

# Does agility foster sustainability: development of a framework from a supply chain perspective

**Samudi Perera, Claudine Soosay, Sukhbir Sandhu**

School of Management, University of South Australia Business School, Adelaide, SA 5001, Australia  
[samudi.perera@mymail.unisa.edu.au](mailto:samudi.perera@mymail.unisa.edu.au), [Claudine.Soosay@unisa.edu.au](mailto:Claudine.Soosay@unisa.edu.au), [Sukhbir.Sandhu@unisa.edu.au](mailto:Sukhbir.Sandhu@unisa.edu.au)

## **Abstract**

Supply chains need to possess agile and sustainable characteristics to achieve competitive advantage. Currently there is very little knowledge about how these two approaches interact within a supply chain. Drawing on the dynamic capability perspective, social capital theory and the related literature, this paper develops a conceptual framework depicting how agility and sustainability are related in manufacturing supply chains. We argue that agility as a dynamic capability strengthens the social capital of firms and enables social, environmental and economic sustainability within the supply chain. The paper concludes with describing the methodological approach and empirical analysis to be undertaken, as well as explaining the theoretical and practical implications of the proposed study.

**Key words:** agility, sustainability, dynamic capability

**Topics:** sustainability, lean and agile, and supply chains

**Methodology:** Theory and/or research framework

## **Introduction**

Agility and sustainability are two approaches that enable firms to obtain competitive advantage. Agility is the ability to understand changing market needs and respond quickly to them. One reason for market changes is the evolving stakeholder requirements on sustainability issues. Even though Carter and Rogers (2008) suggested agility as an approach to be sustainable, many researchers hold the view that agility and sustainability are contradictory to some extent (Halldórsson et al., 2009; Melnyk et al., 2010). Nevertheless, agility is a capability that drives competitiveness. Sustainability represents performance in a broader perspective by extending traditional economic-based performance to incorporate environmental and social aspects. There are limited studies that have explored the relationship between these two concepts and its application in supply chain management. Based on an extensive literature review, we provide justification for empirical investigation into the area and propose a research framework underpinned by relevant theories.

The term 'supply chain management' refers to managing relationships between upstream and downstream partner firms in order to add value to products while reducing costs to all the firms in the chain (Christopher, 2011). A supply chain perspective is significant for manufacturing industries along with the constant changes to the industry, where firms tend to focus on activities they are more competent in and outsource the other non-core activities to other firms. With this situation, the management of

companies associated with the activities from material extraction, manufacturing, and distribution to customers, to receiving products at the end-of-life cycle became significant. This view changed the long held notion of competitiveness among firms to a new view in which competition is between supply chains rather than between firms (Christopher, 2000).

In present volatile and turbulent market conditions, changes are caused by factors such as shortening product life cycles, technological advancement, increasing commodity markets and disruptions to supply chains. In such circumstances, markets demand products in a variety of specifications, and manufacturers need to be in line with these changing requirements to overcome competition. As a result, forecast-based and inventory driven approaches to managing supply chains become obsolete. Moreover, market winning criteria shifted to availability of products in the market (Christopher & Holweg, 2011). The requirement for competitive advantage rests on the ability to recognise and respond to market changes in a timely manner (Christopher & Holweg, 2011; Braziotis et al., 2013). In other words, success lies in the ability of being agile to adapt to market changes (Lee, 2004; Roh et al., 2011).

On the other hand, companies face the challenge of increasing input material costs and decreasing availability of raw materials for production (specifically natural resources and energy) which have instigated them to reduce their environmental impact (Holt & Ghobadian, 2009; Golicic & Smith, 2013). The increasing trend to outsource activities especially to low-wage countries has raised issues of child labour, sweatshops, damages to natural resources and unethical practices (Maloni & Brown, 2006; Gimenez & Tachizawa, 2012; Wolf, 2014). Consequently, the performance of supply chains in manufacturing industries also needs to incorporate sustainability apart from being agile.

Agility as a capability in the supply chain (Charles et al., 2010; Carvalho et al., 2011; Naim & Gosling, 2011) represents the ability to adjust frequently and this reflects the dynamic nature of the capability. Previous studies have confirmed that in order to successfully compete in current markets, supply chains need to be dynamic (Defee & Fugate, 2010). Markets in which sustainability determines competitiveness require dynamic capabilities (Beske, 2012). Companies must be able to recognise sustainability requirements and adjust their structures and processes to implement sustainability practices. In such circumstances, the capability to adjust sustainable practices to align with stakeholder requirement is important. A literature review shows limited studies in the area. Pagell and Wu (2009) found that companies with sustainable supply chains have implemented industry best practices and inculcated new behaviours to develop such practices. Parmigiani et al. (2011) have noted that the capabilities developed in the past may not be appropriate to meet social and environmental needs. They suggest the need for new capabilities accordingly. Additionally, Beske (2012) advocates that dynamic capabilities enable supply chains to become sustainable. None of these studies have examined how specific capabilities or new behaviours influence sustainability, in particular, how agility as a capability influences sustainability. The lack of understanding of the impact of capabilities calls for research into the area.

