

A RESPONSIVENESS LOGIC OF SUPPLY CHAIN MANAGEMENT & LOGISTICS

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ABSTRACT

The examination of responsiveness as a foundation for investigating supply chain organizational adjustments to market, partner, and customer conditions has motivated multiple streams of research which have conceptualized responsiveness and related concepts in increasingly disconnected as well as overlapping ways. While these literature streams have highlighted many important issues related to responsiveness, they diverge widely in basic conceptualizations and nomological network. This disagreement may be a function of the field having no core theory and likely impedes the advancement of an overarching theoretical perspective masking many promising research directions that may help distinctly define the discipline. The emergence of supply chain management as a distinct business discipline may be dependent on the development of supply chain theories and logics. We contend that responsiveness may be the central issue of concern for supply chain management research. Indifference to the theoretical importance of the concept, setting, and dimensions may also be why the discipline is finding it difficult to grow to maturity. Drawing from the organizational strategy and business logistics/supply chain literature, this manuscript argues that responsiveness realized through supply chain management is a foundational logic (Responsiveness Logic) that affords firms the opportunity to successfully compete amidst changes and disruption in all business environments. Responsiveness is further proposed as a key outcome and/or managerial goal charting the direction for supply chain management researchers as a theoretically distinct research domain. Arguably, all roads to superior performance in supply chain management pass through the responsiveness of supply chain members. *

Keywords: Responsiveness, Supply Chain Management, Flexibility, Adaptability, Improvisation, Robustness, Resiliency, Modularity, Seamlessness, Logic, Theory Building

INTRODUCTION

Let's be honest, many of our colleagues in other fields remain unconvinced that Supply Chain Management and Logistics (SCML) is a distinctive discipline.¹ This may be due to the fact that the conceptual grounding of research in the SCML discipline remains a fragmented set of borrowed theories and diverse outcomes with limited exceptions (Richey et al., 2010). Very few studies ask or answer the big "meaning of life" like questions – why does SCML matter or what is the ultimate goal of SCML? No research has ever asked what should be our major goal, our central thesis outcome, or even dependent

¹ The context of SCML is in reference to Bowersox et al.'s (1996) approach to integrated logistics. It is also an acknowledgement of the managerial approach and the practicality of supply chain management operations.

variable(s). In fact, most researchers working within the discipline fall back on longstanding siloed traditions that do not tie well with our unified domain of SCML as described by Mentzer and his colleagues (2001). For example, transportation oriented researchers often focus on time and cost. Operations oriented researchers often center on optimization and even solution processing speed. Logistics oriented researchers largely focus on customer service outcomes and sourcing oriented studies target quality and cost. All these researchers generally adopt various external theories that address their area as; combinations of theories, parts of a theory, or no theories at all! Ultimately, these perspectives represent isolated parts of the supply chain that not long ago were united in attempts to examine processes and service quality (e.g., LSQ in Mentzer et al, 2001). These types of studies, while very relevant to a specific area, do not support SCML as a unique and united discipline, but as a conglomeration of specialty fields built around academic organizational units. The result is an inability to differentiate our discipline, driving misconceptions about what research and pedagogy is SCML and is not SCML. Perhaps the curse of supply chain management being defined as everything (see Mentzer et al., 2001) is that it becomes nothing?

Relevant examples of legitimizing and developing new core disciplines are evident in the business literature at least twice since 1950 (see Kenworthy and Verbeke 2015; MacKinnes and Folkes 2009). For example, the corporate strategy discipline has grown from being a sub-segment of the general management field to a fully defined core discipline supported by a strong body of literature largely due to research paradigms that are directly focused upon firms achieving competitive advantage. Similarly, emerging from marketing, the consumer behavior field has moved from being a marketing research “area” to a recognized discipline thanks to a specific and concentrated focus on consumer affect. Understanding competitive advantage is corporate strategy’s purpose. Understanding consumer affect is consumer behavior’s purpose. So, what is our purpose in SCML?

One of the potential impediments to SCML’s recognition as a mature and independent discipline is its lack of unification under a central theme, in contrast to consumer behavior’s identification of customer affect and corporate strategy’s purposeful study of competitive advantage. Responsiveness, as a defining dynamic objective embodies the interaction among organizations as they seek organizational adaptation towards efficient and effective demand management by way of the adjustments made to supply chain behaviors, norms, processes, and policy (Bernardes & Hanna, 2009; Qrunfleh & Tarafdar, 2011). However, current conceptualizations do not approach the need for a focal outcome or provide the necessary bridge to such a unified goal/objective for SCML. Perhaps we can take a lesson from ourselves? Our collaboration research stresses the importance of clear and mutual goals across multiple organizations (Min et al., 2006). As a discipline, we should demand complete conceptual clarity in defining our objective and the issues that facilitate achieving that objective. Taken to the highest conceptual level, we argue that responsiveness is an SCML encompassing notion that should be adopted by scholars to unite our goals, research models, and ultimately help legitimize the field. A consensus conceptual foundation which focuses on legitimizing the domain of SCML has yet to be realized. While important, most attempts have stopped with building a definition and boundaries rather than broad based philosophy (LeMay, Helms, Kimball, and McMahon 2017) or focus on theory building in specific areas of the discipline like relationship management (Richey et al 2010). It is our contention that without a defined foundational perspective, supply chain management may never be considered a legitimate domain unto itself. This paper proposes an emerging Responsiveness Logic as a critically important foundational perspective of the SCML domain and hopes to spur on discussion about SCML theory development.

CONCEPTUAL ARGUMENT AND DEVELOPMENT

Responsiveness is what managers do across SCML world. The purpose companies work towards in both logistics activities and system wide supply chain initiatives. Responsiveness is studied broadly and remains an important concept in the fragmented interorganizational literatures. For example, the distribution channels literature examines the issue of responsiveness from a customer-centric approach, which underlies the idea that organizations must have the ability to respond to customer demand and its inherent variability (Bowersox and Daugherty 1990). This is a view that typically highlights the external consumer as the catalyst for market effectiveness. The attention to the customer ultimately drives organizational efficiency (Aaker and Mascarenhas 1984; Bahrami 1992; Evans 1991; Matusik and Hill 1998). Contrarily, the organizational strategy literature emphasizes the organization's reaction (e.g. redeployment of resources) to uncertainty in the environment as the primary foundation for developing responsiveness (Slack 1987). This perspective highlights the external environment as the catalyst for influencing organizational efficiency in that an efficient organization encourages market effectiveness (Carlsson 1989; Evans 1991; Johnson 1999; Johnson et al. 2003; Sanchez 1995), often through supply chain adjustment (Gordon 2000). Understanding the literature of our sister disciplines is an important guide for concept development, but to assess the argument for a SCML theoretical foundation, we must focus specifically on the SCML literature.

The most rigorous attempts to study supply chain adjustment are reflected in flexibility studies (see Vickery, Calantone, and Dröge 1999) and in the area of supply chain agility (see Holcomb, Gilgore, Stank 2013). Yet neither literature reviews nor empirical models address responsiveness as a unifying logic that embraces key SCML dimensions including adaptability, agility, flexibility, improvisation, resilience and robustness. These dimensions can be built upon and reconfigured into intervening perspectives that provide a theoretical position to study the tradeoff between efficiency perspectives and effectiveness perspectives in a purely SCML setting. The extant research also sometimes concentrates upon *intra*-organizational aspects (Vickery et al. 1999; Zhang, Vonderembse, and Lim 2002) rather than mutuality in outcomes. As the supply chain is a sum of its parts, having too stringent a focus can be a limiting factor in the study of how organizations, working within a supply chain, individually and mutually respond to demand and the environment.

In SCML, our response to owning no core theory has largely been to combine Transaction Cost Economics (efficiency – Williamson 1985) and the Resource Based View of the Firm (effectiveness – Barney 1982) to provide at least a theoretical window dressing. Even when taken in combination, these theories do not explain the complexity of what supply chain managers hope to accomplish. Appropriately, most supply chain management research notes the importance of the efficiency/effectiveness trade-off which is detailed in the emerging relationship management governance theories (Richey et al. 2010). Yet these focused theories and adopted theories do not provide a solidified and/or central grounding for our discipline (see similar comments by Ellram and Cooper 2014; LeMay, et al. 2017); thus, it is very difficult to produce research questions that chart and assist in discipline based growth and related directions for management within and across the SCML setting.

To fully understand SCML responsiveness, fore mentioned dimensions of responsiveness need serious fleshing out as to their meaning and applications. As an example, definitions of adaptability suggest a company level dimension through which supply chains achieve responsiveness. Flexibility's definitions, by comparison, suggest a more process oriented dimension of responsiveness. Definitions of both clearly indicate that adaptability and flexibility are constrained and possibly confused by supply chain structure. Our conceptualization presents adaptability and flexibility, as well as agility, improvisation, robustness and resilience as supporting dimensions of responsiveness. These dimensions are the foundations of responsiveness. They are the key building blocks that enable an efficient and effective means of serving

the partner and customer. As such, firm efficiencies and effectiveness in serving the supply chain and stakeholders lie at the heart of the networked definitions of responsiveness. Taken together, we assert that responsiveness and its dimensions create and appropriate philosophical logic upon which to focus the SCML discipline.

Our argument that responsiveness is the appropriate goal of SCML research and practice is highlighted with the exploration of three unambiguous needs for SCML research. The first seeks to establish research goal clarity. The second examines a dimensionalized approach to being responsive within the supply chain management setting. The third addresses the argument that supply chain management is the appropriate domain from which to study and develop understanding of the responsiveness phenomenon (Burgess et al. 2006, Swafford et al. 2006; Tsoukas 1993). We believe it is time for SCML to identify a discipline defining outcome in order to better establish itself among business disciplines. We offer this conceptualization of a Responsiveness Logic as a first step.

Crafting a Conceptual Foundation

SCML research area has long focused on static logistics and operations processes. Only recently has our field worked to theoretically conceptualize supply chain adjustment (i.e. a change in norms, managerial decisions, and/or process(es) across supply chain partners) or what is sometimes called reconfiguration phenomenon (Darkow, Weidmann, and Lorentz, 2016; Gundlach et al., 2006; Kauffman et al 2017; Johnson and Leenders 2001). Unfortunately, extant research notes the importance of, but poorly conceptualizes adaptability and flexibility as the same, and even refers to a managerially meaningless term - organizational slack. Beyond semantics, research notes that poor conceptualizations have taken us dangerously close to tautology at times (i.e. Evans 1991; Fawcett, Calantone, and Smith 1996; Johnson et al. 2003). This may also be due to a consistent operations focus on organizational efficiency (i.e. cost optimization) rather than supply chain oriented results. Such an approach lacks the distinction that can be provided by embracing the dimensions of responsiveness (and perhaps other related concepts) and otherwise creating confusion and an insufficient understanding of the complexity of supply chain adjustment (Gordon 2000).

Literally thousands of SCML studies have examined important organizational antecedents and their potential connection to responsiveness. It is expected that if antecedents could be conceptually identified, the support for a responsive organization and supply chain would be justified (Swafford, Ghosh, and Murthy 2006). A count of the seminal defining studies is detailed in Table 1.

