

A Systematic Literature Review Protocol for the analysis of practices, measurement instruments and contextual factors inherent to Supply Chain Agility

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Abstract

Supply Chain Agility (SCA) has recently received substantial attention in the literature and in practice. The previous literature encompasses a number of different tools and constructs that are used to measure SCA, indicating the need to refine and validate a supply chain-level measurement instrument of SCA. In addition, the role of the contextual factors inherent to the implementation of SCA and the need to achieve a certain fit between SCA and other supply chain and firm strategies and orientations has received little attention by the research community. This paper represents a SLR protocol to identify definitions, practices, and measurement items of SCA, as well as the contextual factors that affect supply chain's ability to implement and measure supply chain agility. Finally, this paper will try to contribute to the theory development and advancement on SCA by clarifying the need to accomplish a certain fit between SCA and other supply chain and firm strategies and orientations.

Keywords: *Protocol; Systematic Literature Review; Supply chain agility; Agility; Supply chain management; Supply chain strategy; Supply chain orientations.*

1. Introduction

In today's global marketplace, individual firms no longer compete as independent entities but compete as an integral part of supply chain links. The base of competition between companies depends to a great extent on their ability to assemble capabilities across their supply networks (Yang, 2014; Towill and Christopher, 2002). Among these capabilities agility has been identified as one of the most vital capabilities that supply chains need to grasp in order to achieve effectiveness of strategic supply chain management and ultimately enhanced business performance (Gligor et al., 2015; Braunscheidel and Suresh, 2008; Gligor et al., 2013; Tse et al., 2016). Agility as a new strategy for enhancing competitiveness has been

widely researched since its inception in the early 1990s. The concept, in its various forms, is now acknowledged as a winning strategy for growth if not a fundamental one for survival in certain business environments (Ismail and Sharifi, 2006). Defined as a supply chain's capability to adapt or respond in a speedy manner to a changing market place environment (Swafford et al., 2005), and aimed to respond quickly to the unique needs of customers and markets, mastering change and uncertainty, leveraging the impact of the people, and enrich customers (Yusuf et al., 2004), SCA helps firms to overcome all types of changes that exists in the business environment, such as, market volatility, intense competition, changes in customer's requirements, accelerating technological change, and changes in social factors (Lin et al., 2006; Du et al., 2021), resulting in more differentiation and increased profitability (Um, 2016).

The concept of SCA reflects a complex philosophy, which is not about rules and procedures which can be easily implemented or imitated (Liu et al., 2013). Thus, developing an agile supply chain goes beyond simplistic solutions such as inserting certain capabilities in individual organizations in isolation or at best to partially align or coordinate operations along the supply chain (Ismail and Sharifi, 2006). Despite its popularity, the concept of SCA seems to be vaguely defined and loosely structured. More specifically, definitional ambiguity and conceptual fragmentation have prevented the concept of SCA from reaching its full potential. Current knowledge about SCA is still limited (Humdan et al., 2020); for instance, the literature associated with this concept is dispersed and it is uncommon for any two articles to adopt the same definition of SCA (Gligor et al., 2013).

The study of the drivers/formative capabilities of SCA (Dubey et al., 2018; Chen, 2019; Dubey et al., 2018; Kim and Chai, 2017; Roscoe et al., 2019) has been a common area of research in the literature. Based on the above reasoning and the current focus of SCA literature, there is scanty in research that is dedicated to develop an effective measurement tool for SCA. Measuring SCA is not a simple task neither and firms that operate in complex environments (such as international markets) face challenges in implementing the measures necessary to evaluate and increase their agility performance. The complexity and vagueness involved in agility evaluation process must be considered precisely for agility estimation for an ASC system (Samantra et al., 2013). So, it may be argued that there is still a need for a supply chain-level measurement instrument that can count on the consensus of the scientific community, considering that measuring SCA is fundamental to identify and address deficiencies in the supply chain activities, and it serves as a good input for managerial decision-making.

Current knowledge about supply chain agility is focused on the study of mutual interaction between SCA and its performance outcomes; for example, researchers like Gligor (2014), Yang (2014), Khan and Wisner (2019), Um (2016), among others, have conducted research trying to address the positioning of the relationship between SCA and firm performance within the supply chain management literature, and the nature of this complex relationship. Nevertheless, further research is needed to explain how an agile supply chain strategy can improve supply chain performance (Tarafdar and Qrunfleh, 2016).