In this regard, there are gaps identified in the literature. First, researchers have examined agility and sustainability in supply chains separately. A number of studies are available in each area examining drivers, antecedents and how they relate to organisational performance. Researchers have asserted that supply chains excel from various capabilities, performance outcomes and have emphasised the need for agility and sustainability (Melnyk et al., 2010). But the literature does not provide adequate insight into the link between agility and sustainability in supply chains. Second, agility is positioned as a dynamic capability in the literature and sustainable supply chain

studies highlight the need for dynamic capabilities in attaining sustainability (Beske, 2012). With this view, the link is clear, but previous studies tend to be anecdotal in nature (e.g. Halldórsson et al., 2009; Melnyk et al., 2010), and have not examined this significance of agility being a capability in enabling sustainable supply chains. This study intends to explore the impact of agility on sustainability in supply chains. In measuring sustainability, the study adopts the Triple Bottom Line (TBL) referring to the three dimensions of social, environmental and economic sustainability. This study investigates the impact of economic sustainability as an aspect of sustainability. However, studies dealing with agility in supply chains have examined how agility impacts on economic performance and have neglected the impact on social and environmental sustainability. This study fills the gap and intends to investigate how agility impacts on sustainability (Naim & Gosling, 2011).

The proposed study aims to address the knowledge gap by developing a research model to extend the understanding between agility and sustainability in supply chains. The model assumes that the agility is a dynamic capability and sustainable supply chains require capabilities of a dynamic nature to be sustainable. It further proposes that such dynamic capabilities accumulate social capital within firms to enable sustainability along the supply chain. Based on the above argument our central research question for the study is ***“What is the relationship between agility and sustainability of firms in the supply chain”***. The model is developed in the context of a manufacturing supply chain. The next section starts with clarifying the concept of capability. Then it reviews studies on agile and sustainable supply chains and positions this paper on capabilities developed through agility enabling sustainability in supply chains. After that it provides the theoretical underpinning to the proposed framework followed by the hypotheses. The paper concludes by describing the next steps to empirical investigation and emphasising the contribution to theory and practice in supply chain management.

## **Literature Review**

### *Capabilities, agility and sustainability in supply chains*

Since capabilities are important in supply chain issues, it is important to clarify the concept and identify capabilities in the supply chain context. A capability refers to an organisational ability to achieve end results using resources by coordinating a set of activities. Capability is defined as “a high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization’s management a set of decision options for producing significant outputs of a particular type” (Winter, 2000, p.983). Accordingly, capabilities are developed through routines followed by firms and also accumulated with the tacit knowledge such as know-how and leadership (Wang & Ahmed, 2007). According to Teece et al. (1997), capabilities include organisational skills, resources, and functional competences.

Two main classifications of capabilities are operational and dynamic (Helfat & Peteraf, 2003). Operational capabilities entail performing an activity with a collection of routines that have direct impacts on a firm’s output. Operational capabilities refer to the ability of a firm to perform its main function. In contrast, a dynamic capability does not involve the production of goods or services; rather it builds, integrates and reconfigures operational capability (Helfat & Peteraf, 2003). Therefore, dynamic capabilities do not directly affect a firm’s output; but indirectly impact through operational capabilities. The strategic management theory of dynamic capability can be adopted to explain the concept. The dynamic capability perspective will be discussed later in the article. Both

these capabilities have two routines: performing individual task and coordinating tasks (Helfat & Peteraf, 2003).

Literature has recognised the need for capabilities to attain competitive advantage at the firm level (Teece, 2007; Barreto, 2010; Barney, 2012). Equally, it demonstrates the applicability to the supply chain level. Firms in supply chains should develop capabilities to perform individual activities and to manage other firms to achieve the overall objectives. The management of other firms involves activities such as developing relationships, sharing knowledge and information and influencing the behaviour of others. Accordingly, processes followed and available resources such as human skills and relational and human capital in supply chains contribute to supply chain capabilities. These capabilities represent the social capital developed within the supply chain. Supply chains therefore utilise the social capital of firms in the supply chain to attain competitive advantage. The view of social capital is discussed later in the article.

### *Agile supply chains*

An agile supply chain, being a supply chain strategy, is a network of companies in which firms are highly connected through shared information and flexibly work towards a common objective (of being agile). The basis for agile supply chain is sharing information among the key supply chain partners which provides visibility in operations (Christopher, 2000) by making available accurate and timely information. Therefore, direct access to real time demand, inventory and other operational information (Christopher, 2000; Lee & Whang, 2001, 2004; Braunscheidel & Suresh, 2009) enables firms to be aware of market changes. Information sharing moderates the capability of a supply chain to respond (Simatupang & Sridharan, 2005).

With shared information, supply chain partners can exchange knowledge to synchronise decisions relating to the planning and execution of demand forecasts, inventory replenishments and product and service designs (Lee & Whang, 2001, 2004; Simatupang & Sridharan, 2005). Coordinating these activities enables supply chains to collectively adjust for market changes (Simatupang & Sridharan, 2005). Therefore, joint planning becomes a key component (Agarwal et al., 2007). Together, information sharing and joint planning permit buyers and suppliers to work in collaboration (Christopher, 2000; Simatupang & Sridharan, 2005) to integrate processes to coordinate workflow activities such as production, planning, operations, procurement and order execution. Coordinated workflow activities among firms increase efficiency, accuracy and speed of response in the supply chain (Lee & Whang, 2001, 2004). Therefore, integrating processes with buyers and suppliers is vital to responding to market changes (Li & Lin, 2006). This is further supported by information and communication technologies (ICT) through business process automation in procurement, order execution, design optimisation and financial exchange (Lee & Whang, 2001, 2004). Information sharing, collaboration and joint planning are only possible through sharing common views by supply chain members which can be achieved by inter-organisational relationships developed through trust and commitment (Li & Lin, 2006).

