Sustainability must go beyond product and service or the physical environment. It should be woven into the fabric of the organization: its structure, process, function and culture. This is only possible if the organization is designed and behaves as a social system (Ackoff & Gharajedaghi, 1996). In an environment faced with rapid rate of change and turbulence, and increased rate of production of understanding, knowledge, and information, only a social system can survive. There the open systems perspective is the only one that can engage all the internal and external stakeholders in the process of sustainable innovation and the creation and maintenance of a competitive edge and log-term viability.

In conclusion, we have contributed to the theoretical gap in the literature by presenting an open systems' view of sustainable innovation, with practical implications on how to design an active adaptive organization capable of on-going sustainable innovation that will contribute to a long-term competitive advantage; while generating directions for further research that can lead to theory development.

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