Another area of the research on SCA that is still underdeveloped and needs further investigation is related to the different interrelationships between SCA and other supply chain and firm strategies, as well as, the different interrelationships between SCA and supply chain orientation. Previous research has demonstrated the necessity of achieving a good fit between SCA and other SC strategies such as market strategy, product strategy, sourcing strategy, procurement strategy, IT strategy, corporate environmental strategy, distribution strategy, and competitive strategy (Ismail and Sharifi, 2006; Swafford et al. 2006; Qi et al. 2011), as well as the need to achieving a fit between SCA and supply chain orientation (learning orienta-

tion, market orientation, and innovation orientation), these previously mentioned elements in addition to supply chain design are considered as essential aspects needed for the development, implementation, and enhancement of SCA (Sharifi et al., 2006).

Finally, the contextual factors inherent to the implementation of SCA have comparatively received little attention by the operations management research community. For instance, Eckstein et al. (2014) called for more research to study the contextual factors that may affect the implementation of SCA, such as supply chain complexity and other non-complexity factors. The authors argued that accounting for dynamism, munificence, and cultural setting might provide useful extensions to SCA's literature. In the same vein, Abdelilah et al. (2018) suggested studying the effect that different industry settings have on the firm's ability to implement SCA, and Naughton et al. (2019) indicated that SCA literature effectively misses a contextualized understanding of the nature of SCA experienced by firms bearing different characteristics.

By clarifying the above-mentioned ambiguities in the literature, our Systematic Literature Review (SLR) will address: a) the practices used to make up the operational definition of SCA, b) the groups of items used to measure SCA, and c) the measurement metrics and methodologies that have been used to measure SCA. On the other hand, this research also aims to analyze the main contextual factors that affect a company's ability to implement and measure supply chain agility, as well as the interrelationships between SCA and different supply chain strategies and orientations.

Having these objectives in mind, the rest of this paper is structured as follows. First, a general review about the topic in the previous existing literature is included. Secondly, the main objectives, and research questions the authors want to answer by doing this SLR are established. Thirdly, the main stages followed to conduct the SLR are described. Fourthly, the main stages followed for material selection are designated. Finally, the data extraction strategy and work plan are included.

2. Background

In an environment where the only constant is change, SCA has become a source not only for competitive advantage, but in some instances also for the long-term sustainability of an organization (Blome et al., 2013). A key feature of present-day business is the idea that it is supply chains that compete, not companies (Martin and Towill, 2000). Therefore, SCA with its emphasize on flexible, and timely action in response to rapidly changing demand environments is now being considered as a qualifying characteristic for supply chains in order to succeed as units of competition (Ismail and Sharifi, 2006).

Being found in disciplines such as military, sports science, organizational science, and manufacturing science, the concept of agility is considered a multidimensional and multidisciplinary concept. For instance, Nazempour et al. (2018) argued that alertness, accessibility, decisiveness, swiftness, and flexibility are the most important dimensions of supply chain agility, while Eckstein et al. (2014) considered dynamic sensing, dynamic flexibility, and dynamic speed as the dimensions of an agile supply chain. By defining agility as a business wide capability that embraces organizational structures, information systems, and in particular mind sets, Christopher (2000) has identified the characteristics of a "truly agile" supply chain to be market sensitive, virtual, network-based, and process integration, whilst Bidhandi and Valmohammadi (2017) highlight speed, competence, flexibility, and responsiveness as the dimensions of

agility in supply chains. More recently, Patel and Sambasivan (2021) have identify up to thirteenth dimensions of agility discussed in the literature, with the quickness, responsiveness, competency and flexibility as the prominent ones.

As a business concept, “agility” originated in manufacturing science and it has been extended to a variety of business domains, including supply chain management (Gligor, 2014). The driver behind agility in manufacturing was the need to find a revolutionary way of manufacturing products while being able to manage uncertainties, and product introduction time to achieve responsiveness, innovation, superior quality, maximization of profit, and to satisfy the ever-increasing customer demand (Potdar et al., 2017). As the concept of agility evolved and was introduced to supply chains, researchers have classified the drivers behind agility in the supply chain in five broad areas including market volatility, intense competition, changes in customer requirements, accelerating technological change, and change in social factors (Lin et al., 2006; Du et al., 2021). It was also suggested that SCA is one of the most important strategies needed to face these changes with its objectives of establishing a Seamless Supply Chain (SSC) in which all players think and act as one, ensuring end customer satisfaction, having the ability to respond quickly and efficiently to a volatile marketplace (Mason and Towill, 1999; Power et al., 2001; Du et al., 2021), enriching customers and employees (Lin et al., 2006), anticipating uncertainties (Baramichai et al., 2006), reducing inventory, and integrating with suppliers more effectively (Faisal et al., 2007).