With these characteristics, an agile supply chain provides firms with certain capabilities, such as: market sensitivity, synchronisation of supply with demand, production using high technology, innovative products with shorter time frames, reduction in delivery lead times and exploitation of unexpected market changes in a cost-effective manner. Therefore, agility is an externally oriented capability (Swafford et al., 2006; Baramichai et al., 2007; Braunscheidel & Suresh, 2009; Ngai et al., 2011; Blome et al., 2013). The agility of a supply chain is dependent on the ability of other

firms in the supply chain to collectively respond to market requirements. Therefore, agility requires a coordinated approach in the supply chain.

Enriching agile capabilities along the supply chain by linking with partners leads to the development of the concept 'supply chain agility' (SCA). A common theme is that SCA is a business-wide capability that enables firms to respond to changing market environments involving both the competencies and resources of the supply chain. Therefore, SCA is sometimes referred to as the 'firm's supply chain agility'. In other words, agility is viewed as a capability of the firm. The firm needs to influence and enable its partners in the supply chain to be responsive. The whole supply chain becomes agile when all the parties in the supply chain have SCA. Consequently, an agile supply chain is a result of the cumulative capabilities of agility of each partner firm in the supply chain (Christopher, 2000; van Hoek et al., 2001; Kumar & Ramakrishna, 2011). In order to avoid the confusion, this study refers to the term 'agility' hereafter to represent agility at firm level that enables supply chain partners to attain agility. Agility has been interpreted in supply chain studies as the coordination and integration of different internal and external parties and functions along the supply chain by aligning their collective capabilities efficiently and effectively to market changes (Braunscheidel & Suresh, 2009; Chakraborty & Mandal, 2011; Ngai et al., 2011; Gligor & Holcomb, 2012; Sukati et al., 2012). This view implies that the agility as a dynamic capability enables the social capital of the firms in the supply chain.

Despite the plethora of research that identifies agility as a capability to respond to dynamic market conditions, only a few studies have recognised it as a dynamic capability (e.g. Chiang et al., 2012; Gligor & Holcomb, 2012; Blome et al., 2013). Among the studies, Gligor and Holcomb (2012) examined the effect of agility as a dynamic capability on operational and relational outcomes. Furthermore, Blome et al. (2013) examined the impact of agility as a dynamic capability on operational performance. Therefore, the area of agility as a dynamic capability is emerging and warrant more research. One particular area is investigating the need for agility in impacting sustainability performance.

### *Sustainable supply chains*

Sustainability issues have received increased attention in many political and business agendas in the 21st century (Linton et al., 2007). The widely acknowledged concept of sustainability is meeting the needs of the present without compromising the needs of the future (World Commission on Environment and Development [WCED] 1987). The concept of sustainability has a variety of interpretations (Szolnoki, 2013). The widely accepted explanation applied in business is the framework developed by Elkington (1997) which is known as the TBL refers to the three dimensions of social, environmental and economic sustainability. Until recently, the majority of sustainable supply chain research focused on environmental sustainability only, while a few considered social aspects in supply chains or all three dimensions together (Ahi & Searcy, 2013). Firms adopt various practices under each of the dimensions to attain sustainability as well as enabling supply chain partner firms to be sustainable.

The premise of social sustainability is 'social equity' which ensures equal access to all people for resources and opportunities (Bansal, 2005). Social sustainability entails management of social resources (Sarkis et al., 2010) that enriches humans in firms within the supply chain and in the wider community (Dyllick & Hockerts, 2002). The study of social sustainability is limited in the supply chain literature (Hutchins & Sutherland, 2008; Ashby et al., 2012; Winter & Knemeyer, 2013). Corporate social responsibility (CSR) in supply chains is considered to provide better insights for the

purview of social sustainability practices in the supply chain (Hutchins & Sutherland, 2008; Ashby et al., 2012), even though some supply chain scholars disagree with its applicability (Sarkis et al., 2010). From the supply chain perspective, CSR means the business ethics, philanthropy, community, work place diversity, safety, human rights and environment (Carter & Jennings, 2002). Social sustainability practices mainly include fair trade, socially responsible purchasing, human resource practices and community activities. Fair trade involves keeping equitable relationships with suppliers and providing better trading conditions with reasonable prices to sustain their businesses (Maloni & Brown, 2006; Park-Poaps & Rees, 2010). Maloni and Brown (2006) state that responsible purchasing decisions should avoid favouritism, preferences, bribery, gift giving and power abuse. Firms which purchase products in a socially responsible manner seem to also produce in a socially responsible manner (Ashby et al., 2012). Therefore, firms insist that suppliers must be responsible in operations and sometimes cooperate to inculcate social responsible practices in suppliers (Carter & Jennings, 2002). The most noteworthy social sustainability practice in the supply chain literature is human resource practices (Pagell & Wu, 2009; Sarkis et al., 2010) which emphasises labour and human rights, provision of health and safety of employees and work-life balance (Maloni & Brown, 2006; Closs et al., 2011). Firms constantly invest in human capital aiming to increase employee well-being, and to create an appropriate work culture (Pagell & Wu, 2009). Studies have shown that all the parties in the supply chain should pay attention to labour rights and laws by forming partnerships especially with suppliers (Park-Poaps & Rees, 2010). Thereby firms demand and help suppliers to adhere to the labour standards acceptable to the supply chain. Social sustainability could also include promoting activities that support initiatives for the improvement of local communities such as education, economic development, health care, literacy and recovery from disaster conditions (Maloni & Brown, 2006; Closs et al., 2011).

