

SME Adaptive Capacity in Response to Environmental Requirements: Understanding it as a Complex Adaptive System

Nguyen, Nga H¹; Beeton, Robert J.S²; Halog, Anthony³

¹The University of Queensland,
St Lucia Campus, Brisbane Qld 4072, Australia

²The University of Queensland,
St Lucia Campus, Brisbane Qld 4072, Australia

³The University of Queensland,
St Lucia Campus, Brisbane Qld 4072, Australia

ABSTRACT --- *The pressure on Small and Medium sized Enterprises (SMEs) in emerging economies to adapt their production and management to meet global industrial environmental standards is enormous. These pressures come from both the international supply chain and the government's environmental legislation. Yet, an effective way to help SMEs adapt to these challenges in emerging economies is not reported. Little is available about environmental adaptation process at SMEs in developing countries. This paper attempts to address this gap in knowledge. It uses the theory of Complex Adaptive Systems to understand the complex nature of environmental adaptation at SMEs, and more importantly, it outlines an agenda for further research to identify key success factors for the environmental adaptation process at SMEs based on the key components of such a system.*

Keywords--- SMEs, environmental adaptation, complex adaptive systems

1 INTRODUCTION

There is no doubt that SMEs play an important role in the world economy. They are the engine of the economic growth in every economy. SMEs account for 99% of all European businesses, provide two out of three of the private sector jobs and contribute to more than half of the total value-added created by businesses in the EU [1]. In ASEAN member states, SMEs account for more than 96% of all enterprises and between 50% to 85% of domestic employment, contributing from 30% to 53% of GDP and 19% to 31% of exports [2].

At the same time SMEs are thought to be responsible for around 60% of all carbon dioxide emissions and 70% of all other pollution [3]. Consequently, SMEs are now under increasing pressure to adapt their management and production systems to meet global industrial environmental standards [4-6]. These pressures come from the international supply chain, government legislation and the local communities [6, 7]. Thus, by taking into account the predictability of stronger environmental requirements, it is necessary to investigate an effective way to help SMEs adapt to these challenges.

Most studies that try to explain the reasons of the poor state of environmental management by companies examine the monitoring and enforcement of environmental policies [8, 9] or investigate firm's compliance behaviours [10-14]. However, we believe that this is not sufficient. Rather, it is more crucial to investigate the environmental adaptation process and identify the conditions under which SMEs' adaptability can be enhanced. This allows observers to comprehend why the majority of SMEs could not proactively adapt to changes in environmental requirements and suggests ways to enhance their adaptive capacity.

Current literature pays little attention to the adaptation process that the firms need to carry out when facing rapidly and unpredictably global changes, including new requirements on environmental protection and environmental management. While adaptability is a must for the survival of SMEs in the future [15], we know very little about their adaptive capacity and behaviours. We may know some cases where companies are successful in adapting to environmental changes; but we don't really understand the reasons that limit the environmentally proactive adaptation by SMEs. Camison [16] studied

SME's problems with environmental adaptation; yet, her study only examines the problem with information and knowledge. Other studies focus on inter-firm adaptation, but many of them, with the exception of Louise and Stuart [17], do not shed light on how adaptation occurs as a result of particular events and activities. Studies on business adaptation to climate change is more advanced but it is still at an early stage [18]. In addition, studies on corporate environmentalism in developing countries have been reported as largely non-existent [19, 20]. There is almost no study focusing on the environmental adaptation process in the East Asian context [21]. So, it is difficult to know the environmental adaptation process taken by SMEs in these countries.

This paper reviews the existing relevant literature on adaptation, which are mainly business adaptation to climate change and inter-firm adaptation, in order to deepen understanding of the firm's environmental adaptation process. It utilises the theory of Complex Adaptive Systems to understand the complex nature of environmental adaptation and the elements of such systems. More importantly, it attempts to develop a framework for conceptualizing the adaptive capacity of SMEs in response to environmental requirements. Finally, it outlines a research agenda to identify key success factors for the environmental adaptation process of SMEs in developing countries.

2 UNDERSTANDING THE ENVIRONMENTAL ADAPTATION PROCESS

2.1 *The Concept of Adaptation*

Adaptation is understood differently in various contexts. In natural sciences, particularly evolutionary biology, adaptation refers to the development of genetic or behavioural characteristics which enable organisms to cope with environmental changes in order to survive and reproduce [22]. In social sciences, adaptation is related to the success or survival of a culture [23, 24]. A similar treatment of adaptation is used by Fang [25] to examine the driving forces for inter-firm adaptation.