Supply chains cannot become agile overnight. There are certain enablers which would help to transform a supply chain into an agile entity. Some of them are collaborative working between supply chain partners, joint product development, common systems and shared information (Faisal et al., 2007). In the literature several enablers of SCA have been suggested; for example, Chen (2018) proposed IT integration, and trust as antecedents of supply chain agility, and Dubey et al. (2018) have proposed big data analytics capability as a driver of supply chain agility. Gligor and Holcomb (2012) have presented a conceptual framework to achieve SCA based on the three key enablers of demand management interface capabilities, supply management interface capabilities, and information management capabilities, while Kim and Chai (2017) in their empirical study have supported the role of supplier innovativeness, information sharing, and strategic sourcing in achieving SCA. Amongst these enablers of SCA are certain capabilities that supply chains needs to possess, and other structural, relational, social, and strategic enablers: for instance, many researchers have studied the impact of structural related enablers of SCA such as supply chain design, IT infrastructure, and market proximity (Ismail and Sharifi, 2006; Khalili et al., 2011; Avelar et al., 2018), while others have indicated the importance of strategic enablers in achieving SCA (Kim and Chai, 2017; Qi et al. 2011).

Being able to measure SCA is vital for supply chain leaders to assess their current level of agility and to guide purposeful change so that their supply chain can survive, adapt, and grow in the face of turbulent and complex business environments (Pettit et al., 2013). Nevertheless, extent of agility computation is very challenging due to involvement of uncertain, imprecise or vague estimation of the subjective agile criteria (Mishra et al., 2014), and different measurement tools and instruments have been utilized within the previous literature to measure SCA. For instance, Chen (2018), Zhang et al. (2002), and Swafford et al. (2008) measured SCA using 8 items related to manufacturer’s rapid response, and adjustment to the supply chain to cope with dramatic change, whereas Kim and Chan (2017), and Tse et al. (2016) used 8 items related to joint planning, demand response, visibility, and customer responsiveness. Furthermore, Eckstein et al. (2014) and Roscoe et al. (2019) used a 16 items tool to measure SCA as a second order variable comprising dynamic sensing, dynamic flexibility, and dynamic speed, and Altay et al. (2018)

added other items to the measurement of SCA such as information gathering, and speed of decision making. Other researchers have measured SCA by comparing actual performance with required performance and planned performance (Webber, 2002), and by introducing certain indexes to measure SCA. For example, Faisal et al. (2007) have introduced a measurement instrument called SCA index to evaluate SCA, and Jain et al. (2008) have measured SCA using a dynamic SCA index, where these indexes are composed of a combination of characteristics that enable agility (Lin et al., 2006). Using yet a different technique, others applied interpretive structural modeling to a list of perceptual variables identified by supply chain experts as enablers of sSCA to gain insights on the interrelationships between these variables (Agarwal et al., 2007).

Scholars have identified several consequences associated with SCA. Specifically, literature indicates that agility positively impact operational performance, and relationship performance (Feizabadi et al., 2019). Chen (2018), Dubey et al. (2018) and Marin-Garcia et al. (2018) find empirical evidence linking SCA and competitive advantage; this result was in line with Tse et al. (2016) findings; these authors found a positive relationship between SCA and firm performance reflected by return on sales, sales growth, return on assets, overall profitability, and return on investment. In the same vein, agility has been linked to improved profitability, and cost performance (Bidhandi and Valmohammadi, 2017; Eckstein et al., 2014).