Environmental sustainability refers to managing natural resources (Sarkis et al., 2011) which entails the use of energy and other resources and the footprint leave as a result of operations (Gimenez et al., 2012). These activities relate to waste, emission and pollution reduction, energy efficiency, decrease in the consumption of hazardous/harmful/toxic materials, and decrease in the frequency of environmental accidents (Gimenez et al., 2012). Environmental sustainability practices in the supply chain cover the activities adopted at the different stages of the product life-cycle that prevent environmental damage. These practices include green purchasing, eco-design, customer cooperation, reverse logistics, supplier assessment, evaluation and education (Zhu & Sarkis, 2004; Rao & Holt, 2005; Zhu & Sarkis, 2007; Zhu et al., 2007; Eltayeb et al., 2011). In other words, firms purchase products and materials that have less environmental impact (Eltayeb et al., 2011). Green purchasing involves collaboration and educating suppliers (Zhu et al., 2005; Zhu et al., 2007). Supplier collaborations show that the firms engage in activities to improve supplier's environmental performance (Eltayeb et al., 2011). Similarly, firms collaborate with customers to develop common objectives to reduce the environmental impact of the supply chain (Zhu et al., 2007; Eltayeb et al., 2011). Furthermore, firms design environmentally friendly products in conjunction with supply chain partners by way of reduced material usage, improved reusability and recyclability, and use of alternative energy and less hazardous substitutes (Zhu et al., 2007; Eltayeb et al., 2011; Ashby et al., 2012). These activities minimise the total life-cycle impact of the product on the environment.

Economic sustainability refers to the long-term success and competitiveness of firms (Winter & Knemeyer, 2013), which encompasses increased sales, market share, profits and longevity. Sustainability initiatives need investment in environmental management

systems (EMS), health and safety of employees and community activities. As a result, sustainability efforts initially increase cost (Krause et al., 2009) and are not attractive in the short-term especially to small firms (Orlitzky, 2005). However, these activities reduce the cost of material, health and safety issues, lower labour turnover, labour and disposal costs, improve product quality and differentiate the firm's products and operations (Carter & Rogers, 2008; Wagner & Svensson, 2010). These activities are associated with positive outcomes such as increasing sales and profits and a favourable image. Furthermore, sustainability initiatives in the supply chain reduce the risk of firms running into public backlash and avoid future cost of compensation. Therefore, in the long run, sustainability in supply chain increases the economic performance (Carter & Easton, 2011; Winter & Knemeyer, 2013).

Sustainability is only attainable if all the partners in the supply chain are committed to it. Sustainable supply chains address environmental and social issues beyond organisational boundaries while meeting customer needs and sustaining economic viability in the long-run (Carter & Rogers, 2008; Seuring & Müller, 2008). As stakeholder requirements for sustainability change over time (such as changing government regulations or non-government organisations' concerns on social and environmental aspects), firms need to adopt strategies to address changes, risks and opportunities in the market (Carter & Rogers, 2008; Beske, 2012; Winter & Knemeyer, 2013). Sustainable supply chains should therefore be able to reconfigure resources in line with being sustainable (Beske, 2012). The important practices in this regard are strategic purchasing (Paulraj, 2011), supplier management (Gold et al., 2010; Reuter et al., 2010), development of supplier's sustainability capabilities (Seuring & Müller, 2008; Pagell & Wu, 2009) and integration and collaboration with supply chain partners (Gold et al., 2010; Wittstruck & Teuteberg, 2012; Ahi & Searcy, 2013). These practices require dynamic capabilities such as knowledge assessment, supply chain partner development, co-evolution, reflexive supply chain control and supply chain re-conceptualisation (Pagell & Wu, 2009; Defee & Fugate, 2010; Beske, 2012). The basis of these underlying capabilities is trust, which develops and enables knowledge sharing between partners (Beske, 2012) and being innovative (Pagell & Wu, 2009). Furthermore, these characteristics encompass frequent changes of the configuration of connection between firms in the supply chain and their relationships. These characteristics are in line with the dynamic capabilities and social capital views. Also it represents the ability of an agile supply chain as reviewed in the 'agile supply chain' section previously. It can therefore be established that agility is instrumental in developing sustainability practices in the supply chain.