In the context of climate change adaptation, there is no common understanding of what adapting to climate change entails for businesses. Sometimes, adaptation is confused with mitigation [18]. This is not surprising as climate change adaptation by business is a relatively new idea. In spite of this, there is emerging commonality of how governments, the private sector and academic researchers approach climate change adaptation. In 2001, the Intergovernmental Panel on Climate Change (IPCC) defined climate change adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities"[26]. Brooks and Adger [27 ,p168] simplify this definition by describing climate adaptation as "adjustments in a system's behaviours and characteristics that enhance its ability to cope with external stress"

In marketing, adaptation is considered in the context of inter-firm relationships (often between seller and buyer or supplier and customer). This concept of inter-firm adaptation was first used in the Industrial Marketing and Purchasing (IMP) group [28-31]. For example, Hakansson [29] introduced an interaction model including adaptation as one important element of a long-term relationship; Turnbull and Valla [30] attempted to quantify adaptive behaviours and distinguished it between usual and unusual adaptations; Hallen et al. [31] investigated the relationship between relative power, commitment, trust and adaptation. However, these researchers did not provide a definitive definition of adaptation. Their examinations were either limited by supplier's perspectives and exclude adaptations made by customers or concentrate too narrowly on managerial variables [32].

Halinen [33] in her PhD thesis distinguishes between active adaptations (investing) and passive adaptations (adapting). However, she also observes that these are actually two sides of the same phenomenon. An adaptation in one situation may also be seen as an investment in another. According to her, adaptive behaviours are a response to different parties in the suppliers' surroundings. The response can be towards the buyer, another supplier in the supply chain, another potential buyer or to industry norms, for example, environmental requirements.

Brennan and Turnbull [32] identify an alternative approach to define the concept of adaptation. Instead of focusing on the outcome of adaptation behaviours as previous researchers suggested, they propose focusing on the behaviours itself. Following this, adaptation is described as "behavioural modifications made by one company, at the individual, group or corporate level, to meet the specific needs of another organisation". Since then, this definition has been widely used by other researchers in the IMP group.

More recently, in a study to investigate the drivers and outcomes of importer adaptation in international buyer-seller relationships, Leonidou et al. [34] express adaptability as the firm's ability to respond to environmental and other forces as a means of surviving and succeeding in the market.

For the purpose of examining environmental adaptive capacity of SMEs, the definitions provided by Halinen [33] and Leonidou et al. [34] are the most relevant. In other words, environmental adaptation is the process in which the firms

respond to environmental requirements from different parties. Firms' environmental adaptive capacity is their ability to respond to environmental requirements.

2.2 The Environmental Adaptation Process in Developing Countries

Current literature is not adequate to understand the environmental adaptation process at SMEs in developing countries. However, it provides insights about adaptation in different business context, including supply chain management [35], buyer-seller and supplier-customer relationships [17, 32, 34, 36-40], decision support systems [41], firm economizing behaviours [42], investor strategy development [43], product adaptation [44], and cultural adaptation [25].

Literature on SMEs and environment is also very well-established [3, 45-47]. There is a lot of information on the impact of regulations on SMEs' environmental performance [48-50]. Much of the research in this area discusses the difficulties experienced by SMEs when developing and implementing environmental policies and practices [3, 46, 47, 51, 52].

Gladwin [53] argues that understanding of environmental management could be further developed by making use of material from other streams of management research. There are two relevant streams of the research literature on adaptation that are reviewed below: climate change adaptation, with a focus on business adaptation to climate change, and inter-firm adaptation.

2.2.1 Business adaptation to Climate Change

David et al. [18] provide a synthesis of academic theories regarding business adaptation to climate change in their report to the Network for Business Sustainability. The review includes more than 200 sources, from the public and private sectors and academia dating from 1997 to 2009. They discuss theories that focus on understanding the impacts of climate change on business practice, and a variety of models used to when, why and how business may adapt.

Analysis shows that theories of business adaptation to climate change are still at a very early stage. Most literature in the area does not go beyond simple definitions or taxonomies borrowed from the IPCC or other sources [54, 55]. Some researchers studied the impacts of climate change on business through the application of climate change scenario models [56-60]. These scenarios are useful in modelling potential risks or opportunities to business providing the underlying assumptions are correct; however, their contribution to understanding how and why businesses may adapt is limited. Other progress is in terms of the organizational learning models. The tourism sector has taken a sophisticated approach making use of potential climate impact scenarios [54, 61, 62]. However, two major limitations are apparent. First, the application of existing cross-disciplinary approaches to the field is quite limited. And second, there is limited empirical work upon which to base new theory.

2.2.2 Inter-firm Adaptation

When does Adaptation occur?