The establishment of SCA is not trivial. Partners will share profits, risks and responsibilities and ultimately the performance and success of the entire structure will always be dragged down by the less agile participant. Therefore, an agile supply chain requires various distinguishing capabilities, or “fitness” (Jain et al., 2008). Based on this nature of SCA, it is very important to consider many aspects that are essential for their successful implementation. Amongst these aspects are achieving a good fit between SCA and other supply chain and firm strategies such as market strategy, product strategy, sourcing strategy, procurement strategy, IT strategy, corporate environmental strategy, distribution strategy, and competitive strategy (Ismail and Sharifi 2006; Swafford et al. 2006; Qi et al. 2011), as well as the need to achieving a fit between SCA and supply chain orientation (learning orientation, market orientation, and innovation orientation) (Braunscheidel and Suresh, 2009). While research has shown the importance of achieving a fit between SCA and certain supply chain strategies and orientations, there is scant literature dedicated to provide a comprehensive and exclusive theoretical understanding about the topic.

3. Objectives and research questions

An analysis of the SCA literature confirms the lack of a systematic literature review article dedicated to identify the practices used to make up the operational definition of this concept, and its corresponding measurement items to develop an effective measurement tool for SCA. Essentially, the prior systematic literature reviews were mostly aimed to differentiate between the concept of supply chain agility and flexibility (Fayezi et al., 2016; Abdelilah et al., 2018), distinguish between SCA and supply chain resilience (Gligor et al., 2019), and extract and analyze the enablers of SCA and its performance outcomes (Humdan et al., 2020; Sangari et al., 2016; Sharma et al., 2017). Thus, the need to identify the practices and measurement items that are used to measure SCA are of great importance as it helps to eliminate the uncertainty that surrounds the concept, and the fragmentation that have prevented the concept of SCA from reaching its full potential (Humdan et al., 2020).

Another area of research on SCA that still in its infancy phase and needs further investigation is related to the need of achieving a good fit and alignment between SCA and supply chain and firm strategies and orientations in a way that allows firms to harvest the desired outcomes of applying SCA (Wu et al., 2014). Considering that approaching the development and management of demand networks through alignment of strategies and operations within the networks has been a focal point in many recent works, it has been suggested that the SC strategy can't be applied without taking into consideration the agreement between SCA and the other strategies and orientations that the firm already applies (Ismail and Sharifi 2006; Swafford et al. 2006; Qi et al. 2011).

Finally, another point that can be recognized by reviewing the previous literature on SCA is the confusion related to the contextual factors inherent to the implementation of SCA. Boyd et al. (2012) argue that direct effects are central, but they seem incapable of explaining real-world complexities. Thus, researchers have acknowledged that the performance effect of supply chain management practices depends on the environmental context. They have also mentioned that SCA strategy holds merit and proves advantageous under specific market and economic circumstances. Eckstein et al. (2015) indicate that such a view is often reflected in contingency theory (CT), which suggests that peculiarities of a firm's internal and external contextual environments need to be considered in its design so as to improve its performance (Sabri et al., 2018), indicating the importance of analyzing the contextual factors that affect the company's ability to implement SCA, and to gain the outcomes required from implementing such a strategy.

The novelty of this research will stem from the selection of highly recognized publications. It will also provide an encompassing definition of SCA, consolidate its enablers for better communication, introduce the concept of SCA-supply chain strategy (SCS) fit, and investigate the contextual factors that affect the relationship between SCA and firm performance. Thus, the objective of this paper is to design a SLR protocol to a) identify definitions of SCA and its corresponding measurement items, b) synthesize the measurement tools used to measure SCA according to the literature published to date, c) develop a supply chain level measurement tool for SCA, d) investigate the alignment between SCA and supply chain strategies and orientations, and e) analyze the contextual factors that affect the implementation and measurement of SCA.

This systematic literature review will respond to calls of research set by Humdan et al. (2020), Eckstein et al. (2014), and Abdelilah et al. (2018) in which these researchers indicated that there is a need to conduct more research on the contextual factors that affect the applicability of SCA, and that the existing research on SCA has largely neglected the influence of these contextual factors. In addition, this SLR will address the need to conduct more research regarding the measurement tools of SCA in order to add clarity to the concept, and reduce the ambiguity that surrounds this concept, as indicated by Gligor et al. (2013) and Humdan et al. (2020). Finally, to our knowledge there is no article in the previous literature that provided a comprehensive and inclusive discussion of the different types of strategy fit that advantage the implementation of SCA. Thus, by addressing this issue this research will significantly contribute to the theory by identifying the different correlations between SCA and other SC strategies, orientations, and contextual factors. It could provide a better understanding of the impact that SCA have on the performance of supply chains a relationship that has slightly contradictory findings in the previous literature (Humdan et al., 2020) To achieve these goals the following research questions have been formulated:

RQ1: What practices are used to make up the operational definition of SCA and what groups of items are used to measure SCA according to the literature published to date?