Table 1: Summary of Literature Counts

Construct	Journal	Definitions
Adaptability		7
	International Journal of Physical Distribution and Logistics Management	3
		Charles et al., 2010 Christopher & Holweg, 2011 Engelhardt-Nowitzki, 2012
	International Journal of Supply Chain Management	1
	Journal of Business Logistics	1
	Journal of Operations Management	1
		Pettit et al., 2013
		1
		Chandrasekaran et al., 2012

Construct	Journal	Definitions	
Adaptability (cont.)	Supply Chain Management: An International Journal	1 Prakash, 2011	
		14	
Agility	Decision Support Systems	1 Liu et al., 2013	
	International Journal of Operations & Production Management	1 Bernardes & Hanna, 2009	
	International Journal of Physical Distribution and Logistics Management	4 Charles et al., 2010 Scholten et al., 2010 Weiland & Wallenburg, 2012 Weiland & Wallenburg, 2013	
	International Journal of Production Economics	1 Naim and Gosling, 2011	
	International Journal of Supply Chain Management	1 Ghagra, 2013	
	Journal of Business Logistics	3 Gligor et al., 2013 Golicic & Sebastiano, 2011	
	Journal of Business Research	1 Roberts & Varun, 2012	
	Journal of Operations Management	1 Devaraj et al., 2012	
	Supply Chain Management: An International Journal	1 Gligor & Holcomb, 2012b	
		11	
	Flexibility	International Journal of Operations & Production Management	2 Bernardes & Hanna, 2009 Chaing, et al., 2012
		International Journal of Physical Distribution and Logistics Management	2 Christopher & Holweg, 2011 Engelhardt-Nowitzki, 2012
International Journal of Supply Chain Management		1 Ghagra, 2013	
Journal of Business Logistics		4 Gligor et al., 2013 Grawe et al., 2011 Omar, et al., 2012 Pettit et al., 2013	
Journal of Operations Management		2 Malhotra & Mackelprang, 2012 Patel et al., 2012	
		2	
Improvisation	Journal of Operations and Supply Chain Management	1 Bradaschia & Pereira, 2015	
	Journal of Operations Management	1 Morrison, 2015	
Modularity	Harvard Business Review	5 1 Carliss et al., 1997	

Construct	Journal	Definitions
Modularity (cont.)	International Journal of Operations & Production Management	2 Doran, 2003 Stevenson & Spring, 2007
	Journal of International Management	1 Parente et al., 2011
	International Journal of Logistics Management	1 van Hoek & Weken, 1998
		11
Resilience	Harvard Business Review	2 Hamel & Valikangas, 2003 Coutu, 2002
	International Journal of Physical Distribution and Logistics Management	1 Weiland & Wallenburg, 2013
	Journal of Applied Business Research	1 Ponis & Koronis, 2012
	Journal of Business Logistics	1 Pettit et al., 2013
	Journal of Supply Chain Management	1 Brandon-Jones et al., 2014
	Supply Chain Management Review	1 Melnyk et al., 2014
	Human Resource Management Review	1 Lengnick-Hall et al., 2011
	International Journal of Logistics Management	1 Ponomarov & Holcomb, 2009
	Proceedings of the 5th International ISCRAM Conference	1
	Science, Practice & Policy	Falasca et al., 2008 1 Fiksel, 2006
		7
	Responsiveness	International Journal of Operations & Production Management
Journal of Business Logistics		2 Golicic & Sebastiano, 2011 Grawe et al., 2011
Supply Chain Management: An International Journal		2 Collin et al., 2009 Qrunfleh & Tarafdar, 2011
		10
Robustness	European Journal of Operational Research	1 Klibi et al., 2010
	Harvard Business Review	1 Ferdows, 1997
	International Journal of Physical Distribution and Logistics Management	3 Meepetchdee & Shah, 2007 Weiland & Wallenburg, 2012 Weiland & Wallenburg, 2013
	International Journal of Production Economics	1

Construct	Journal	Definitions
Robustness (cont.)		Vlajic et al., 2012
	Journal of Supply Chain Management	1
	Procedia CIRP	Brandon-Jones et al., 2014
	Production and Operations Management	1
	Production Planning & Control	Stricker & Lanza, 2014
Seamlessness		Kouvelis et al., 2006
	Decision Support Systems	1
	International Journal of Operations & Production Management	1
	Supply Chain Management Review	Schoenherr et al., 2010
	Omega	1
		Geary et al., 2002
		1
		Li et al., 2006

While a focus on antecedents may help draw construct specific interest in responsiveness as a key concept, the fluid conceptualizations offered in Table 1 motivate the question: what is the relationship to and role of responsiveness in supply chain management? Moreover, could responsiveness be the foundational focal SCML outcome condition similar to that of competitive advantage in corporate strategy (Burgess, Singh, and Koroglu 2006; Chen and Paulraj 2004; Giannakis and Croom 2004; Harland et al. 2006; Storey et al. 2006)? In that spirit, we follow with a meta-conceptual conversation that ties various literature streams together to identify a distinctive research domain that is SCML.

The extant research has examined the supply chain management phenomenon from behavioral and mathematical perspectives. To date, the focus of these studies approach a conceptual boundary theoretical dependent on internal efficiency (Ketokivi 2017). Studying supply chain adjustment as a managerial perspective naturally follows a simple approach – ‘if we changed what we do, what is the cost savings?’ Efficiency alone implies a limited view as it examines the interaction of processes and activities with no effectiveness outcome. Accordingly, this view leaves scant recognition of how the organization and supply chain responds to consumers; a market effectiveness approach (e.g. Porter 1980; Zollo and Winter 2002; Wang and Ahmed 2007). In other words, the shortcoming of borrowing from the management and marketing channels/distribution literature bases without integration into a foundational perspective has impeded the development of understanding how organizations in a supply chain develop and utilize abilities towards what should be the discipline’s defining criteria, managerial goal, and research outcome. Carrying forward, the extant research actually implies that responsiveness is a foundational outcome and goal of SCML (Roh, Hong, and Min 2014). Additionally, responsiveness represents a higher order ability, an outcome that is achieved through the development of specific dimensions as capabilities (Dobrzykowski et al 2015; Stevenson and Spring 2007). Obviously, development of a Responsiveness Logic requires a complete definitional clarity.

What is Responsiveness?

Resource-based view of the firm researchers in organizational strategy consider responsiveness to be an important and ongoing ability to modify a course of action through organizational adjustment in response

to market conditions (e.g. Aaker and Macarenhas 1984; Bahrami 1992; Bowersox and Daugherty 1990; Evans 1991; Matusik and Hill 1998). Responsiveness has also been defined as "...the ability to react purposefully and within an appropriate time-scale to customer demand or changes in the marketplace" (Holweg 2005, pg. 605). These ideas build upon Slack's (1983) view, highlighting a firm's contingent ability to exercise a wide range of options it can exploit to reduce the costs and time associated with employing options which subsequently have a direct or indirect impact on a supply chain's responsiveness. Quite clearly, the responsiveness concept is tied to reactive adjustment and conceivably proactive positioning for future adjustment. The measure of these changes is the ability to respond or be responsive. We suggest this discussion can be easily adapted such that; supply chain responsiveness be defined as: *the outcome of business process and organizational adjustment implemented in an attempt to place a supply chain and its members in a favorable position when altering behaviors, norms, processes and policy to environmental, competitive, partner and customer conditions and disruptions.*

The term outcome is important in the definition above. There are numerous constructs in our literature that have been used as outcome variables for supply chain management, including but not limited to: collaboration, integration and logistics service competency. Unfortunately, these types of outcome constructs possess a non-discipline unifying critical limitation. Definitions of collaboration tend to center on working relationship between entities within the supply chain (Kahn, Maltz and Mentzer 2006), enabling coordination of plans and activities (Cao and Zhang 2011), pooling of resources (Fawcett, et al. 2012), and requiring joint ownership of decisions and responsibility for outcomes (Stank, Keller, and Daugherty 2004). In a related conceptualization, integration has been defined as the ability to collaborate with others to efficiently and effectively manage relationship embedded processes (Chen, Daugherty and Landry 2009; Flynn, et al. 2010) that tie physical, informational and financial flows together among various organizations (Fabbe-Costes and Jahre 2008) in order to deliver the highest possible benefits to supply chain members and their collective end-customer (Huo 2012). A logistics service competency has been described as an ability to reduce costs and enhance the provision of time and place utility to customers (Adams, et al. 2014) and partners (Richey, et al. 2007). While all of these (types) outcomes have important managerial implications within a specific supply chain or logistics setting, they remain penultimate attempts to study supply chain adjustments to market dynamics. In other words, they do not approach fulfilling the need for a SCML unifying outcome. These and similar concepts evoke the underlying notion of developing an ability (or capability) to manage relationships, but to what end? They stop short of explaining why they matter to management.

In comparison, serving the customer at the business-to-business (B2B) and business-to-consumer (B2C) levels is at the heart of responsiveness conceptualizations. Congruent with the views of Ackoff (1971), Johnson and colleagues (2003), and Kritchanchai and MacCarthy (1999), responsiveness in this setting suggests that all other supply chain variables ultimately are oriented towards some level of responsiveness. In turn, responsiveness is often followed by measures of financial performance that may not be controlled by supply chain managers (e.g. stock price). Arguably, terminating a conceptual framework with responsiveness should provide more research accuracy and managerial relevance. This does not mean that responsiveness need always be the dependent variable as it can take both a stated (e.g. Fisher 1997) and a latent (e.g. Christopher and Holweg 2011) position in SCML studies. In fact, examination of extant SCML models even reveals important and meaningful opportunities for inclusion of responsiveness as a mediator (e.g. related competitive performance) when legitimate and controlled financial performance outcomes are known. Nevertheless, supply chain managers care about what they can control and responsiveness is certainly a controllable metric. Table 2 provides a detailed summary of the major conceptualization of Responsiveness.

Table 2: Definitions of Responsiveness

Responsiveness - the outcome of supply chain management and logistics organizational and process adjustment implemented in an attempt to place a supply chain and its members in a favorable position when altering behaviors, norms, processes and policy to environmental, competitive, partner and customer conditions and disruptions.