### **Theoretical underpinning**

Agility as a capability in the supply chain (Charles et al., 2010; Carvalho et al., 2011; Naim & Gosling, 2011) represents the ability to adjust frequently. This characteristic reflects the dynamic nature of the capability. Previous studies have also confirmed the need for dynamic capabilities for supply chains to be competitive (Defee & Fugate, 2010), in particular, to be sustainable (Beske, 2012). Both agility and sustainability incur interactions of firms in the supply chain and the exchange of resources. The social capital theory posits that people and relationships between organisations develop competitive advantage through exchanging resources in networks (Carey & Lawson, 2011). Therefore, social capital theory also serves as a theoretical underpinning to combine agility and sustainability in supply chains. Based on the above arguments, this study will draw from the 'dynamic capability view' and the 'social capital theory' in

developing the relationship between agility and sustainability of firms in the supply chain.

#### *Dynamic capability perspective*

The dynamic capability perspective reflects the ability of firms to achieve competitive advantage in dynamic market conditions by renewing competencies (Teece et al., 1997; Teece, 2007). This perspective stems from the resource based theory and extends the firm level competitive advantage to a dynamic environment by changing organisational and managerial processes and structures to address the evolving nature of competencies that respond promptly and innovatively (Teece et al., 1997; Teece, 2007). Dynamic capability is defined as the ‘firm’s ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments’ (Teece et al., 1997, p.516). These capabilities are essential to address changing market situations in which each firm’s competitive advantage lies and the ability to respond promptly and innovatively to changes by effectively coordinating and deploying internal and external competencies (Teece et al., 1997). Process-related capabilities develop relationships with buyers and suppliers, along with increased learning and resource reconfiguration (Teece et al., 1997; Eisenhardt & Martin, 2000). Even though this concept was originally used to explain firm level competitive advantage, several researchers have applied it at the supply chain level (Beske, 2012; Hofmann et al., 2012; Blome et al., 2013).

Changing market conditions need unique and ‘difficult to imitate’ dynamic capabilities which can be used to develop and maintain distinctive asset bases within the company (Teece, 2007). These dynamic capabilities are in various forms as they identify market opportunities and threats, ability to exploit opportunities and being competitive through utilising tangible and intangible assets (Teece, 2007). They integrate, reconfigure resources and develop knowledge creation routines (Eisenhardt & Martin, 2000). Therefore, dynamic capability concerns creating new knowledge with rapid changes. However, dynamic capabilities do not guarantee a competitive advantage unless firms reconfigure resources to meet market changes (Eisenhardt & Martin, 2000).

Agility provides the ability for firms to meet changes in the market by changing production by coordinating with suppliers. It demonstrates the three dimensions of dynamic capabilities introduced by Teece (2007): sense, seize and reconfiguration. Agility captures the demand side variations by integrating processes and sharing timely information with customers. This feature reflects the ability to search opportunities and threats, which Teece (2007, p.1324) had referred to as ‘sense’. It also possesses the seizing capability as it determines the ways of addressing the identified market changes by adjusting the present product portfolio or by developing new products. Agility also embeds ‘reconfiguration’ capability by modifying the production routines and configuring suppliers. Consequently, agility possesses all the types of dynamic capabilities and represents a dynamic capability.

The key features of agility (namely, identifying market changes, sharing information and integrating processes with supply chain partners) (Christopher, 2000; Lin et al., 2006; Braunscheidel & Suresh, 2009) enable firms to continuously develop their competencies and adjust processes in line with market needs. Agility enables the development of relationships with buyers and suppliers (supply chain partners) and recognition of market changes using collaborative work and reconfiguring resources to address changes (Gligor & Holcomb, 2012; Blome et al., 2013). This process enables firms to identify and capitalise on market opportunities, thereby enhancing adaptive capability (Wang & Ahmed, 2007). Information sharing enriches the learning process



both at the organisational and supply chain levels (Teece et al., 1997; Wang & Ahmed, 2007; Barreto, 2010). Learning enhances a firm's absorptive capability by enabling firms to recognise, assimilate and utilise new knowledge (Wang & Ahmed, 2007). Agile firms possess innovative capability as they develop new solutions to respond to market changes through collaborations (Agarwal et al., 2006). Further, it develops path-dependent capabilities which are unique to the firm by integrating various partners and sharing information which cannot be easily replicated by competitors. Accordingly, agility is underpinned by the concept of dynamic capabilities.

The dynamic nature of the present market conditions creates changes to the social and environmental sustainability requirements of the stakeholders. The changing sustainability requirements make present resources and routines invalid to meet new conditions (Castiaux, 2012). It heightens the need to adjust their resource base and routines so as to align with the new market needs. This requires firms to develop relationships to capture information, generate new knowledge and reconfigure resources towards emerging requirements. The need for changing resources and routines suggest the applicability of 'dynamic capability' view to describe the sustainability of a firm (Beske, 2012).

Implementing sustainability practices also demonstrates the need for dynamic capabilities. Firms identify sustainability requirements through the relationships with stakeholders which reflect the sensing capability. When the requirements are identified, firms develop appropriate environmentally friendly products and adopt socially and environmentally friendly processes. These activities demonstrate the seizing capability. In developing the culture of sustainability and implementing practices, firms change the organisational structures, management approaches and processes. Therefore, sustainability further embraces the capability of reconfiguring. It is argued that the implementation of sustainability practices and achieving sustainability within the supply chain necessitate dynamic capabilities.