Adaptations occur in business relationships when one or both parties respond to the changing conditions to which they are exposed [31]. Such changes include new requirements to products systems, operational process, logistic systems or financial procedures. The introduction of environmental requirements also changes the behaviours of the companies and therefore can lead to adaptation [39].

More specifically, with respect to environmental adaptation, the process will start when the companies try to align their activities with the environmental criteria of their partner companies [20, 63]. This process will be repeated as companies acquire new knowledge regarding the environmental impact of their activities and their understanding of the environmental requirements and capabilities of exchange partners develops [39].

When starting the adaptation process, the companies make decisions on different levels of adaptation. The level of adaptation is influenced by materials resources, including human resources, finance and technology [64]. In addition, the level of adaptation is also determined by the way companies choose to adapt, either actively or passively. When the company chooses to invest (active), the level is higher than when it just adapts (passive) [33, 36]. When the company is forced to adapt (because of the legislation for example), the adaptation level is limited [65]. The higher the level of adaptation, the higher is the environmental complexity that can be handled by the firm [66].

The adaptation process

Understanding the adaptation process would help identify the barriers for enhancing adaptive capacity [67]. It is, therefore, important to examine the key steps involved in the adaptation process.

Dunn [68] divides the process of adaptation into two sub-processes - adaptive specialization and adaptive generalization. Chakravarthy [66] defines adaptive specialization as the rationalization of the process and adaptive generalization as the process that improves the survival potential of the organization. He claims that the aim of adaptive generalization is to enhance the capacity of a firm to move it to the next stage of adaptation. This division is useful but it remains unclear about the steps involved in the process. Thus, it is not possible to identify the key success factors or barriers of an environmental adaptation.

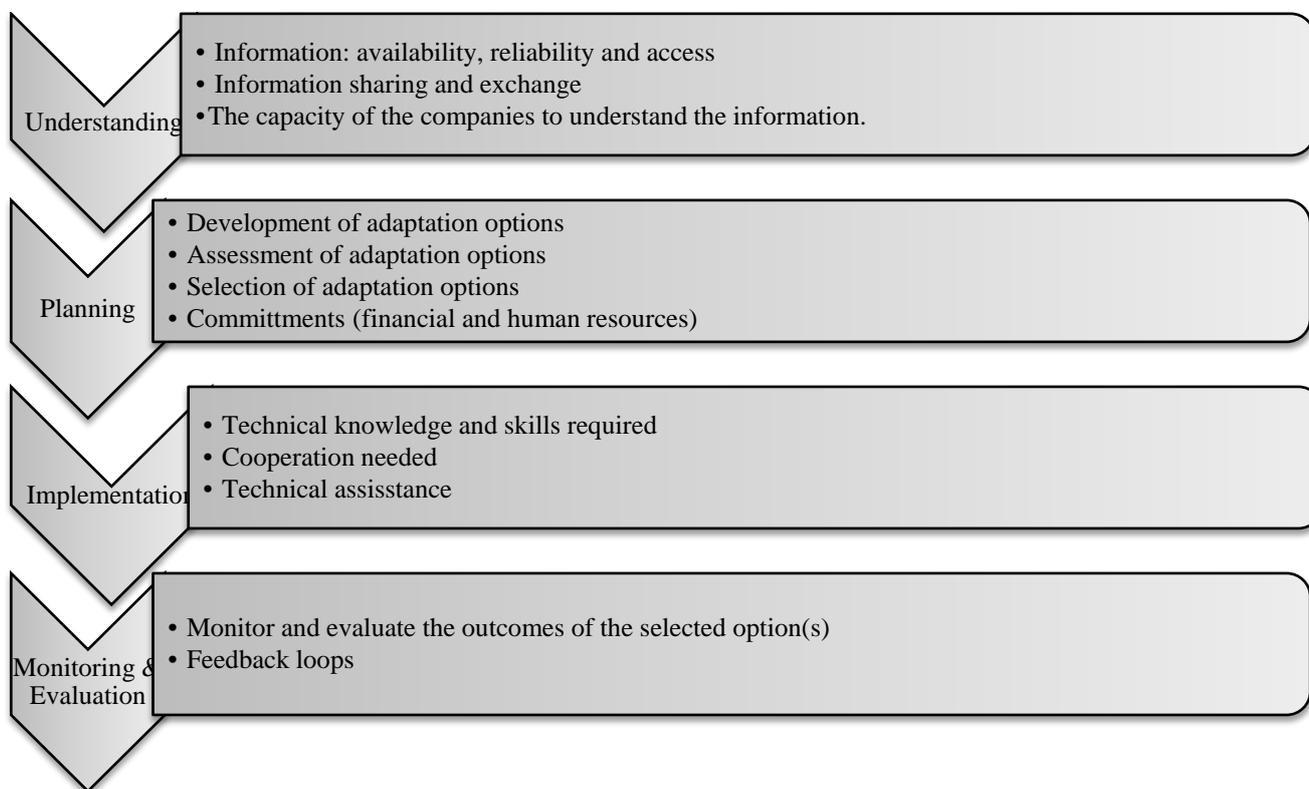


Figure 1: The adaptation process (adapted from Louise and Stuart [17] and Moser and Ekstrom [67])