RQ2: Why is measuring SCA relevant and what methodologies and measurement metrics/scales have been used (and re-used) to measure supply chain agility?

RQ3: What is the nature of the relationship between SCA and other firm strategies and/or supply chain orientations?

RQ4: What are the main contextual factors that affect the implementation and measurement of SCA?

4. Systematic literature review protocol

This research follows the four main phases of SLR as defined by Sharma et al. (2017): setting the agenda for the review, material collection, material evaluation and classification, and synthesis of the data to report the results. This paper presents the protocol, a plan for the review based on the guidelines suggested by Medina-López et al. (2010) and Durach et al. (2017). The SLR process has emerged as a robust methodology for locating, and analyzing research by following established guidelines to locate existing studies, select and evaluate contributions, analyze and synthesize data, and report the evidence to arrive at clear conclusions about what is and is not known about the phenomenon under investigation with the goal of revising and refining existing theory, and discovering the most important gaps in the literature (Durach et al., 2017). Thus, SLR is protected from researcher's bias through a predefined protocol although it cannot control the publication bias (Ilyas and Khan, 2012). The various steps in the protocol will be discussed in the remaining sections of the paper. Figure 1 presents the SLR process. The first step is the identification of the existing literature on supply chain agility up to 2021, thus considering all publications made from the beginning to the year 2020 (included). The time span for choosing the articles was not limited in the starting in order to be able to obtain a wider idea on the topic.

4.1. Inclusion criteria

The inclusion criteria were used to determine which piece of literature (papers, technical reports, or 'grey literature') found by the search term will be used for the data extraction is listed below:

- English- speaking peer-reviewed research paper on SCA.
- Indexed in WOS, or SCOPUS in the Social Science category.
- Describe definition and measurement items of SCA.
- Describe the relationship between SCA and its expected outcomes and/ or its formative capabilities.
- Describe the contextual factors that affect the implementation of SCA or the relationship between SCA and its expected outcomes.
- Describe the motivation for building, measuring, and sustaining SCA.
- Describe the relationship between SCA and other firm strategies, or supply chain orientations.

4.2. Exclusion Criteria

The exclusion criteria were used to determine which piece of literature (papers, technical reports, or 'grey literature') found by the search term will be excluded is listed below:

- Studies that are not relevant to the research questions.
- Studies that do not describe the relationship between SCA and its expected outcomes and/ or its formative capabilities.

- Studies that do not describe the contextual factors that affect the implementation of SCA or the relationship between SCA and its expected outcomes.
- Studies that do not describe industrial, manufacturing, and service-based supply chains.
- Studies that do not describe definition and measurement items of SCA.
- Studies that do not describe the relationship between SCA and other supply chain strategies, or orientations.

4.3. Constructing a search term

The following details assisted us in designing a search term relevant to our research questions.

- Population: manufacturing and service-based supply chains.
- Intervention: operational definition of SCA, measurement metrics, methodologies and instruments of SCA, correlations between SCA and SCS, and contextual factors that affect the implementation and measurement of SCA.
- Outcomes of relevance: practices that make up the operational definition of SCA, groups of items used to measure SCA, fit between SCA and supply chain strategy, and main contextual factors that affect the implementation and measurement of SCA.
- Experimental Design: empirical studies, theoretical studies, case studies, experts' opinion.

4.3.1 Automatic search string

Considering the multidisciplinary characteristic of SCA, it was deemed important to cover a wide range of sources. Thus, we utilized WOS, and SCOPUS databases to ensure a comprehensive coverage. The previously mentioned databases were chosen because they are considered extensive, are available at academic institutions, and have been used in similar studies (e.g., Abdelilah et al., 2019; Gligor et al., 2019; Humdan et al., 2020).

Following the inclusion/ exclusion criteria, we have created the automatic search strategies shown in Table 1 were the results in WOS, and SCOPUS are collected.