Cite	Journal	Quote	Page
Bernardes & Hanna, 2009	International Journal of Operations & Production Management	"...responsiveness is a propensity for purposeful and timely behavior change in the presence of modulating stimuli. It is not a latent means (availability of options), but an outcome. It is neither being prepared for a pre-established range of actions nor being able to change the means to achieve (reconfiguration), but a tendency to alter states in response to modulating stimuli. In order for an entity to be denoted responsive, it has to anticipate or address stimuli with timely and commensurate changes.	43
Collin et al., 2009	Supply Chain Management: An International Journal	"...being able to fill orders quickly".	411
Golicic & Sebastiano, 2011	Journal of Business Logistics	"a responsive or agile supply chain strategy places a premium on flexibility and responsiveness to uncertainty in demand (Lee 2002; Goldsby et al. 2006), suggesting a supply chain structure in which collaborative problem solving, ongoing communication and information sharing, and the ability of supply chain members to adapt to changing market conditions are essential elements."	255
Grawe et al., 2011	Journal of Business Logistics	"...doing things fast."	71
Qrunfleh & Tarafdar, 2011	Supply Chain Management: An International Journal	"the ability of the supply chain to quickly adapt to changes in customer preferences."	572
Squire et al., 2009	International Journal of Operations & Production Management	"...responsiveness refers to the speed with which action is taken in response to changing customer needs in an effective and profitable manner."	766-767
Vachon et al., 2009	International Journal of Operations & Production Management	"The term responsiveness refers to the ability of a supply chain to respond quickly to market movements."	324

For supply chains to achieve different levels of responsiveness, they can travel different paths or more specifically, employ defend dimensions of responsiveness. Responsiveness is a multi-level dynamic concept, and as noted, often poorly conceptualized. To begin the cultivation a Responsiveness Logic, we break the conceptualization into theoretical dimensions of responsiveness that are both measurable and closely related to extant research on SCML adjustment. These dimensions provide a framework from studying adjustment and include adaptability, flexibility, agility, improvisation, robustness and resilience. Each of these concepts will be explained to avoid them being used interchangeably in future literature and by managers in the field. In study, researchers may choose to focus on one single dimension or multiple dimensions dependent upon the research question. Development of the multi-dimensional Responsiveness Logic of SCML follows.

A RESPONSIVENESS LOGIC OF SUPPLY CHAIN MANAGEMENT

Following this needed introduction, it is now appropriate to discuss a specified logic based approach to grounding research in the SCML domain. This requires charting the theoretical focus, detailing previously defined components, and “beginning” an explanation the assumptions expected to be present for studying the SCML phenomenon (e.g. Hunt and Morgan 1995). Responsiveness Logic is a living paradigm that needs to be shaped by the discipline. First, we will introduce the concept of a logic(s) to the field.

What is a logic?

A logic is a midlevel theory that is often employed in an industrial or organizational setting, the supply chain (Thornton et al, 2012; Vargo and Lusch, 2004). Researchers are increasingly calling for the use of similar perspectives for better grounding of SCML research (Carter, Rogers, and Choi, 2015). Logics represents the way that management groups understand and express their decision-making along with how organizations interact with externalities. The logics perspective is a development from neoinstitutional theory that seeks to understand the role of organizations, societies, and their decisions. Logics inform the decisions, actions, and responses of supply chain members with attention given to constraints, choices, and change. Many SCML researchers are familiar macro-economic institutional logic/theory (Scott 1995), which is an offspring of the general logics approach and employed heavily by organizational theorists. In the same vein as institutional logic, adopting a Responsiveness Logic of SCML should more tightly align research goals and place more appropriate parameters on studies in SCML than the traditional adoption of borrowed theories from other fields. The logic itself should be crafted to provide the researcher with the parameters to study the supply chain relative to specific dimensions and assumptions (Hunt and Morgan 1995; Vargo and Lusch 2016).

Thornton and Ocasio (1999) defined logics to be the “socially constructed, historical patterns of cultural symbols and material practices, assumptions, values and beliefs by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their daily activity” (P.803). We draw on the approach of developing managerial logics in neoinstitutional theory, which has become a core perspective in sociology and organization theory (Greenwood, Oliver, Sahlin-Andersson, and Suddaby, 2008). This research sees decisions and actions to be shaped by the interaction between organizations that have managers with the power to make decisions, but the organizations within which those managers are embedded make the organizational adjustment choices (Friedland and Alford, 1991). In the SCML discipline, this logic is abstracted to a higher level where firms are embedded and constrained by their supply chain. Logics reflect the complex interaction between the firms’ goals and the effects of the supply chain, societal conditions, and organizational setting within which the firm is embedded.

There are important distinctions between theories and logics (Nigem & Ocasio, 2010; Thornton et al., 2012). Theories provide very broad and wide-ranging principles and explanations for why and how organizations operate. Logics represent a midlevel perspective for seeing how organizations interact with one another to provide frameworks of understanding decision making and action. SCML nearness to implementation demands this type of approach. An approach that understands the role of logics in the practice of supply chain management because it highlights how factors (such as in the way that managers think about their abilities) influence managers’ actions, but also constrain the range of considerations that they bring to bear on in their judgement (Thornton and Ocasio, 2008). As such, the logics perspective provides “precision in understanding how ... behaviour is located in a social setting and the social mechanisms that influence that behaviour” (Thornton and Ocasio, 2008: 121-122).

Logics research has noted how theory may not reflect actual organizing practices, and may diverge from reality in how much they reflect real organizational practices (Thornton, Ocasio and Lounsbury, 2012, 152-3). This is a potential fatal flaw in our attempts to continually adopt imported theories into our discipline. Those theories embody “underlying assumptions, deeply held, often unexamined, which form a framework within which reasoning takes place” (Suddaby and Greenwood, 2005: 37), but may not be fully or partially relevant to the borrower’s research (Horn, 1983). Logics represent practices, assumptions, values and beliefs, through which organizations strategize, act, manage, and form meaning in what they do (Thornton, et al., 2012, 51). They also provide structures supporting how organizations think about their situation, and the guidelines behind how they might act; rules, norms and beliefs that indicate what companies can do what and how (Greenwood and Hinings, 2006: 819), all informed by the historical symbols and practices within the supply chain as an institution (Scott, 2001; Suddaby & Greenwood, 2005; Thornton, 2002, 2004).

Logics inform decision-making by determining which issues and problems are relevant for managers (and researchers) to consider (Lounsbury, 2007) and provide a shared understanding of how to formulate strategies and decisions (Di Maggio, 1997; Jackall, 1988; Thornton, 2002: 82). Logics can focus the attention of the researcher to delimited sets of issues and solutions (Ocasio, 1997) “leading to logic-consistent decisions that reinforce strategies” (Lounsbury, 2007: 289-290). Therefore, logics provide a collection of taken-for-granted understandings and principles by which managers and organizations are able to select and implement courses of action (Thornton and Ocasio, 2008), classify others (Mohr and Duquenne, 1997), and govern which strategies and actions are appropriate for them to pursue in particular settings (Spicer, 2006).

The goals, setting, and assumptions held by a supply chain and its managers can potentially invalidate the use of some traditional theories. For instance, humanitarian logistics studies likely should not be grounded in theories that target extreme cost minimization or profitability. While efficiency is sometimes important in this setting, time compression often renders the make or buy decision less important due to the need for timeliness and reliability in potentially life threatening situations. Similarly, examining a principle-agent relationship between supply chain members may be inappropriate due to the difficulty of understand the true position of the actors and extrapolating that position to the organizational level. Logics provide a tighter lens that fits the specific domain of study and examining responsiveness through such a lens should improve conceptualization, fit conceptualizations to the domain, better explain underlying assumptions, drive important managerial outcomes, and even simplify the hypothesis conceptualization process.

Responsiveness as the Logical Lens

SCML is characterized as the coordination and management of activities within a network of firm partnerships. The supply chain is defined structurally as a set of two or more firms (selected from the distribution channel) that are linked directly to the upstream and downstream flows of products, services, finances, and information (Mentzer et al. 2001). It is through these linkages that individual firms are able to gain access to resources, develop capabilities, and increase individual performance. In supply chains, managers seek the capacity to interpret and understand the environment as well as the aptitude to disseminate market information among partners to improve customer based outcomes (Zhang et al. 2002). Doing so incurs a certain degree of interdependence due to organizational interactions as well as access to partner based resources and market access among the supply chain members. Hence, supply chain management incorporates a view of organizations as a network of institutions exchanging access to resources, abilities, and markets through cross firm coordination in order to increase the potential for both individual and joint success in a dynamic global market environment (Chan, Chung, and Wadhwa 2004).

Consequently, supply chain management describes a dynamic and evolving domain central for defining the 21st century institutional mechanisms for responding to market forces by managing a myriad of organizational processes (internal and external to the firms) to best meet the dynamics of market forces (see Council of Supply Chain Management Professionals 2005).

Addressing various market contingencies suggests that organizations must be able to recognize valuable resources across the distribution network and mobilize them to produce and utilize their abilities to collaborate and coordinate in different organizational forms, time cycles, and market conditions to meet the demands of both partners and end consumers. These goals are increasingly difficult to achieve at the focal firm level. Market performance is improved if the supply chain is responsive to market dynamics rather than how well the independent organization (firm held in isolation) adapts to the market. This realization subsumes the notion of an individual firm's ability to adjust at supply chain level (Fawcett et al. 1996; Vickery et al. 1999, Martínez and Pérez 2005). The proposal that the performance of the supply chain can be improved if the entire supply chain responds as a unit has gained traction in extant literature (Christopher 1998; Balakrishnan 2004). Research examining interorganizational coordination suggests that an integral part of supply chain management is the indication that an individual firm's overall 'response' to the market is enhanced and constrained by other supply chain members' behaviors and abilities (Gereffi, Humphrey, and Sturgeon 2005; Vickery et al. 1999). This interactive sociological conceptualization is reflected in considerations of issues that go beyond an individual firm's influence on performance (Fawcett et al. 1996, Mason-Jones, Naylor, and Towill 2000; Martínez and Pérez 2005; Vickery et al. 1999).

The supply chain domain demonstratively changes the concept of adjustment to market dynamics in a socio-organizational sense. This is due to issues including viewing the firm as an extended enterprise, the lack of a collaborative performance outcome (the offer of a value proposition to the consumer from the extended enterprise), and the potential ability to address the complexity of the global business environment as a more responsive unit. The conceptual challenge is to examine responsiveness as an outcome of multiple supply chain members' managerial decisions and efforts. As a logic, supply chain responsiveness suggests that partners mutually and willingly modify their abilities, activities, arrangements, and behaviors to develop a higher, more dynamic capability enabling firms to adjust to environmental uncertainty and opportunities (Evans, 1991; Young, Sapienza and Baumer 2003). Thus, these factors underlie responsiveness; detailing the process of when, why, and how partners modify their supply chain configuration, policy, and implementation collectively in responding to a range of changes.

The concept of responsiveness is intuitive on the surface. Many researchers consider responsiveness to be a firm's (ongoing) ability to modify a course of action in rejoinder to dynamic market conditions (e.g. Aaker and Macarenhas 1984; Bahrami 1992; Bowersox and Daugherty 1990; Evans 1991; Matusik and Hill 1998). Responsiveness has also been defined as "...the ability to react purposefully and within an appropriate time-scale to customer demand or changes in the marketplace, to bring about or maintain competitive advantage" (Holweg 2005). Holweg's definition offers is an overarching theme which is applicable to any organization; yet, the idea does not specifically address the perspective of the supply chain's constellation of firms and their collective interaction with the demands of the market. Instead, these ideas build upon Slack's (1983) view which highlights a firm's ability to exercise a wide range of options it can exploit to reduce the costs and/or time associated with employing those options.