Figure 1 sets out the four steps of the environmental adaptation process. Understanding (Step 1) involves the stages of awareness raising; information exchange and negotiation. During this step, the decision makers are provided with knowledge and responsibilities, the two parties share understanding of the nature of the problems and agree on issues to be addressed. Planning (Step 2) involves the development of adaptation options; assessment of options; and selection of options. The two parties make a commitment to the selected options. Execution (Step 3) is the step where the actual tasks of adaptation take place. While the companies closely interact with each other through a series of negotiation and commitment in the first two steps, they take action individually during the implementation stage. Finally, the management phase (Step 4) involves monitoring and evaluation of the outcomes of the realized options.

Forms of Adaptation

Depending on the firm's adaptive behaviours, adaptation has been classified into five main types [29, 31, 34, 69]:

1. Adaptation of the product specification, product design and manufacturing processes,
2. Adaptations in the delivery procedures,
3. Adaptations in stockholding,
4. Adaptations in the administrative procedures,
5. Adaptations in the financial procedures.

Inter-firm adaptation has also be classified based on the outcomes of the adaptive behaviours [32]. There are five dimensions of such adaptation:

1. Resource commitment

2. Proactive or reactive
3. Voluntary or coerced
4. Reciprocal or unilateral
5. Formal or informal

Depending on the focus of the study, i.e. the process or motives of adaptation, one of these classifications would be considered.

3 UNDERSTANDING THE COMPLEX NATURE OF ENVIRONMENTAL ADAPTATION

3.1 A systems approach

This paper adopts the definition of a system from Newell and Wasson [132, p5]: “a system is something composed of discernible parts (elements, agents) that interact to constrain each other’s behaviour. It is these *mutual constraints*, operating between the parts of the system that limit the range of behaviours available to the system as a whole and thus give rise to its “emergent” or synergistic properties”.

The issue of complexity within systems was realised in the early stages of systems thinking. Boulding [70, pp.14-16] presents eight level of complexity:

1. Framework of static structure
2. The clockworks of physics and astronomy
3. The control mechanism or cybernetic system
4. The cell or self-maintaining structure
5. The genetic or plant level
6. The animal level with purposive behaviours and self-awareness
7. The human level
8. Social organization or individuals in roles

As environmental adaptation involves social organizations and individuals in roles, it fits into the highest level of complexity.

In addition, Seng [71] views the complexity of a system in terms of its level of detail and dynamism. Detail complexity refers to the number of components or elements within the system. Dynamic complexity relates to the interaction and feedback between all the components of the system and between the system and its external environment. Based on this explanation, environmental adaptation is highly complex in both details and dynamics. Environmental adaptation is even more complex than previous adaptive challenges. It involves the usual human elements (managers, workers, trade associations, buyers, suppliers, regulators, and local communities), financial elements (investment), and institutional elements. These elements interact with each other in the environmental adaptation process.

Further evidence to prove that environmental adaptation is a complex system can be found from Flood and Jackson [72] who consider general characteristics of complex systems such as the inclusion of a larger number of elements; many dynamic interactions between the elements; or subject to behavioural influences.

Obviously, environmental adaptation is a complex phenomenon and to understand it, an approach is required that can cope with complexity. Such approach must be able to investigate both the principles common to all complex entities and the models which can be used to describe the environmental adaptation process. It must be also able to explain the forces at play in the complex interaction of the environment and the human society. Applying this thinking, environmental adaptation is a system of interrelated parts, operating within the wider systems of the national and international societies and their economies. This systems approach emphasises the role and importance of the context, the ways systems can reach the goal through different paths, and the structural, behavioural, and developmental features that are shared across systems [73].

3.2 Environmental Adaptation as Complex Adaptive Systems

The complex system approach has its origin in von Bertalanffy’s General System Theory (GST) [74]. According to this theory, the complex system consists of large populations of interacting agents that form a dynamic network. The behaviour of a complex system emerges from the behaviour of and interactions between its isolated elements [75]. GST recognises that there are limitations in looking at how two components affect each other by considering them as two

individual components links by a causal or correlation relationship. The contribution of this theory is to consider a new way of thinking that allows the study of interconnections among systems [73, 76] . It attempts to solve problems by looking the whole picture instead of analysing its individual components. The focus is on the interconnectedness, understanding the relationships between the components of the system, how they fit together and how they interact with each other [77].