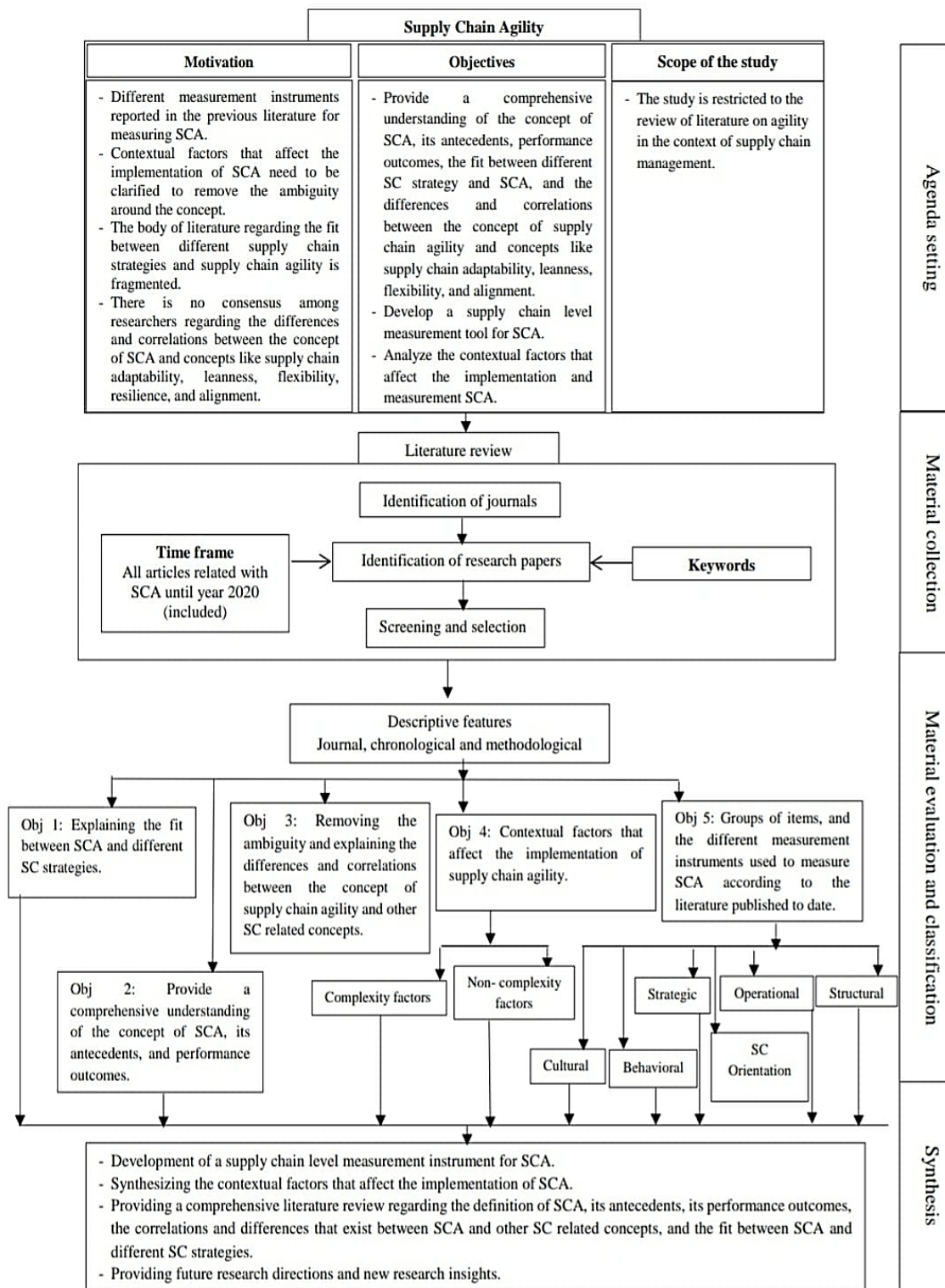


Figure 1. Framework for literature review

Table 1. Search strategy

Search 1- WOS	(TS= ("supply chain* *agil*") OR TS= ("*agil* suppl*") OR TS= ("SC *agil*") OR TS= ("*agil* SC") OR TS= ("*agility in the supply chain") OR TS= ("*agility in the SC")) Refined by: Years: until 2020 (included). Document type: article and review article. Database: web of science core collection. Languages: English	437
Search 2- Scopus	(TITLE-ABS-KEY ("supply chain* *agil*") OR TITLE-ABS-KEY ("*agil* suppl*") OR TITLE-ABS-KEY ("SC *agil*") OR TITLE-ABS-KEY ("*agil* SC") OR TITLE-ABS-KEY ("*agility in the supply chain") OR TITLE-ABS-KEY ("*agility in the SC") AND DOCTYPE (ar OR re)) Refined by: Years: until 2020 (included). Language: English	549