In dynamic market conditions, the success of a business lies with a firm's ability to recognise changes that occur at both demand and supplier sides and to quickly respond to them (Lee, 2004; Blome et al., 2013). The awareness of these changes gives rise to the need for inter-organisational relationships, which facilitate information sharing across organisational boundaries. Such relationships enhance trust which enables firms to integrate processes and collaborate to achieve common objectives; hence optimising the performance of the entire supply chain (Agarwal et al., 2007). These characteristics prevail in an agile supply chain and are also applicable to implement sustainability practices in supply chains. This perspective reflects the building of social capital within firms in the supply chain.

### *Social capital theory*

Social capital theory posits that people and relationships between organisations develop competitive advantage through exchanging resources in networks (Carey & Lawson, 2011). In the context of supply chains, it includes relationships and the interactions among firms and the processes developed from the interactions within a supply chain (Min et al., 2008). Social capital comprises three dimensions: structural capital, relational capital and cognitive capital (Nahapiet & Ghoshal, 1998). Structural capital refers to the pattern of connection between actors; which reflects the parties connected, network configuration and the pattern of linkages in terms of density, connectivity, hierarchy and appropriable organisation (Nahapiet & Ghoshal, 1998). The location of actors in the social structure provides certain advantage to firms (Tsai & Ghoshal, 1998). Relational capital means the assets developed in actors such as trust and

trustworthiness in the network through past interactions (Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998). Cognitive capital is the resources that represent shared interpretations among actors in the network (Nahapiet & Ghoshal, 1998). The theory suggests that firms interact with other firms and jointly receive benefits of efficient information sharing, cooperative behaviour supportive to innovation and value creation and the ability to exert power on other's behaviour (Nahapiet & Ghoshal, 1998). Therefore social capital facilitates resource exchange among firms and leads to value creation (Tsai & Ghoshal, 1998). The level of uncertainty in demand and supply determines the relative importance of each dimension of the social capital (Carey & Lawson, 2011). An important feature of social capital is its ability to use the social capital developed in one context for other purposes (Nahapiet & Ghoshal, 1998; Adler & Kwon, 2002).

Social capital theory underpins the concept of agility. Agility depends on the capability to share accurate information between firms quickly (Vickery et al., 2010; Chakraborty & Mandal, 2011; Ngai et al., 2011). Agile firms have integrated business processes and linkages through ICT (Christopher, 2000; van Hoek et al., 2001). Firms have therefore developed structural arrangements necessary to facilitate information sharing by being agile. When firms have more connections with upstream suppliers, firms obtain the flexibility to switch suppliers especially in disruptions at one of their supplier places (Youn et al., 2013). Firms in an agile supply chain are highly linked together by sharing information and integrating processes in between partners. These relationships enable developing inter-firm interactions that support the exchange of assets, knowledge, resources and capabilities (Paulraj, 2011). Accordingly, agility possesses the relational capital. Agility develops a common goal of being responsiveness to market changes among supply chain partners. Trust among partners is vital to develop such relationships which facilitate information sharing (Li & Lin, 2006). Firms tend to share information and are more likely to cooperate and work collaboratively when they have developed trust (Min et al., 2008). Firms which are highly integrated can work towards a shared objective and reflect the cognitive capital. Therefore, firms strengthen social capital through agile practices.

It could also be established that social capital serves as a foundation to explain the achievement of sustainability. Structural dimension is an attribute of sustainable supply chains as firms with higher number of connections and those who are powerful can influence other firms to implement sustainability practices. Firms which are connected with other firms can disseminate sustainable strategy and practices along the supply chain. Firms share information, knowledge and jointly work to develop sustainable practices (Gimenez & Tachizawa, 2012; Hollos et al., 2012). Relationship between firms supports the collaboration among firms (Sarkis et al., 2011); therefore it is attributable to the relational capital. In a sustainable supply chain, developing a common goal towards sustainability is important to implement sustainability practices among all the firms in the supply chain. Firms implement practices within the firm and try to extend to those practices to partner firms. The process of extending practices to partner firm necessitates knowledge sharing mechanisms which are trust based (Hung et al., 2014). Therefore sustainable supply chains represent the cognitive capital. Consequently, the social capital theory serves as the theoretical underpinning to combine agility and sustainability in supply chains.

### **Conceptual framework and hypotheses**

Based on the literature review and arguments developed, agility is a dynamic capability at the firm level and enables inter-organisational relationships in the manufacturing

supply chain. It facilitates information transfers in the manufacturing supply chain, develops congruence in goals and influences the behaviours of partner firms. Therefore agility enhances the social capital in firms to attain sustainability. Building on the dynamic capability perspective and social capital theory a conceptual framework is developed to illustrate the relationship between agility and sustainability in firms in the manufacturing supply chain as shown in figure 1.