Burn and Stalker [78], Katz and Kahn [79] and Taylor [80] made a significant contribution to GST by discussing the concepts of open systems and closed systems. According to these authors, organizations are considered as open systems, which present “organismic” alternatives. Individuals, groups, and departments are treated as “mechanistic” closed systems. Each individual worker as a closed system performs his or her duty but having little contact with the rest of the organization. Traditional strategic planning is a classic example of closed system thinking that focused only on organizational goals without consideration to the external environment [73].

Open systems are far less stable than closed systems. Organizations as open systems exist in a continuous interaction with the environment. Different environments require different organization structures and therefore structures are more flexible.

Ison et al. [81] proposed the concept of “hard systems” and “soft systems”. Hard systems are engineering-based approached, focusing on mathematical models of feedback, control and communication while soft systems approaches incorporate the understanding that the same system can be considered differently by various stakeholders [81]. Soft systems methods stress uncovering assumptions and worldviews, consensus building and participation [73], which can be facilitated with the use of causal loop diagrams.

After its initial successes, GST was criticized mainly because of its equilibrium orientation. Although GST introduced the concept of open systems with the potential for disequilibrium, social science puts much emphasis on the importance of maintaining equilibrium in the face of turbulent environment [73].

Systems thinkers such as Ackoff [77], Bateson [82] and Flood and Jackson [72] enriched the systems theories with various approaches and perspectives such as “inquiry systems” or “organization learning”. In particular, chaos and complexity theories have become closely linked with the holistic strain of thought associated with GST under the generic label of “new sciences” [73]. The term of “new sciences” refers to the application of findings from quantum physics, evolutionary theory, and chaos and complexity theories [73].

Complex Adaptive Systems (CAS) emerges from those “new sciences”. CAS was first established by researchers at the Santa Fe Institute in New Mexico, USA. One of the largest contributors to the inception of the field from the perspective of adaptation was Holland [75].

Comparing to GST, CAS are more evolutionary than revolutionary. They do not negate the findings of GST but complement the limitations that GST may have in some types of systems [83]. There are three interrelated building blocks in CAS: non-linear dynamics, chaos theory, and adaptation and evolution [83]. A complex adaptive system modifies its behaviours to adapt to changes in its environment through interacting with and learning from its environment. It represents a special case of complex systems as it has the property of adaptation meaning that it is able to learn and evolve. This evolutionary capability makes CAS resilient because they can respond to changes in the environment.

The theory of Complex Adaptive Systems provides a framework for understanding changes in situations with a number of interacting variables, which is typical of an environmental adaptation process. Therefore, CAS can be considered as a theoretical framework for understanding the environmental adaptation process at SMEs in developing countries.

4 A FRAMEWORK FOR CONCEPTUALIZING THE ADAPTIVE CAPACITY OF SMES IN RESPONSE TO ENVIRONMENTAL REQUIREMENTS

This section attempts to develop a conceptual framework for understanding the adaptive capacity of SMEs in response to environmental requirements. It includes two parts. The first part identifies conceptual aspects of environmental adaptation and the second part analyses the key elements influencing the environmental adaptation process as a CAS.

4.1 Conceptual Aspects of Environmental Adaptation

When considering environmental adaptation as a system, each of the factors influencing the environmental adaptation process could be considered as an element of the system. These elements are complex systems themselves and have their

own behaviours. If properly designed, the interaction between these elements can increase the strength of the system and making it more adaptable to changes.

There are three key elements of business adaptation: key actors and their attitudes; the firms and their characteristics; and the broader system context of organizations and institutions [67, 84, 85]. It is, therefore, important to: (i) identify who the key actors in the environmental adaptation process are and whether their attitudes and behaviours have any influence on the adaptive capacity of SMEs; (ii) consider if the characteristics of the SMEs such as ownership type, size and age have any influence on the adaptive capacity of the SMEs; and (iii) examine the role and the influence of the institutions, especially the governmental governance and corporate governance, towards the enhancement of SME adaptive capacity. We return to this in section 4.2 of this paper.

Those key elements should be modelled at each of the steps of the environmental adaptation process (section 2). The relationships between these elements and how they interact with each other can also be modelled so that we can understand how the whole system influence SME adaptive capacity and under which conditions and at what stage the adaptive capacity of SMEs is highest.

Furthermore, as environmental adaptation is a complex adaptive system, it is essential to model its elements at various spatial and temporal scales because their behaviours will adapt to changes in its environment through interacting with and learning from its environment. Figure 2 is an attempt to conceptualise the SME adaptive capacity when responding to environmental requirements.