In contrast to a focus on the firm, Ackoff (1971) approaches responsiveness from a system's perspective "... a system event produced by another system or environmental effect (the stimulus). Thus, a response is an event of which the system itself is the co-producer" (p. 664). This description of a responsiveness

systems approach is more aligned with the network of firms operating in a supply chain. Building upon this ideas and previous research, we develop an overarching definition of responsiveness as *the outcome of business process adjustment and organizational adjustment implemented in an attempt to place a supply chain and its members in a favorable position when altering behaviors, norms, processes and policy to environmental, competitive, partner and customer conditions and disruptions*. This definition reflects the evolving logic which includes the necessary integration of marketing, management, and supply chain literature bases.

Dimensions of Responsiveness Logic

Responsiveness Logic encompasses six dimensions that may all be active or inactive in a supply chain's management; adaptability, flexibility, agility, improvisation, robustness and resiliency. Quite obviously Responsiveness Logic could include just in time, just in case, omnichannel design, and many other decision contexts of value delivery that are implementation mechanisms of these dimensions. Future research should look to canvas and categorize strategic decisions and these implementation mechanisms. Table 3 provides a detailed content analysis of the research defining the six dimensions of responsiveness. Moving forward we will discuss and define each dimension as it related to Responsiveness Logic in SCML.

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Table 3: Defining the Dimensions of Responsiveness

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Adaptability - the firm and supply chain's willingness and ability to adjust or reconfigure structurally based upon the understanding and expectations of customer, market, partner, and environmental externalities.

Cite	Journal	Quote	Page
Chandrasekaran et al., 2012	Journal of Operations Management	"Adaptability is the organizations flexibility to accommodate strategic or project level changes."	137
Charles et al., 2010	International Journal of Physical Distribution and Logistics Management	"agility is being able to deal with and take advantage of uncertainty and volatility, adaptability is rather used for more profound medium-term changes".	724
Christopher & Holweg, 2011	International Journal of Physical Distribution and Logistics Management	"In that sense, we argue that we need to rethink how we operate supply chains in the era of uncertainty and create supply chains that are adaptable to such changes."	69
Engelhardt-Nowitzki, 2012	International Journal of Physical Distribution and Logistics Management	"in contrast to flexibility – the long-term adjustment of a company and related SC flows require structural modifications."	324
Jayant & Ghagra, 2013	International Journal of Supply Chain Management	"Adjust the supply chain's design to meet the structural shifts in markets, modify supply network strategies, products and technologies."	21
Pettit et al., 2013	Journal of Business Logistics	"Ability to modify operations in response to challenges or opportunities."	49
Prakash, 2011	Supply Chain Management: An International Journal	"Adaptability reflects ability to adapt with environment and changing conditions (Lee, 2004), and involves willingness to correct errors in products/services delivered to the focal organization (Mersha and Adlakha, 1992), and ability to interact and understand focal organization's need at different levels of the supply chain."	363

Commented [R"RJ3]: These tables are kinda odd!

Agility is defined as the firm and supply chain's willingness and ability to immediately make tactical level changes based upon the reaction to customer, market, partner, and environmental externalities.

Cite	Journal	Quote	Page
Bernardes & Hanna, 2009	International Journal of Operations & Production Management	"...agility is the ready ability to fundamentally change states to accommodate unforeseen circumstances in a timely manner. It is a property that allows the system to change its fundamental configuration vis-a`-vis unanticipated issues. It implies uncertainty about the future state (configuration) of the system: upon materialization of a situation, the system changes states such that the new architecture can address the situation. It is not the ability to absorb change within pre-established parameters, but the ability to reorganize rapidly and smoothly, whereby the end state or situation needing change are not established a priori. It is not bound by pre-defined possibilities, as it implies the fundamental change in the arrangement itself. It is not an available option previously incorporated to accommodate uncertainty, but the fundamental change of the options available themselves once uncertainty has materialized."	42
Charles et al., 2010	International Journal of Physical Distribution and Logistics Management	"agility is being able to deal with and take advantage of uncertainty and volatility, adaptability is rather used for more profound medium-term changes".	724
Devaraj et al., 2012	Journal of Operations Management	"To the extent that one of the key manifestations of agility is flexibility, we demonstrate the business value of agility by documenting the effect of flexibility on business performance such as cost, quality, and delivery	517
Ghagra, 2013	International Journal of Supply Chain Management	"The ability of a supply chain to respond to short term changes in demand or supply quickly and handle external disruptions smoothly."	21-22
Gligor & Holcomb, 2012a	Journal of Business Logistics	"we suggest that SCAGI can be succinctly defined as the supply chain's ability to quickly adjust its tactics and operations. This ability can manifest itself proactively or reactively."	296
Gligor & Holcomb, 2012b	Supply Chain Management: An International Journal	"the agility literature emphasizes a need to be able to react and respond to changing conditions that can be either demand or supply driven"	446
Gligor et al., 2013	Journal of Business Logistics	"...a firm's ability to quickly adjust tactics and operations within its supply chain to respond or adapt to changes, opportunities, or threats in its environment."	95
Golicic & Sebastiano, 2011	Journal of Business Logistics	"a responsive or agile supply chain strategy places a premium on flexibility and responsiveness to uncertainty in demand (Lee 2002; Goldsby et al. 2006), suggesting a supply chain structure in which collaborative problem solving, ongoing communication and information sharing, and the ability of supply chain members to adapt to changing market conditions are essential elements."	255
Liu et al., 2013	Decision Support Systems	"Supply chain agility, as a type of operational capability, refers to a firm's ability to perform operational activities together with channel partners in order to adapt or respond to marketplace changes in a rapid manner."	1453

Naim and Gosling, 2011	International Journal of Production Economics	"Agility means using market knowledge and a virtual corporation to exploit profitable opportunities in a volatile market place."	343
Roberts & Varun, 2012	Journal of Business Research	"A firm's customer agility, its ability to sense and respond quickly to customer- based opportunities for innovation and competitive action, is critical for survival and success. ... a firm's customer agility consists of two distinct yet complementary dimensions – customer sensing capability and customer responding capability."	579
Scholten et al., 2010	International Journal of Physical Distribution and Logistics Management	"...the concept of agility captures how an organisation can synthesise new productive capabilities from the expertise of its members, through knowledge and skill development, promoting innovative thinking, emphasising management and providing appropriate physical facilities ... which attempt to reliably meet market demands while minimising costs and reducing security risks."	626
Weiland & Wallenburg, 2012	International Journal of Physical Distribution and Logistics Management	"...agility is mostly understood as the ability of a supply chain to rapidly respond to change by adapting its initial stable configuration. Agility corresponds primarily with being responsive (Christopher et al., 2006), being fast (Prater et al., 2001), and being able to reconfigure the supply chain (Bernardes and Hanna, 2009)."	890
Weiland & Wallenburg, 2013	International Journal of Physical Distribution and Logistics Management	"In this research, agility is understood as "the ability of a supply chain to rapidly respond to change by adapting its initial stable configuration" (Weiland and Wallenburg, 2012)."	302

Flexibility - the firm and supply chain's willingness and ability to adjust policy and/or process in the near term based upon the understanding of and interaction with customer, market, partner, and environmental externalities.

Cite	Journal	Quote	Page
Bernardes & Hanna, 2009	International Journal of Operations & Production Management	"...flexibility seems to be related to an ex ante mode in relation to change, whereby a system is prepared in advance for some future transformation within defined constraints. For instance, volume flexibility allows firms to respond quickly and effectively to both increases and decreases in aggregate demand levels."	41
Christopher & Holweg, 2011	International Journal of Physical Distribution and Logistics Management	"Current SCM practice has sought to create what we term dynamic flexibility, which allows firms to cope with certain shifts in demand and technology, but only within the set structure of their existing supply chain design ... to meet the challenges of a turbulent business environment, we need structural flexibility that builds flexible options into the design of supply chains."	64
Engelhardt-Nowitzki, 2012	International Journal of Physical Distribution and Logistics Management	"a short- and middle-term concept in the sense of "the ability to change with little penalty in time, effort, cost or performance" (Upton, 1995, p. 207)".	323
Ghagra, 2013	International Journal of Supply Chain Management	"...an organization's ability to effectively adapt or respond to change."	22
Gligor et al., 2013	Journal of Business Logistics	"...the ability to modify the range of tactics and operations to the extent needed."	97

Grawe et al., 2011	Journal of Business Logistics	"Most definitions of flexibility refer to a firm's ability to meet a variety of needs in a dynamic environment. ... Operational flexibility is short-term and refers to having 'built-in procedures which permit a high degree of variation in sequencing, scheduling, etc.'"	71
Malhotra & Mackelprang, 2012	Journal of Operations Management	"...we consider supply chain flexibility as a system or network of interrelated external flexibilities (inbound and outbound) and internal manufacturing flexibilities, which taken together support the focal firm's performance outcomes from a customer oriented perspective."	181
Omar, et al., 2012	Journal of Business Logistics	"...supplier flexibility, defined as the manufacturer's perception of the supplier's ability to respond to changes in the environment, including changes in supply and demand or changing risk levels in the home country."	130
Patel et al., 2012	Journal of Operations Management	"A large body of research focuses on manufacturing flexibility as a key element of an organization's response to environmental uncertainty."	202
Pettit et al., 2013	Journal of Business Logistics	"Ability to quickly change inputs (outputs) or the mode of receiving inputs (delivering outputs)."	49

Improvisation - the firm and supply chain's willingness and ability to adjust managerial actions to address immediate needs without prior planning as a one-time emergency response based upon reaction to customer, market, partner, and environmental externalities

Cite	Journal	Quote	Page
Bradaschia & Pereira, 2015	Journal of Operations and Supply Chain Management	"Improvisation involves the ability to recombine available resources for a specific task. In this vision of improvisation, the author also includes creativity, defining it as the ability to use what you already know in different situations. In this way, creativity and, consequently, improvisation, are related to flexibility, to the extent that they are responsible for the increase in available options for dealing with a given situation."	123
Morrison, 2015	Journal of Operations Management	" find[ing] other ways of getting things done. Some scholars view this process as one of improvisation or bricolage - the 'use of whatever resources and repertoire one has to perform whatever task one faces' (Weick, 1993; p.352)."	82

Robustness - the firm and supply chain's willingness and ability to resist adjustment to disruption of its normal policy and processes caused by customer, market, partner, and environmental externalities.