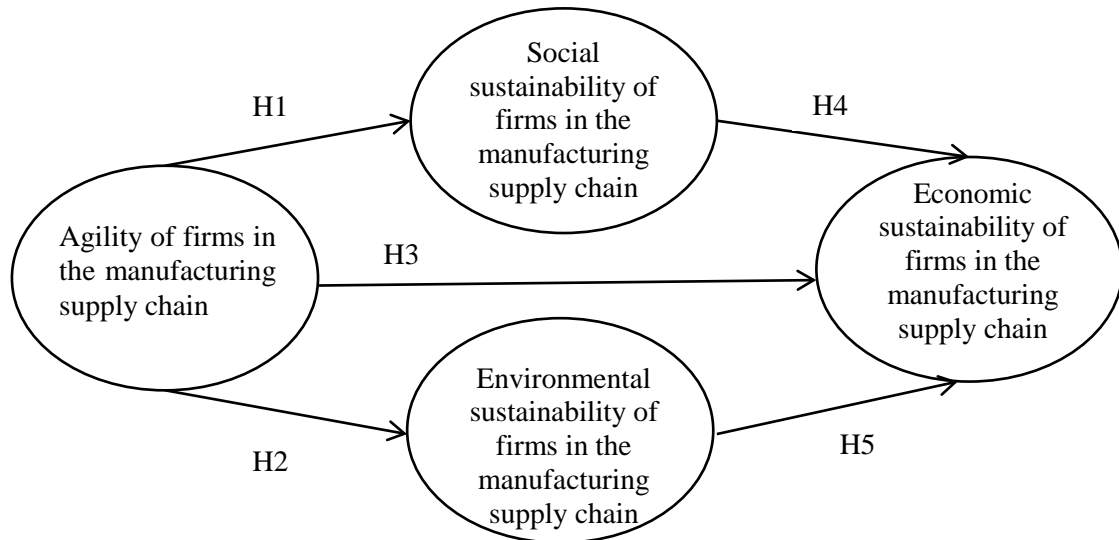


Figure 1: Conceptual framework

#### *Linking agility with sustainability in manufacturing supply chains*

Agility provides the ability to sense market requirements in relation to social sustainability. Supply chain partners manage human resources effectively for the benefit of society by developing common values among companies on employee relations and sharing information on ethical standards and labour laws (Porter & Kramer, 2011). Inter-organisational relationships enable supply chain partners to collaboratively plan fair labour practices along the supply chain, with shared information as well as to influence suppliers in that regard (Park-Poaps & Rees, 2010). Therefore, the structural, relational and cognitive capitals of agility act as resources that facilitate social sustainability. Therefore, we develop the following hypothesis:

*H1: Agility is positively associated with the social sustainability of firms in the supply chain*

Similarly, the ability to sense market requirements and the inter-relationships enable firms to develop environmental sustainability. The literature reveals that the relationships with suppliers are a key to jointly plan environmental practices and to develop supplier capabilities on such practices (Youn et al., 2013). Agility tends to work with few key suppliers with similar values and objectives (Christopher, 2000); therefore reflects the structural arrangement of ties between firms. The ability work towards a common objective reflects the cognitive capability of firms. Therefore, the agility builds environmental sustainability by providing the necessary social capital. For example, the implementation of EMS becomes easier with the shared values along the supply chain partners. Sharing information with buyers enables them to integrate stakeholder requirements in a firm's environmental efforts (Closs et al., 2011). Studies in the environmental supply chain reveal that working collaboratively with the supply

chain partners is vital to reduce the environmental impact and thereby to enhance environmental quality and performance (Geffen & Rothenberg, 2000; Sandhu et al., 2012; Ahi & Searcy, 2013). Therefore, the social capital enhanced through agility guarantees the achievement of environmental sustainability in the supply chain. This suggests the hypothesis:

*H2: Agility positively associates with the environmental sustainability of firms in the supply chain.*

Economic sustainability is the long-term success and competitiveness of firms (Winter & Knemeyer, 2013). Studies have shown that agility improves economic performance (increase sales, market share, profits and operational performance) by being agile, hence the economic sustainability (Swafford et al., 2008; Gligor & Holcomb, 2012; Blome et al., 2013; Qrunfleh & Tarafdar, 2013). Therefore we argue that:

*H3: Agility positively associates with the economic sustainability of firms in the supply chain.*

Social sustainability in the supply chain enhances economic performance (Markley & Davis, 2007; Carter & Rogers, 2008). The CSR literature suggests that firm's social performance leads to improved financial performance with the highest payback (Orlitzky et al., 2003; Margolis et al., 2007). Unfair labour and trading practices encountered by a supply chain partner would damage the entire supply chain (Maloni & Brown, 2006; Porter & Kramer, 2006). Therefore, fair labour practices reduce a firm's liabilities and avoid a bad image. Furthermore, it leads to a satisfied, committed and productive workforce with less accidents (Porter & Kramer 2006, 2011) and lowers other labour costs such as turnover and absenteeism (Carter & Rogers, 2008). Fair labour practices result in improved operational performance in terms of cost, quality and timely delivery. Treating employees properly would develop a favourable image for the firm and the supply chain in which the firm is embedded. Furthermore, fair trade practices and activities to support the suppliers and the communities create a positive image among general public and increase reputation (Markley & Davis, 2007). The CSR literature suggests that the reputation achieved through social activities leads to higher financial performance (Orlitzky et al., 2003). Firms achieve social sustainability through such practices and social sustainability in terms of employee well-being and reputation create valuable, non-imitable and non-substitutable assets for the supply chain that reduce costs and increase profits and market share. Social sustainability in the supply chain has been showed to enhance economic sustainability. Therefore the impact of agility on economic sustainability is further enhanced through social sustainability. Consequently, we can propose that:

*H4: There is a mediating impact of social sustainability of firms in the supply chain on the relationship between agility and economic sustainability.*