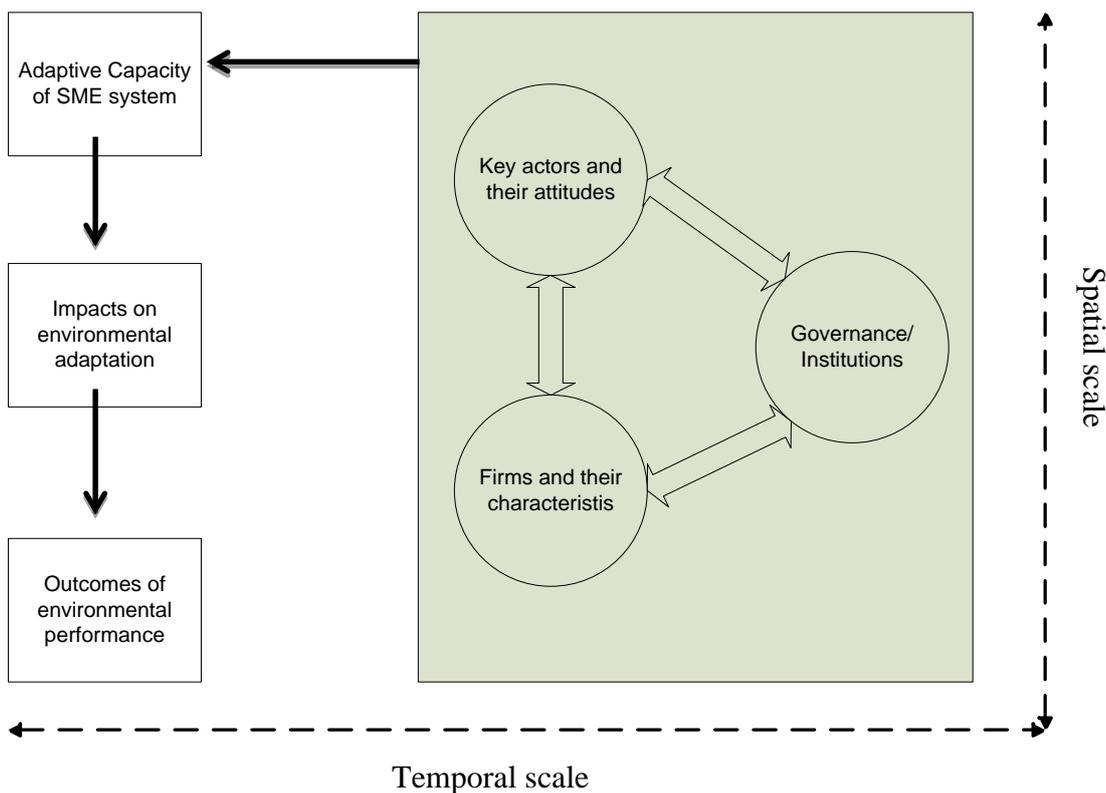


Figure 2: A framework for conceptualizing the adaptive capacity of SMEs (adapted in part from Murta et. al, 2012 [134])

4.2 Understanding Key Elements of the Environmental Adaptation Process

4.2.1 Key Actors and Their Attitudes

Environmental adaptation is to do with people, their attitudes and behaviours. Therefore, it is crucial to understand who the key actors are and how they influence the environmental adaptation process [86].

The issue relating to key actors of corporate environmentalism has been studied by many researchers [20, 87, 88]. Results suggest that organizations are driven to environmental responsibility by pressure from stakeholders [89]. Donaldson and Preston [90] consider three aspects of this theory as descriptive accuracy, instrumental power and normative validity. However, the inclusiveness of this theory makes it difficult to recognize which stakeholder play the most influencing role in corporate's environmental responsiveness [91]. Giving a remedy to this problem, Mitchell et al. [91] propose that stakeholders with power, legitimacy and urgency would be regarded as salient by managers of a firm. Sandhu et al. [20] test this theory in the case of India. Interestingly he found that stakeholders such as employees, local communities, and Non-government-organizations (NGOs) are not the driver for the adoption of organization's environmental responsiveness. In India, the stakeholders who control the resources (supply chain buyers) or supply chain customers are most powerful in terms of forcing business organizations to respond to environmental requirements.

With regard to the attitude and behaviours of the key stakeholders in environmental management, current literature has been using different theories, including game theory; planned behaviours theory; resource-dependence theory and various models, namely early US linear progression models; altruism, empathy and pro-social behaviours models; and sociological models [92-95].

Game theory refers to the study of methods in which strategic interactions among players produce outcomes with respect to their preferences, either intended or not [96]. Within a game theory, an agent is defined as an entity with a preference while a game is considered as any situation where at least one agent can act to maximize their preference, either consciously or unconsciously.