Cite	Journal	Quote	Page
Asbjørnslett & Rausand, 1999	Production Planning & Control	"We define robustness as 'a systems ability to resist an accidental event and return to do its intended mission and retain the same stable situation as it had before the accidental event'."	220
Brandon-Jones et al., 2014	Journal of Supply Chain Management	"...the ability of the supply chain to maintain its function despite internal or external disruptions"	56
Ferdows, 1997	Harvard Business Review	"A robust network is one that can cope with changes in the competitive environment without resorting to extreme measures."	86
Klibi et al., 2010	European Journal of Operational Research	"A supply chain network is robust, for the planning horizon considered, if it is capable of providing sustainable value creation under all plausible future scenarios."	290

Kouvelis et al., 2006	Production and Operations Management	"The designed supply chain is robust in the sense that it hedges the firm's performance against the worst contingencies in terms of uncertain factors[...] over a planning horizon."	452
Meepetchdee & Shah, 2007	International Journal of Physical Distribution and Logistics Management	"The extent to which the supply chain is able to carry out its functions despite some damage done to it."	203
Stricker & Lanza, 2014	Procedia CIRP	"A robust production system has to be able to deal with disturbances in order to keep its performance on a high level. This can either be done by being resistant to disturbances (resilience, agility) or by an appropriate reaction to differing conditions (flexibility, changeability)."	87-88 88
Vlajic et al., 2012	International Journal of Production Economics	"...robustness describes the stability against different varying conditions..." "We define supply chain robustness as the degree to which a supply chain shows an acceptable performance [...]during and after an unexpected event that caused disturbances in one or more logistics processes."	177
Weiland & Wallenburg, 2012	International Journal of Physical Distribution and Logistics Management	"A robust supply chain remains effective for all plausible futures (Klibi et al., 2010), it remains in the same situation before and after changes occur (Asbjørnslett, 2008, p. 19), and it is insensitive to noise factors (Mo and Harrison, 2005, p. 243). Thus, a robust supply chain endures rather than responds to changes (Husdal, 2010, p. 14)."	890
Weiland & Wallenburg, 2013	International Journal of Physical Distribution and Logistics Management	Thus, robustness requires the proactive anticipation of change prior to occurrence. In this research, robustness is understood as 'the ability of a supply chain to resist change without adapting its initial stable configuration' (Weiland and Wallenburg, 2012)."	302

Resilience - the firm and supply chain's willingness and ability to rapidly return to a normative policy and process state of operation after disruption caused by customer, market, partner, and environmental externalities.externalities.

Cite	Journal	Quote	Page
Brandon-Jones et al., 2014	Journal of Supply Chain Management	"...the ability of a supply chain to return to normal operatin performance, within an acceptable period of time, after being disturbed..."	55-56
Coutu, 2002	Harvard Business Review	"...the ability of an organisation to face reality with staunchness, make meaning of hardship and improvise solutions from thin air."	55
Falasca et al., 2008	Proceedings of the 5th International ISCRAM Conference	"...the ability of a supply chain system to reduce the probabilities of a disruption, to reduce the consequences of those disruptions once they occur, and to reduce the time to recover normal performance."	596
Fiksel, 2006	Science, Practice & Policy	"...the capacity of an enterprise to survive, adapt and grow in the face of turbulent change."	16
Hamel & Valikangas, 2003	Harvard Business Review	"...refers to a capacity for continuous reconstruction. It requires innovation with respect to those organizational values, processes and behaviours that sytematically favour perpetuation over innovation."	55

Lengnick-Hall et al., 2011	Human Resource Management Review	"...firm's ability to effectively absorb, develop situation-specific responses to and ultimately engage in transformative activities to capitalise on disruptive surprises that potentially threaten organisation survival."	244
Melnyk et al., 2014	Supply Chain Management Review	"the ability of a supply chain to both resist disruptions and recover operational capability after disruptions occur..." requiring "...two critical capacities : the capacity for resistance and the capacity for recovery."	36
Pettit et al., 2013	Journal of Business Logistics	"...the capacity for complex industrial systems to survive, adapt, and grow in the face of turbulent change."	35 47
Ponis & Koronis, 2012	Journal of Applied Business Research	Ecological perspective: "...resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks—in other words, stay in the same basin of attraction". Organizational "...the ability to proactively plan and design the Supply Chain network for anticipating unexpected disruptive (negative) events respond adaptively to disruptions while maintaining control over structure and function and transcending to a post-event robust state of operations, if possible, more favorable than the one prior to the event, thus gaining competitive advantage".	922 926
Ponomarov & Holcomb, 2009	International Journal of Logistics Management	"...SCRes is the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function."	125
Weiland & Wallenburg, 2013	International Journal of Physical Distribution and Logistics Management	"...resilience can be conceptualized, both as the proactive capacity to "[t]ake action before it is a final necessity" and the reactive capacity to '[r]ecover after experiencing a crisis'. It includes both the ability to 'prevent or resist being affected by an event' and to 'return to an acceptable level of performance in an acceptable period of time after being affected by an event' (ISO, 2010)."	301

Adaptability – A Structural Adjustment

Adaptability refers to a firm's ability to "adjust the supply chain's design to meet the structural shifts in markets, modify supply network strategies, products and technologies" (Jayant and Ghagra, 2013, pg. 21), and "...modify operations in response to challenges or opportunities" (Pettit, Croxton and Fiksel, 2013, pg. 49). However, adaptability tends to be, "...in contrast to flexibility – the long-term adjustment of a company and related [supply chain] flows require structural modifications" (Engelhardt-Nowitzki, 2012, pg. 324), and tends to function at the strategic, rather than operational level (Chandrasekaran, Linderman and Schroeder 2012).

Yet, while an organizational level form of adjustment, adaptability remains distinct from – and subordinate to – responsiveness in that it is change in the firm or supply chain in response to externalities (e.g. environmental changes), altering the products and services delivered across multiple levels of the supply chain (Prakash 2011). Identifying those externalities is a function being adaptive and then

responsiveness. Adaptability's long-term view also separates it from other, shorter-term dimensions of responsiveness, such as agility and improvisation.

While often poorly defined, definitions of Adaptability have tended to center on the ability to shift the supply chain's design (Ghagra 2013) or structure (Engelhardt-Nowizki 2012), modifying how the supply chain operates when conditions change (Pettit, Croxton and Fiksel 2013). These are major changes that require planning and strategic decision making. SCML research explains adaptability using the terms strategic, project level, long-term, environmental, and design. Definitions of adaptability have tended to imply abilities and adjustment with long-term implications (Chandrasekaran, Linderman and Schoreder 2012; Engelhardt-Nowizki 2012). Moving forward in the grounding of a Responsiveness Logic, Adaptability should be defined as the firm and supply chain's willingness and ability to adjust or reconfigure structurally based upon the understanding and expectations of customer, market, partner, and environmental externalities.

Flexibility –Policy and Process Adjustment

Supply chain management examines intra- and interorganisational efficiency and effectiveness in dealing with changing demand (Barney 1991; Day 1994). Being flexible when challenged by change has been supported as a dynamic capability (Eisenhardt and Martin 2000; Makadok 2001). When well-managed, flexibility can even create a responsiveness advantage versus the competition (Upton 1995). Flexibility addresses the reaction to market dynamics requiring a rapid response. Here the distinction between flexibility and responsiveness is that flexibility is a time-oriented dimension of the dominant concept of responsiveness. Responsiveness examines the adjustment from the perspective of the supply chain network. It is an outcome of supply chain member interaction that is built upon flexibility (and the other dimensions) as it embodies the ability to recognize the intrinsic values of resources across the network, and adjust them to incorporate and develop abilities (Collis 1994). Thus, responsiveness is a higher level concept integrating conceptual notions associated with supply chain management, while flexibility, like adaptability is a dimension of - and managerially a path to - being responsive.

Slack (1983) defines flexibility as “the range of states a system can adopt, the cost of moving from one state to another, and the time which is necessary to move from one state to another.” Upton (1995) refers to flexibility as “the ability to change or react with little penalty in time, cost, or performance.” Later, Swafford et al. (2006) adopted these definitional characteristics to propose that range corresponds with the number of different states of preparedness (levels, positions, or options) that can be achieved with existing resources. This conceptualization suggests that flexibility encompasses both proactive and reactive means to being responsive.

As a result of the disparate categorizations and definitions of flexibility, researchers have often failed to specifically define and contextualize this important dimension of responsiveness. Thus, fluidly poorly and sometimes undefined terms such as adaptability, flexibility, and agility have entered the semantics of research and practice with blurred meanings. For clarity in the responsiveness-flexibility relationship, one need only examine the foundation of Clark's (1991) proposition, that responsiveness describes “systems flexibility” or a path to responsiveness through a flexible ability. When viewed from this perspective, some extant research not grounded in a Responsiveness Logic has confusingly composed several actions/decisions loosely termed flexibility across multiple supply chain studies covering the dimensions discussed here.

Overall, we argue that the link between flexibility and responsiveness follows Slack's (1991) conceptualized framework whereby systems flexibility relates to the higher order supply chain responsiveness concept. Flexibility is specifically defined as the supply chain's "ability to respond in a speedy manner to a changing marketplace environment" (Swafford et al. 2006, pg. 172). This definition proposes that the processes associated with flexibility must be based on the understanding of responding to partners and the market.

Flexibility's definitions also tend toward coalescing around an ability to cope with shifts in supply or demand conditions and partner expectations (Christopher and Holweg 2011). However, definitions of flexibility have tended to refer to changes bound by a supply chain's extant structure (Christopher and Holweg 2011) and that use of flexibility tends to entail a range of preplanned options rather than attempting to innovate a solution in process (Bernardes and Hanna 2009). Engelhardt-Nowitzki (2012) view flexibility as a mid-term means of coping with change versus the longer-term adaptability. Some views even suggest that Flexibility represents the boundaries that constrain a firm's ability to exercise agility (Chaing, Kocabasoglu-Hillmer and Suresh 2012). In Responsive Logic. . SCML research explains flexibility using the terms including prepared, turbulent, structural, mid-term, tactics, built-in, manufacturing, Flexibility is best viewed as the firm and supply chain's willingness and ability to make significant adjustments to policy and/or process in the mid-term based upon the understanding of and interaction with customer, market, partner, and environmental externalities..

Agility – An Immediate Tactical Adjustment

While very popular in SCML research since the 90s, the root of agility's definition is perhaps most easily seen in disciplines such as kinesiology an where it is described as "the ability to change direction with a minimal loss of control and/or average speed" (Barnes, et al. 2007, pg. 1192). This implies dependence on cognitive and perceptual processes to cope with unpredictable changes in the environment (Sekulic, et al. 2014). The agility definitions reflect industrial engineering's view of "reacting quickly and effectively to changing markets, driven by customer-designed products and services" (Hasan, et al. 2009, pg. 409), and operations management views of "efficiently changing operating states in response to uncertain and changing demands placed" upon production (Narasimhan, et al. 2010, pg. 443).

In the supply chain and logistics literature, agility has been described as "[t]he ability of a supply chain to respond to short-term changes in demand or supply quickly and handle external disruptions smoothly" (Ghagra, 2013, pg. 21-22). While at the firm level, it has been defined as "...a firm's ability to quickly adjust tactics and operations within its supply chain to respond ... to changes, opportunities, or threats in its environment" (Gligor, Holcomb and Stank, 2013, pg. 95). The most extensive definition of supply chain agility comes from Bernardes and Hanna (2009), who view it as "the ready ability to fundamentally change states to accommodate unforeseen circumstances in a timely manner. It is a property that allows the system to change its fundamental configuration vis-a`-vis unanticipated issues. It implies uncertainty about the future state (configuration) of the system: upon materialization of a situation, the system changes states such that the new architecture can address the situation. It is not the ability to absorb change within pre-established parameters, but the ability to reorganize rapidly and smoothly, whereby the end state or situation needing change are not established a priori. It is not bound by pre-defined possibilities, as it implies the fundamental change in the arrangement itself. It is not an available option previously incorporated to accommodate uncertainty, but the fundamental change of the options available themselves once uncertainty has materialized" (p. 42). This definition makes it clear that the supply chain will prefer agile partners to clumsy ones.