Despite the implementation of EMS which incur costs for firms, activities such as pollution prevention and the application of environmental practices throughout the life-cycle of the product reduce the cost of operation, thus leading to improved profits and sales (Rao & Holt, 2005; Youn et al., 2013; Golicic & Smith, 2013). Such practices develop a favourable image of firms, products and supply chains among community, leading to improved market share (Rao & Holt, 2005; Youn et al., 2013; Golicic & Smith, 2013). Moreover, environmental sustainability develops a favourable image among the stakeholders as they enforce supply chains to be sustainable (Zhu et al.,

2005; Zhu et al., 2007; Holt & Ghobadian, 2009). Despite most studies (Rao & Holt, 2005; Markley & Davis, 2007; Youn et al., 2013; Golicic & Smith, 2013) reporting a positive relationship between environmental sustainability and business performance in supply chain, some other researchers report mixed results (Zhu et al., 2007). By managing natural resources through environmental practices, firms achieve environmental sustainability and the resources-such as reputation-which enhances overall economic performance. Consequently, the environmental sustainability in the supply chain increases economic sustainability in addition to economic enhancement through agility; therefore leading to the hypothesis:

*H5: There is a mediating impact of environmental sustainability of firms in the supply chain on the relationship between agility and economic sustainability.*

## **Discussion**

Given the growing concerns for agile and sustainable performance in today's manufacturing supply chain environment, the ability to implement both aspects is no easy task. It is evident that a combination of both aspects in a single study does not exist in the literature. In order to fill this void in the literature, this study raised the question of whether agility of firms can enhance sustainability of firms in the supply chain. The manufacturing supply chain will be investigated for the next phase in this study due to the high relevance of both agility and sustainability in this industry.

Sustainability in this study will adopt the TBL perspective to determine dimensions and focus on social, environmental and economic perspectives in the supply chain. We argue that agility is a capability of a dynamic nature which nurtures social capital to achieve sustainability among firms and in response to changing market and stakeholder requirements. Therefore the framework suggests agility increases the environmental and social sustainability (H1, H2). In addition, we also state that agility directly increases economic sustainability (H3). Furthermore, we test if social and environmental sustainability will have some impact on economic sustainability through the mediating relationships between agility and economic sustainability (H4, H5). Since there is an increasing concern on agility and sustainability issues in manufacturing supply chains, there is a need for research and empirical investigation into the area.

In Australia, the manufacturing industry on the whole has faced a downward trend in performance over the past two decades and is expected to decline further (Department of Innovation Industry Science and Research (DIISR), 2011; Commonwealth of Australia, 2012). In attempts to propose strategies to uplift the Australian manufacturing industry, Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2012) and DIISR (2011) indicate the need to build capabilities on agility to gain competitive advantage. Partnerships developed in supply chains allow firms to develop the required flexibility and to identify opportunities in new markets (DIISR, 2011). Presently, the manufacturing industry accounts for the highest proportion of the greenhouse gas emissions in the country (CSIRO, 2011). In addition to government pressure, demand from consumers and the public for environmentally and socially friendly products and services is also increasing (CSIRO, 2011; DIISR, 2011). Moreover, Australian manufacturers currently lag behind in sustainability initiatives as compared to the other developed nations (CSIRO, 2012). Within this context, agility and sustainability are important to manufacturing supply chains in Australia.

## **Proposed Methodology**

The study will be carried out using a quantitative approach gathering empirical data through online surveys. The sampling frame comprises firms associated with the

manufacturing industry and classified under the Australian and New Zealand Standard Industrial Classification (ANZSIC) as manufacturing-related. The research is about firms operating in the supply chain, while the unit of analysis is at the firm level. It will embrace various perspectives of firms at each node of the supply chain (e.g. suppliers, wholesalers, retailers, distributors and logistics providers in addition to manufacturers).

An online self-administered questionnaire will be distributed to senior managerial levels such as operations managers, supply chain managers, logistics managers or general managers of firms as they are likely to be more reliable sources of information due to their seniority. Stratified random sampling technique will be employed to draw a sample of 1000 firms covering the various stages in the supply chain. Data will be analysed using structural equation modelling. Structural equation modelling is a statistical approach based on a two-model estimation technique (Anderson & Gerbing, 1988) to identify model-fit and various hypotheses using appropriate software such as SPSS Amos.

## Conclusion

This study intends to investigate the relationship between agility and sustainability in supply chains. Based on the literature, a framework was developed to test if sustainability of firms in the supply chain is attainable by being agile. It is envisaged that the empirical findings conducted at a later stage will provide significant contribution to both practice and research. From a research perspective, agility has been grounded on dynamic capability perspective and linked to sustainability using social capital theory. It has demonstrated with these theories that firms in supply chains can contribute to sustainability in an agile environment. Use of social capital theory is a novel approach in both agile and sustainable supply chain studies. Additionally this study extends the agile supply chain literature by extending it from economic sustainability to cover social and environmental sustainability. From a practitioner viewpoint, the findings from this study will highlight to managers what types of relationships hold between agility and various dimensions of sustainability. When managers understand such relationships, they can determine the strategies for attaining agility levels that facilitate sustainability. Managers can also assess the structural, relational and cognitive capital developed through agility and direct those capabilities to develop sustainability initiatives in specific firms in the supply chain.

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