Game theory is one of the main analytical tools for addressing strategic issues such as behavioural assessment in the field of economics and business management. For example, inter-firm behaviours has been modelled using game theory by Camerer [97]. This theory has recently been increasing its influence in other fields of social sciences, including natural resource and environmental management [92]. Dinar et al. [93] study this theory in relations to policy making in natural resources and environment. It is also used to analyse the enterprises' behaviours under environment taxation [98]. The research results from this study indicate that the enterprises adopt all kinds of game countermeasures to circumvent the laws and ordinances governing the environment taxes in order to maximize their profits.

However, Levy [99] raises the criticism that game theory's models tend to presume the emergence of equilibrium and do not adequately reflect industry dynamics. In addition, Camerer [97] also reports that game theory is hard to use and test as it generates customized models of local settings rather than general circumstances, therefore it offers only part of the advice a manager needs.

The theory of planned behaviours characterises behaviours as depending on three factors: (i) attitudes, defined as a "learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object; (ii) subjective norms, referring to individuals' perceived social pressure to perform or not to perform a behaviours; and (iii) perceived behaviours controls, an individual's perceived ease or difficulty of performing the particular behaviours [100].

Papagiannakis and Lioukas [95] use this theory to model the corporate environmental responsiveness in Greece. The study focuses on the link between values, attitudes and perceptions of the managers and their firms' environmental response. It finds that managers' personal values indirectly influence responses through shaping their environmental attitudes while their perceived ability to handle environmental issues has a great influence on responses.

In a similar study, Lopez-Gamero et al. [101] studied the relationships between managers' perception, environmental regulations and proactive environmental management. Results from this study show that when environmental regulations stem from command-and-control legislation, its influence on managers' perception and proactive environmental management is not significant. On the contrary, if regulations stem from voluntary norms, its effects are more positive.

Inter-firm adaptation studies also consider managers' behaviours, experience and commitment as important factors having a direct impact on adaptation [17, 29, 34].

Though communication has no direct effect on manager's commitment, it does influence cooperation and subsequently leads to adaptation [34]. Communication also plays an important role in negotiations between the two parties during the adaptation process. Moreover, in order to increase the managers' commitment to an adaptation process, communication

needs to serve the educating of these managers on relevant environmental issues and introducing them to environmental responsibilities [39].

Another important factor influencing the attitude and behaviours of key actors in the environmental adaptation process is social norms and cultural traditions [25, 102, 103].

Finally, the attitudes and behaviours of key actors in environmental adaptation are influenced by the motives for adaptation. There are four main motives for relational adaptation. First, adaptation occurs because companies desire to improve the relationships with their partner(s) [39]. Adaptation by a company to meet the performance criteria of a partner organization is a signal that the company can be trusted [69, 104]. This influence of motivation on the company's adaptive actions is explained as the concept of organizational identities in the study of Sandhu et al. [20]. Second, adaptations occur because of the need to respond to elements of uncertainty [16, 39]. The uncertainty elements occur because of legislative and market dynamics. For example, in the cases cited by Louise and Stuart [39], the companies anticipated that there would be legislation threatening a number of countries where they do a lot of business so they concluded that it is "better [to] be proactive about this and not wait for the legislation to arrive"[39, p229]. Third, the motives behind making relational adaptations can be monetary [29]. One or both parties need to make the necessary adjustments in order to increase the financial benefits (sales and profits) for both parties. In some cases, adaptations are stimulated in order to achieve cost improvements (reduce its own internal waste and recycling costs, reduce the cost of packaging and disposal) [39]. And lastly, adaptive behaviours may be influenced by power balance [105]. In other words, adaptations occur because of the high degree of dependence of the supplier on the customers. This theory is based on the resource-dependence theory of Pfeffer and Salancik [106] who suggest that organisations achieve their own goals by shaping the behaviours from other organisations by using their power.

4.2.2 The Firms and their Characteristics

Significant efforts have been made to understanding the relationships between firm characteristics and firm performance. The main characteristics of the firms include ownership types, size, age and gender-related issues [107, 108].

In previous studies on the relationship between ownership type and the firm performance, researchers have been guided by theories such as organizational theory [109], the theory of firms [110] or agency theory [111, 112]. Some organizational theorists suggested that different forms of ownership did not affect firm's strategy or performance [109]. They rest on the assumption that all investors have the same investment goals and will therefore behave in the same way with regard to corporate outcome. However, Chen et al. [113] argued that different types of owners have different objectives and motivations and this will affect how they exercise their control rights over the firms they invest in. Many other studies supported this argument and confirm that ownership type had a significant impact on firm performance [114-117].