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Definitions of agility have included rapidly adjusting to changing supply- and/or demand - driving changes (Gligor and Holcomb 2012a; 2012b), based on a firm's customer-sensing and customer-responding abilities (Roberts and Varun 2012). Other definitions point to an ability to exploit opportunities that surface for limited periods of time due to the dynamic and volatile nature of the marketplace (Charles, Laurus and Wassenhove 2010; Naim and Gosling 2011). The bulk of agility definitions and related mislabeled flexibility constructs can be differentiated from the other dimensions due to a sense of immediacy, or short-term response to changing conditions (Gligor, Holcomb and Stank 2013; Ghagra 2013) but in this case is also expected to endure post implementation as a strategy (Charles, Laurus and Wassenhove 2010).

These conceptualization of agility may resemble flexibility in that they both represent rapid, short-term changes in the face of changing conditions (Gligor and Holcomb 2012; Liu, et al. 2013; Swafford, et al. 2006). However, the two are distinguished from one another due to Agility's freedom from preconceived responses (Bernardes and Hanna 2009), while flexibility relies on preplanned or proactive reconfigurations of the firm or supply chain (Swafford, et al. 2006; Upton 1995). SCML research explains agility using the terms including quick, advantageous, unforeseen, short-term, tactics. Agility definitions across disciplines imply an immediate response to phenomena encountered in proximity, rather than reconfiguration in response to anticipated or forecasted phenomenon. Responsiveness Logic suggest agility be defined as the firm and supply chain's willingness and ability to immediately make tactical level changes caused by customer, market, partner, and environmental externalities.

Improvisation – An Immediate One Time Adjustment

The dimension of responsiveness which addresses short-term action in response to extreme uncertainty can be captured by improvisation. Improvisation is fundamentally grounded in how managers and companies adapt to work routines and activities under rapid environmental changes. Improvisation is "the deliberate and substantive response to the design and execution of a novel production" (Miner et al. 2001, pg. 314.). Hence, improvisation implies the generation of new "one time" ideas (Deng et al., 2003) which reflects thinking and actions that emerge quickly (Ciborra 1999), but are not planned to endure (Mendoca and Wallace, 2007; Moorman and Winer 1998).

Improvisation is primarily associated with decision-making, wherein decisions are made with a minimal amount of preparation. Improvisation invokes the idea of spontaneity or intuition (Weick 1998). This dimension is normally associated with creative activities, such as music (e.g. jazz) rather than preplanned, process driven procedures (Miner et al., 2001). Interestingly, Improvisation is not examined as much in the management literature. Arguably, the process and procedures associated with manufacturing and operations, for example, preclude improvisation's seeming lack of discipline. Nevertheless, SCML managers respond to surprise events by improvising. A classic example of SCML improvisation is exemplified in the legendary actions of a FedEx employee who rented a helicopter to deliver a promised package on time. This improvised response was unplanned and likely not repeated.

Although scholars have not investigated improvisation extensively, there are studies examining improvisation in organizational settings, primarily from a learning perspective (Miner et al., 2001). SCML research does explain improvisation as task specific, creative, getting things done, bricolage, and reacting to whatever one faces. Fundamentally, improvisation is built upon prior experience and an updated modification or recombination of existing routines or plans (Hatch 1998; Miner et al. 2001). Work routines, dictated in part by formalized planning structures, are part of the coordination efforts at the interorganisational level. Inherently, the supply chain is subject to disturbances and inevitable events

which disrupt flows. A high degree of environmental uncertainty, the complexity of processes, and the difficulty in predicting customer requirements necessitate an ability to react in a manner which addresses and improves critical performance errors (Crossan et al. 1996; Jüttner and Macklin 2011). Within the supply chain, improvisation is important and a critical dimension of responsiveness because it provides a complementary approach to planning and a means to address service failure events that cannot be predicted. It can contribute to the integrity of the organization and the supply chain by modifying actions built on fundamental pre-planned actions and processes that are the collaborative elements between companies. In short, improvisation contributes to responsiveness by addressing one time actions alongside the other dimensions of responsiveness.

Few scholars have taken time to fully explore improvisation. However, it has been recently defined in the literature as a means of “find[ing] other ways of getting things done” (Morrison 2015, pg. 82), by “recombin[ing] available resources for a specific task...” requiring “...creativity ... the ability to use what you already know in different situations” (Bradaschia and Pereira 2015, pg. 123). In short, our literature implies that improvisation is a means of achieving responsiveness in the face of unexpected impediments, leveraging whatever resources are immediately at hand, regardless of whether those resources are suited by design to the purpose required or not. Thus, actions and techniques resulting from improvisation are unlikely to become a standard means of addressing the emergency that calls for improvisation. However, the ability to exercise improvisation remains important to responsiveness in any competitive environment where all possible contingencies cannot be foreseen.

Supply chain complexity and the inherent uncertainties in supply chain management call for an ability to respond with quick solutions to emerging problems and situations. Improvising is a means to generating new ideas to address these circumstances. This highlights improvisation; a way to deal with surprises that formal plans and developed activities are not equipped to handle (Miner et al. 2001). Kanter (2002) describes improvisation as action taken by individuals who do not have all the information they need. This description is similar to Ciborra’s (1999) conceptualization of improvisation as action that occurs at the spur of the moment. Ciborra’s development of improvisation is grounded in purposeful human behaviour which is based in intuition, competence and chance. In Responsiveness Logic, Improvisation should be defined as the firm and supply chain’s willingness and ability to adjust managerial actions to address immediate needs without prior planning as a one time emergency response caused by customer, market, partner, and environmental externalities.

Robustness – Enduring the Impact of Externalities

A robust system requires consistent assessment and some changes at the fundamental or structural level in its development (Kitano 2004). A system must be robust in order to function in unpredictable environments. The SCML literature conceptualizes robustness as an ability derived from ensuring long-term survival. robustness of a supply chain is reflected in its ability to either return to its original state or move to a different state while maintaining its ability to function consistently after a disturbance. Robustness is the ability to endure foreseen and unforeseen changes in the environment without Adapting. It is often related to resistance to or self-protection against undesirable impacts (Brandon-Jones, Squire, Autry, and Petersen 2014; Durach, Wieland, & Machuca, 2015). The implication is that certain risks are taken into account a priori in the planning and development of the supply chain membership and structure.

Organizations are working across their supply chains to ensure the extended enterprise has the ability to respond to potential disruptions. However, organization are developing this ability from a long-term standpoint and therefore, are proactive in their outlook. One of the primary elements of supply chain

management is the ability to manage proactively to uncertain and/or changing market conditions. This ability invokes the need to develop supply chain strategies to cope with challenges, changes and disruptions. SCML research uses terms including resist, cope, hedge, carry on, insensitive, and non-adapting to characterize Robustness. Accordingly, we suggest following the slightly adjusted definition of Weiland and Wallenburg (2012) which characterizes robustness as proactive and specifically “the ability of a supply chain (to maintain responsiveness while) resist(ing) change without adapting its initial stable configuration” (Weiland and Wallenburg pg. 890; 2012). Ultimately, robustness is a strategy that contributes to responding without adapting to disruptions. Robustness is standing strong. In Responsiveness Logic, robustness is best defined as the firm and supply chain’s willingness and ability to resist adjustment to disruption of its normal policy and processes caused by customer, market, partner, and environmental externalities.

Resilience – Rebounding from the Impact of Externalities

Referencing Christopher and Peck’s (2004) work, resilience is also noted as built into supply chain strategy. The implication is that management designs resilience by building upon re-engineering the supply chain, creating a risk management culture, establishing collaboration, and embracing agility. Agility describes the conduct of a resilient organization and supply chain. For example, to achieve a resilient supply chain, agility needs to be achieved on an intra- (Goldsby, Griffith, and Roath, 2006) and inter-organizational level (Dhaigude and Kapoor 2017). This can be done through strategy and proactive planning such as choosing specific supply chain partner.

Some supply chains demonstrate the ability to withstand shocks or disruptions to their systems more readily than others. This ability has brought some focus and attention to supply chain risk management and a means to examine the role of resilience (Jüttner and Maklan, 2011). We suggest SCML researchers adopt the defining of resilience a way to recover capabilities and understood as a “capability of the supply chain to prepare for unexpected events, react to disruptions, and recover from them by maintaining (a) the desired level (responsiveness)” (Ponomarov and Holcomb, 2009, p. 131). Christopher and Peck (2004) earlier had defined supply chain resilience as “the ability of a system to return to its original state or move to a new desirable state after being disturbed” (Christopher and Peck, pg. 2, 2004). SCML research discusses resilience using terms like return to normal, reduce disruption, continuous reconstruction, absorb, survival, and recovery of capabilities. A resilient supply chain adjusts its position, but then returns to its original position. In Responsiveness Logic, resilience is best defined as the firm and supply chain’s willingness and ability to rapidly return to a normative policy and process state of operation after disruption caused by customer, market, partner, and environmental externalities.

Key Assumptions of Responsiveness Logic

Assumptions are conditions that are accepted as certain to happen. Assumptions allow researchers a bit of convenience in grounding research, otherwise studies grounded in a logic would have to address all previously accepted conditions as true. Previous research has been valuable in building a solid platform upon which to ground Responsiveness Logic’s conceptualization of assumptions (Fawcett et al. 1996; Johnson 1999; Johnson et al. 2003). Yet these conceptualizations have largely examined responsiveness as an antecedent to other variables in a single-company perspective while not addressing responsiveness as a higher level outcome or goal of SCML research and practice. At the same time, research has contributed to organizational interactions with externalities by underlying the importance of understanding and utilizing the responsiveness construct as a target for making informed managerial decisions (Lau 1996; Yusuf, Sarhadi, and Gunasekaran 1999; Mishra and Wadhwa 2003).

Responsiveness conceptualizations can be categorized generally into three groups: 1) a time based action to market events; 2) a developed ability that could contribute to a competitive advantage; and 3) a performance dimension. When discussing Responsiveness Logic, the dimensions and assumptions must be defined as a foundation to developing the parameters for future research extension and empirical testing. The following assumptions of supply chain responsiveness are based upon activities required for responsiveness to occur. These assumptions must also address consistent customer/interorganizational norms that are likely to exist or need to exist for Responsiveness Logic to be applicable to the phenomenon. Hence, we note that responsiveness is the consequence of differing interconnected firm and partner created decisions and abilities that are specific to the supply chain, *assuming that*:

- o Each supply chain is distinct in the market such that managers able to recognize and implement actions that can adjust their organization and their supply chain's actions.
- o Each firm adds some level of value to the supply chain or is eliminated.
- o Each firm has resources and abilities which dependent organizations can dedicate to the creation of responsiveness and its dimensions when faced with a dilemma.
- o Collaborations across the supply chain network are possible and preferred to the spot market when vertical integration is not possible.

Without these basic assumptions, Responsiveness Logic will not hold. Table 5 presents the summary of the key criteria framing Responsiveness Logic.

Table 4: Responsiveness Logic Key Criteria

Supply Chain Management and Logistics Key Performance Outcome Variable		
Responsiveness – <i>An outcome of the supply chain's ability to anticipate and/or react to uncertainties and changes in the market environment, enabling competitive advantage and superior time-based performance.</i>		
Dimensions of Responsiveness		
A firm or supply chain's choice of key decision variables		
Adaptability Adjusting design based on market shifts, by modifying networks, products and technologies (Jayant & Ghargra, 2013) <i>Example:</i> Brick and mortar retailer adoptions of omni-channel approaches	Flexibility Coping with environmental dynamics through built-in procedures (Grawe et al., 2011) <i>Example:</i> Employment of redundant suppliers with sufficient capacity to provide the total demand	Agility Quickly reacting or responding to changing demand or supply conditions (Gligor & Holcomb, 2012b) <i>Example:</i> Ability to rapidly locate alternative suppliers or retool for different products
Improvisation The ability to use whatever resources are at hand to address immediate needs (Morrison, 2015) <i>Example:</i> Ability to ship in-store stock to compensate for DC stockouts	Robustness The ability to ignore or endure disruptions (Meepetchdee & Shah, 2007) <i>Example:</i> Maintaining safety stock against supplier stockout risks	Resiliency The ability to quickly restore disrupted operations to their normal state (Brandon-Jones et al., 2014) <i>Example:</i> Maintaining multiple supplier networks that can rapidly scale up
Assumptions of Responsiveness		
<ul style="list-style-type: none"> o Each supply chain is distinct in the market and managers recognize the need to differentiate by employing capabilities on the supply chain network level o Each interconnected firm adds some level of value to the supply chain o Each interconnected firm has resources which managers dedicate to execute responsiveness o Collaboration within the supply chain network is possible and preferred to the spot market 		



SCP Process Flow

DISCUSSION

Supply chains are becoming increasingly complex and varied in their strategy, structure, and management. Responsiveness and its components influence the ability of organizations and supply chains to strategize and survive. Organizational decisions, in turn, impact how supply chains partners evolve often assisted by technological advancement (Gereffi et al. 2005). Presumably, the characteristics of supply chains reflect the partners and customers in which they operate. This implies that, unlike earlier attempts to define organizations as M-form (Birkinshaw and Morrison, 1995), no standard supply chain model exists (Harland et al 2011). Given a move to a dynamic view of the extended enterprise, firm boundaries blur across supply chain partners such that governance structures range from market to vertical integration represented across relationships developed to respond to needs and wants. It is quite possible that the root of supply chain adjustment and governance can be traced to a need for responsiveness (Richey, Roath, Whipple, Fawcett 2009).

Responsiveness depends on how firms organize, access, disseminate, and maintain resources and knowledge (Teece, 2000). Agility, adaptability, flexibility, and improvisation are executed through resource and knowledge application depending on what is needed to compete and gain responsiveness (Amaldoss et al. 2000). Partnerships are highly valued in supply chain management (Cai, Jun, & Yang (2017).) and are created primarily to leverage the achievement of mutual objectives (Richey et al, 2010). Responsiveness Logic dimensionalizes supply chain management decision making across the network of relationships and options.

Richey, Tokman, and Dalela (2010), supported the notion that supply chains leverage relationships specifically to build superior responsiveness. In support of the current argument, responsiveness is discussed as a managerial goal of the firm and research objective of the discipline whereby financial performance and customer value may follow as a consequence. Managers of these supply chains and its firms target responsiveness as a key metric to future success and leverage a cost-value trade-off to influence financial performance through a targeted level of responsiveness. It must be noted that while SCML managers are directly responsible for responsiveness, they are often only tangentially responsible for financial and customer value. Setting one of those variables as an outcome requires a litany of controls and assumptions that are beyond the allotted length of any journal article and open the researcher up to enhanced endogeneity issues. It is our hope that Responsiveness Logic allows SCML researchers focus their efforts on a specific conclusion without assuming their way to a less legitimate outcome.

It is likely that the development of Responsiveness Logic – or really any pure SCML conceptual grounding, has been overlooked due to the narrow focus on individual organizational behaviors that lend themselves to borrowed theories with little consideration given to the overall supply chain. For example, in practice managers largely profess the importance of relationships at the supply chain level, but continue to examine performance in individual firm terms. In a supply chain, responsiveness is both an organization specific and supply chain spanning concept that cascades from organization to organization. Thus, from an empirical standpoint, it is the fit of efficiency and effectiveness resulting from dimensions that should be examined to truly estimate the responsiveness (as performance) of the extended enterprise.

Emphasis on the study of responsiveness may help to overcome the very limited theoretical centering and grounding of supply chain management. As a result, this paper addresses some of the issues calling for theory building within supply chain management from the SCML, distribution, marketing channels, and management literatures (Mentzer and Kahn 1995; Melynk and Handfield 1998; Flint, Larsson,

Gammelgaard, and Mentzer 2005). The approach brings multiple elements of existing SCML research into a logic that addresses the supply chain as a specific discipline striving for a specific outcome.

Responsiveness Logic may help eliminate the need for grounding our studies in borrowed often ill-fitting theories. While elements of transaction cost economics, resource dependency theory, and the resource-based view of the firm may be integrated effectively, they ignore the specifics of implementation that makes SCML a truly impactful discipline. The transaction cost economics addresses the idea that a firm decreases its costs by either acquiring and maintaining resources, or assembling cooperating firms that provide access to the outputs of such resources (Williamson 1985). Transaction Cost Economics' resource combination for efficiency and the resource based View of the Firm's (Barney 1991; Wernerfelt 1984) resource combination for effectiveness are assumptions in SCML research and Responsiveness Logic. These things must be true or neither perspective addresses the how things get done as is supported in Responsiveness Logic. The abstraction of these theories makes them less useful than a logic that specifically addresses the domain. The same can be said for resource dependence theory which posits that because firms become increasingly dependent upon these resources, they will seek coordination and collaboration with other firms. Demonstrating a willingness maintain close contact through partnerships, especially strengthened with the presence of uncertainty, is also assumed in SCLM and sourcing literatures. Dependency theory offers little in the way of guidance for SCML researchers. It is a fact of doing business across the supply chain.

This is not to say that past theory should be ignored. Specifically, some of the emerging perspectives should be examined as antecedents and contexts of Responsiveness Logic. Knowledge and learning environments should have a role in superior responsiveness. These concepts are represented as vital components of supply chains and are accumulated over time within the supply chain environment (Gulati 1999). Additional, supply chains that integrate can focus particular organizations on particular contexts to develop abilities leading to lower costs and better responses. One would expect issues like these would help grow a discipline defining nomologic network. It will be the job of future researchers to fully flesh out the paths to responsiveness.

A Note on Process

It should be expected that structure and complexity would have a significant impact on the activities leading to responsiveness. As an example, a concept called modularity relates to adaptability. Adaptability suggests reacting to perceived changes in the market environment by making structural modifications to supply chain flows. Thus, modularity represents a means of adapting to change. For example, retailing firms anticipating an increase in demand for omni-channel fulfillment might add warehouse capacity closer to the market by contracting with (outsourced) warehouses rather than relying on more distant (owned) warehouses and retail locations.

In a similar manner, flexibility has modular characteristics. Flexibility's definitions suggest an ability to react to market changes, but "only within a set structure of [the] existing supply chain design" (Christopher and Holweg 2011, pg. 64). Flexibility, might then represent the range of modular configurations available to a given supply chain in that a supply chain might employ specific combinations of partners and/or resources to execute specific projects, or to cope with anticipated changes in demand or risk within the current structural boundaries. For example, Li and Fung have long been noted for their ability to configure supply chains to best serve customer needs by using combinations of vendors that are pre-qualified based on their suitability to specific tasks and/or conditions.

Examination of the literature revealed opportunities where the dimensions of responsiveness likely work together to achieve firm and supply chain goals. For instance, Stricker and Lanza (2014) suggest an adjustment and a non-adjustment relationship between robustness, resilience, agility, and flexibility. Devaraj et al. (2012) flexibility is most closely related to agility and perhaps one drives the other. Golobic and Sebastiano note a dynamic process and structure including responsiveness, agility, flexibility, and adaptability. It seems a hierarchy may exist among the dimension.

However, many adjustments to market disruptions remain unpredictable. Prices for key inputs might change radically and last long periods in a manner similar to the price of oil over several recent years. Similarly, key suppliers might become impractical due to changing consumer attitudes towards labor conditions. Anticipation of these circumstances may call for a careful repositioning of supply chain member resources and abilities (e.g. change to the supply chain structure) or a reconfiguration of suppliers. Firms in highly volatile or innovative markets might prefer rapid-reaction approaches to medium- and long-term supply chain configurations in order to more immediately seize new opportunities. Thus, there is room for supply chains to exercise adaptability and flexibility through modularized means. The questions then become: what specific combinations are best, when should specific combinations be employed, and how should they be implemented to reach a desired level of responsiveness. Modularity is only one example in our field which contains hundreds of management options.

CONCLUSION

Ambitious all-encompassing definitions of SCML and borrowed theories may be partially to blame for confusion about our discipline and its maturity. Working for a definition that SCML is “everything” may have resulted in many issues that has confused the field. Over the last two decades we have seen the adoption of the SCML domain by tangential researchers, a lack of unity and understand in our field’s research goals, growing confusion about what makes a SCML contribution, and even false assumptions such as assuming a profit/cost motive is always appropriate or even measurable. This manuscript has introduced one logic to assist in better identifying SCML research, especially in the area of decision making, a Responsiveness Logic. While a Responsiveness Logic of SCML is in its infancy, we believe it will help ground future research and give researchers in the field a specific and measurable outcome that can be easily explained to practice. Growing our understanding of the antecedents, dimensions, and assumptions of Responsiveness Logics opens the door for a significant amount of new and replicated research that will help define and advance the SCML field of study.

Advancing Responsiveness Logic Research

We ask the reader of this manuscript to understand that this conceptualization is only a beachhead for larger research goals across the discipline. In this discussion we have worked to define the parameters of the discussion, but this base and dimensional framework needs to be expanded and made completely transparent. In explaining the shape of Responsiveness Logic, we have attempted to detail a unified goal for defining our field of study. Ultimately, this study has introduced a new targeted logic for use in grounding many SCML studies, explained the multi-level decision design of the phenomenon, provided the implementation of specific dimensions, and noted required assumptions. We defined seven important SCML concepts often discussed and equally confused and set the stage for responsiveness to be viewed as a key performance criterion for our discipline. Simply stated, if the study is not examining the ability to respond to partners, markets, disruptions, or customers, it probably isn’t SCML research. It is our hope that this discussion will spur on debate that will improve SCML research and help the field mature through the benefits a focused approach offers.