The theory of firms suggests that public enterprises should perform less efficiently and profitably than private enterprises. Boardman and Vining [110] tested this theory and found out that large mixed-enterprises and state-owned enterprises performed substantially worse than similar private corporations, but in terms of sales, there is no substantial difference among companies of different types of ownership. Earnhart and Lizal [118] go on to indicate that an increase of state ownership actually improved environmental performance relative to all other ownership types. Chen et al. [113] also contended that private firms is not necessarily superior to certain types of state ownership.

With respect to the relationship between firm size and age and firm performance, all the literature reviewed shared the same conclusion that firm size and firm age greatly influenced firm performance [116, 119-123].

Concerns about the relationship between owner-manager gender and firm performance are a reported issue. All the studies reviewed support the view that there is no significant difference in firm performance between businesses headed by men and women [124-127].

4.2.3 Organizations and Institutions

To understand a complex and dynamic system such as environmental adaptation, we need to understand not only the attitudes of key actors and systems of concerns but also the larger context in which the system operates [67, 75]. The larger context of environmental adaptation at SMEs is the organizations and their institutions.

Throughout the literature, it became apparent that the terms organizations and institutions are often confused. In this review, organizations are players or groups of individuals who are bound together by some common purpose to achieve objectives whereas institutions refer to the rules governing behaviours.

However, organizations and their attitudes and behaviours towards environmental adaptation are one of the key actors of the system. Therefore, this section only discusses institutions. More specifically, institutions in this study include both public and corporate governance.

Institutional theory emphasises the social context in which firms operate and explains the role of institution in shaping organizational responses [128]. Following this theory, if a firm fails to conform to institutionalized norms, its legitimacy and survival is threatened.

In general, public governance is considered as the management of public resources and public administration. Good governance is critical to forming and maintaining both external and internal relationships. Hence, a government is often assessed against indicators of good governance by international bodies [129]. These indicators include: participation, consensus, accountability, transparency, responsiveness, efficiency, equitability, and legal compliance [130, 131].

Corporate governance has now become a worldwide issue of importance. It is as important in the world economy as the governance of countries. Corporate governance defines the relationship of a company with society and is the system by which business corporations are directed and controlled [132]. It specifies the distribution of rights and responsibilities among different individuals and groups in the corporation. It provides a set of rules and procedures for making decisions through which the company objectives are set and performance is monitored.

5 CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Environmental adaptation is a complex phenomenon and it is argued here to be a Complex Adaptive System. The three key structural elements of such system are: (1) key actors and their attitudes; (2) firms and their characteristics: and (3) the broader context of organizations and institutions. These elements are complex systems themselves and have their own behaviours. The interactions between these elements increase the strength of the system and making it more adaptable to changes.

Most of the published studies reviewed focus on developed countries, namely the US, UK, Finland, Italy, Canada, Australia, Spain, and Japan. This observation highlights the need for more research on this topic in developing countries [20].

Most of current studies examine adaptations of firms in general, without a focus on SMEs as a specific target group. Meanwhile, the company's size is a factor that may influence its environmental options [133]. In addition, SMEs are the firms that mostly suffer pressures to improve environmental practices [5]. They are also the group with the greatest problems of adaptation and least awareness of and information on the situation [46]. It is, therefore, very crucial to focus more research on SMEs.

It can be concluded that existing evidence is not adequate to understand the environmental adaptation process of SMEs in developing economies as well as their adaptive capacity in response to environmental requirements. Further studies are essential to address this gap in knowledge and propose socially and culturally appropriate strategies for SMEs in developing countries. We suggest three priority areas:

The first is to investigate who the key actors in the environmental adaptation process of SMEs in developing countries are and how their attitude and behavior influence the adaptive capacity of the firms.

The second is to understand the relationships between firm characteristics and firm performance. In other words, we should examine if the firm characteristics of SMEs in developing countries have any influence on their adaptive capacity in response to environmental requirements.

Finally, considering the importance of institutions in shaping organizational responses, an examination of the relationship between institutions and the adaptive behaviours and capacity of SMEs in developing countries in response to environmental requirements is needed.

These studies would establish a new stream of research, namely investigating the environmental adaptation process and adaptive capacities of SMEs in developing countries. This will have four important outcomes. First, it provides descriptive evidence about the environmental adaptation process taken by SMEs in developing countries. Second, it helps the governments and international donors improve the efficiency and effectiveness of their supportive programs to SMEs. Third, it serves SME managers in their quest to learn how to successfully adapt to environmental regulations. Finally, findings of such studies will be useful for the suppliers and buyers in developed countries as many of the SMEs in developing countries are now taking part in the international supply chains.

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