There are many conceptual and methodological questions to answer. For instance, empirically responsiveness can – an initially probably should - be collected through perceptual data, but researchers need to find other ways to perfect measurement into specific metrics within and across organizations. An important measure that could include cost would be return on responsiveness (RoR) similar to examination of return on quality (ROQ). From these types of metrics, researchers could attempt to relate responsiveness to other outcomes in the broader field of business, but only when applying the appropriate control variables. Suggesting that responsiveness is our key criteria does not mean cost, financial performance, and other outcome variables are less important – only that they are distant from the related activities of supply chains and their managers. As such, in studies that include market and financial outcomes, responsiveness could be considered a key mediating criteria similar to the modeling positions of commitment and trust in marketing strategy research (Morgan and Hunt 1994).

This manuscript has worked to provide logic and structure to how supply chains adjust, but we have not empirically examined the relationships between these concepts. This is a gap in the literature that has been largely ignored. Understanding the influence of these dimensions on responsiveness is crucial to building realism and maturity into the discussion. Additionally, research needs to work within, across, and beyond these concepts to address normative decision making as well as best practices. Responsiveness Logic even opens the door for simplification of some past conceptualizations, allowing researchers to examine an outcome less laden with error from missing variables especially in absence of controls. The list of new and repeated research possibilities supported by Responsiveness Logic is truly endless. Researchers should work to redevelop past models with responsiveness as the new outcome. Questions exist concerning the role of resources (i.e. technology) and other mediators and moderators between setting, dimensions, and even responsiveness itself. Other more specific questions include: How does time impact Responsiveness Logic? How does Responsiveness Logic relate to sustainability? How does a proactive or reactive approach further develop and impact the Responsiveness Logic? The opportunities are deep and broad. Finally, and most importantly, SCML managers should be able to understand Responsiveness Logic and find the connection to their explicit needs appealing. That is not something you can say about many of our borrowed perspectives.

Why Should Management Care?

The initial version of this study was entered into a supply chain center advisory board competition for funding. Those managers examined the document and selected this Responsiveness Logic study for funding over many other options. The managers themselves were interested in fleshing out that the dynamics of responsiveness. In the process, we were able to provide a managerial tool designed to help a company examine/audit firm and supply chain responsiveness. This is one of many managerial implications that can be derived in developing a unified understanding of Responsiveness Logic. In closing, a managerial application will be discussed. This managerial responsiveness audit tool presented in Table 5 separates five dimensions between two managerial domains: executive and operational.

Table 5: Managerial Responsiveness Audit

Managerial Domain	Construct	Qualitative Questions	Quantitative Measures	Source
Executive	Adaptability	Do our services satisfy the way customers use our offerings?		

Do we make what our customers want?
 How well does our system fit with changes emerging in the market?

Our supply chain adapts to shifts in markets and adjusts its business relations with its supplier
 Gyan, 2011
 Our supply chain changes production methods at a greater speed in comparison with our competitors.
 Eckstein et al., 2014
 Our supply chain is adapts to shifts in markets and adjusts its business relations with its supplier
 Gyan, 2011
 Our supply chain uses strategic gaming and simulations to design more adaptable supply chain processes
 Pettit et al. 2013
 The management systems in our supply chain evolve rapidly in response to shifts in our business priorities
 Chandrasekaran et al., 2012

Managerial Domain	Construct	Qualitative Questions	Quantitative Measures	Source
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Executive

Flexibility

Do we have a plan to cover each facility's customer needs with the capacity of other facilities in our network, should any given facility go down?
 How many redundant suppliers do we have that could increase production if our preferred suppliers were unavailable?

Our supply chain can quickly change the routing and mode of transportation for outbound shipments.
 Pettit et al. 2013
 Our supply chain can quickly reallocate orders to alternate suppliers and reallocate jobs between different production units.
 Pettit et al. 2013
 Our supply chain can quickly vary outsourced storage, distribution, and other services.
 Pettit et al. 2013

Our supply chain contracts can be easily modified to change specifications, quantities, and terms
 Pettit et al. 2013

Our supply chain has many alternate options for key products and services
 Pettit et al. 2013

Our supply chain is able to postpone production to be more responsive to demand.
 Pettit et al. 2013

Managerial Domain	Construct	Qualitative Questions	Quantitative Measures	Source
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Operational

Agility

Do we do everything by a checklist?
 How else could we satisfy our customers with the resources/capacity we have?
 If our way of serving the customer failed, how else could we use our resources to serve the customer?

Our supply chain can detect changes in demand in a timely manner
 Gligor et al., 2013

Our supply chain can detect changes in supply in a timely manner
 Gligor et al., 2013

Our supply chain can detect strategic opportunities/challenges in a timely manner (e.g., new competitor movement, new economic tendency, new technology, and new market)
 Gligor et al., 2013

Our supply chain can reconfigure supply chain resources in a flexible manner to respond to strategic opportunities/challenges
 Gligor et al., 2013

Our supply chain can reconfigure supply chain resources quickly to respond to changes in supply
 Gligor et al., 2013

Managerial Domain	Construct	Qualitative Questions	Quantitative Measures	Source
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Operational

Resilience

Do our suppliers plan and train to minimize downtime if critical assets go down?
 Do we know how long each of our customers can tolerate a delay in order fulfillment?
 Do we plan and train to minimize down time if critical assets go down?

Our supply chain is able to adapt to the supply chain disruption easily. Ambulkar et al., 2014
 Our supply chain is able to cope with changes brought by the supply chain disruption. Ambulkar et al., 2014
 Our supply chain is able to maintain high situational awareness at all times. Ambulkar et al., 2014
 Our supply chain is able to provide a quick response to the supply chain disruption. Ambulkar et al., 2014

Managerial Domain	Construct	Qualitative Questions	Quantitative Measures	Source
Operational	Robustness	How likely is each link and node in our network to experience disruption? How many days of safety stock can each facility in our network afford to carry?	For a long time, our supply chain is able to carry out its functions despite some damage done to it. For a long time, our supply chain retains the same stable situation as it had before changes occur. When changes occur, our supply chain grants us much time to consider a reasonable reaction. Without adaptations being necessary, our supply chain performs well over a wide variety of possible scenarios.	Wieland & Wallenburg, 2013 Wieland & Wallenburg, 2013 Wieland & Wallenburg, 2013 Wieland & Wallenburg, 2013

The executive domain tends to fall within the concern of senior, or “C-Suite” managers, focused on major concerns of the firm and its supply chain relationships. In contrast, the operational domain tends to be the

concern of managers responsible for the supply chain, boundary spanning activities of the firm, or those activities dependent on such boundary spanning activities.

Executive domain constructs tend to reflect decisions about the infrastructure or the main value proposition of the firm, such as what to produce and what to assets to employ, or alliances to form to produce it. Adaptability is characterized as an executive domain construct because of its description as the ability “to accommodate strategic or project level changes” (Chandrasekaran et al. 2012, pg. 137), its role in medium-to-long-term changes (Charles et al. 2012; Engelhardt-Nowitzki 2012), and its concern with what products to make, what networks to build or join, and what technologies to employ (Jayant and Ghargra 2013; Prakash 2011). In a similar manner, flexibility is concerned with the range of infrastructure or relational options to add or subtract (Malhotra and Mackelprang 2012; Pettit et al 2013) in anticipation of supply or demand shifts (Bernardes and Hanna 2009; Christopher and Holweg 2011).

Operational domain constructs, in contrast, tend to reflect more immediately implementable decisions, such as should a manager react to a disruption with a “canned-plan” or re-purpose resources to cope, and risk assessment issues such as how well the supply chain can endure disruption, or how quickly can it recover. Agility, then, tends to be an operational domain construct because of its characteristics as an uncertainty-coping mechanism (Charles et al. 2010), against short-term changes (Ghagra 2013), sometimes by improvised means (Gligor and Holcomb 2012a). Resilience tends to be an operational domain characteristic, flowing as it does from options that establish a supply chain’s flexibility, but grounded in the short term (Lengnick-Hall et al. 2011), and relying on planning and anticipation (Ponis and Koronis 2012). Robustness also tends to be an operational domain characteristic, as it involves the planned ability to withstand or ignore supply chain disruptions (Brandon-Jones et al. 2014; Vlajic et al. 2012 Wieland and Wallenburg 2012).

The select scale measures presented in Table 5 may be used by managers to assess the dimensions of responsiveness in their organizations quantitatively. However, simply put, managers should begin by asking the simple questions about the ability of their organizations to respond to customer needs through each of the five responsiveness dimensions. Given time and the accumulation of data, it is hoped that responsiveness trends and best practices can be assessed with this tool. For now, companies should be able to use this tool and simple averages to: assess how they fit with supply chain partners, uncover their abilities and weakness, and track the changes in their ability to respond over time by dimension.

Commented [R"RJ6]: Frank – please remove the ops/strat break and just discuss the tool and measures. Add the scale anchors that make sense to the write up

APPENDIX

Possible Scale Items

Construct	Items	Source
Adaptability		
	The management systems in our supply chain evolve rapidly in response to shifts in our business priorities	Chandrasekaran et al., 2012
	Our supply chain changes production methods at a greater speed in comparison with our competitors.	Eckstein et al., 2014
	Our supply chain uses strategic gaming and simulations to design more adaptable supply chain processes	Pettit et al., 2013 Gyan, 2011
	Our supply chain is adapts to shifts in markets and adjusts its business relations with its supplier	
	Our supply chain adapts to shifts in markets and adjusts its business relations with its supplier	
Agility		Gligor et al., 2013
	Our supply chain can reconfigure supply chain resources in a flexible manner to respond to strategic opportunities/challenges	
	Our supply chain can detect strategic opportunities/challenges in a timely manner (e.g., new competitor movement, new economic tendency, new technology, and new market)	
	Our supply chain can detect changes in supply in a timely manner	
	Our supply chain can detect changes in demand in a timely manner	
	Our supply chain can reconfigure supply chain resources quickly to respond to changes in supply	
Flexibility		Pettit et al., 2013
	Our supply chain can quickly change the routing and mode of transportation for outbound shipments.	
	Our supply chain can quickly reallocate orders to alternate suppliers and reallocate jobs between different production units.	
	Our supply chain contracts can be easily modified to change specifications, quantities, and terms	
	Our supply chain has many alternate options for key products and services	
	Our supply chain can quickly vary outsourced storage, distribution, and other services.	
	Our supply chain is able to postpone production to be more responsive to demand.	

Construct	Items	Source
Resilience	<p>Our supply chain is able to cope with changes brought by the supply chain disruption.</p> <p>Our supply chain is able to adapt to the supply chain disruption easily.</p> <p>Our supply chain is able to provide a quick response to the supply chain disruption.</p> <p>Our supply chain is able to maintain high situational awareness at all times.</p>	Ambulkar et al., 2014
Robustness	<p>For a long time, our supply chain retains the same stable situation as it had before changes occur.</p> <p>When changes occur, our supply chain grants us much time to consider a reasonable reaction.</p> <p>Without adaptations being necessary, our supply chain performs well over a wide variety of possible scenarios.</p> <p>For a long time, our supply chain is able to carry out its functions despite some damage done to it.</p>	Wieland & Wallenburg, 2013

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