In our automatic search we only included articles while we didn't take into account books, congress papers, doctoral thesis, or other data resources. One of the reasons is that we were interested in consulting references of quality contrasted by a process of "blind evaluation". Another reason is that we needed to be able to access the full texts of the selected references. In this sense, the easiest sources to locate are academic journal articles since universities normally have subscriptions to electronic journals as well as the privilege to request articles from other journals at a very low cost. Books are also usually quite accessible via the library of the university, although is not as fast, and it is not always guaranteed that the book you are looking for can be located and it can be a little more expensive than a journal reprint, depending on where the product comes from (transport costs). Communications to conferences are usually more difficult to obtain, as it is not usual for organizers to post on the web with free access the full texts of the communications, and in the case that they do, the servers are not usually maintained, thus after two or three years from the end of the congress, meeting or conference it is practically impossible for the links to be active. Finally, doctoral theses are difficult to obtain if the author of the work cannot be contacted directly, or if it was not deposited in the library with authorization for consultation outside the same or has posted it in the web with free access (Medina-López et al., 2010).

The search string was applied in both databases to extract the articles of interest. Among the filters used to retrieve the most relevant results, we only have chosen articles, and review articles. Thus in our automatic search we have refined the document type to include only articles and review articles. The time span for our search was from the first article that appeared in our search until 2020 (last year included). In WOS database we have only considered articles that appeared in the WOS core collection section (Sharma et al., 2017), and the language were limited to English-speaking articles in both databases.

The first author of this protocol reviewed the title and abstract of the results of the automatic search to eliminate those that meet the exclusion criteria. In the second step, the sources were sent to the secondary reviewer, for review in case of any uncertainty regarding the inclusion or exclusion of a particular primary study. Finally, 986 publications were identified using the research string (437 articles in WOS, and 549 articles in Scopus). Among the 986 References identified there might be duplicates. However, the authors reviewed the title and abstract of all the references to include only those results which have relevance to

the problem, and once the references were pinpointed, the duplicates between them were eliminated, the lists of chosen articles by each author were compared, and the differences were discussed and resolved.

Taking in consideration that running search strategies automatically works like a black box that gives some results, but does not give information about the material that has been discarded, several tests have been used to evaluate the search process. The researchers performed a manual search in the two databases to: a) check that the final list of chosen articles included all the articles related to the topic, detecting false negatives, b) locate and identify additional relevant articles, c) minimize the potential for publication and language bias, and d) refining the search strategy and its syntax. With the manual search the criteria are interpreted, doubts that require reflection or clarification arise, and terms that had not been taken into account are discovered. The manual search consisted of applying the established search strategy to a limited set of sources and years. This search was done both manually and automatically. So, we were able to compare the results of the automatic query with the manual selection and check if the search strategy and its syntax were adequate or required some modification. In this way, we took two of the selected journals with the higher number of results (i.e. *IJSCM*, *IJPE*) and performed a manual and automatic search for a limited period of 10 years. With this we manually obtained a set of articles that had to coincide with those obtained in the automatic search (Medina-López et al., 2010). The proposed process of specifying the search strategy, and its syntax, is recursive. A search strategy and its syntax are established, a test is carried out and the results obtained in it are refined in order to improve the strategy. When we consider that the search strategy and its syntax are adequate, the results obtained are applied and refined. Modifying the search strategy after the management and debugging process is very time-consuming. Hence the importance of doing a pilot test well and as many times as deemed necessary is essential to ensure that the strategy is adequate.

Following our procedure, after applying the exclusion criteria, there were a total of 49 articles in WOS, 176 articles in Scopus, and 154 articles that appeared in both data bases. In addition, the authors selected a random sample of the identified publications and thoroughly screened their reference list for further references of interest. Figure 2 shows the PRISMA diagram that represents the different phases that have been followed for material selection, the number of records identified in each phase, as well as those that have been included or excluded for the different reasons (Stovold et al., 2014).

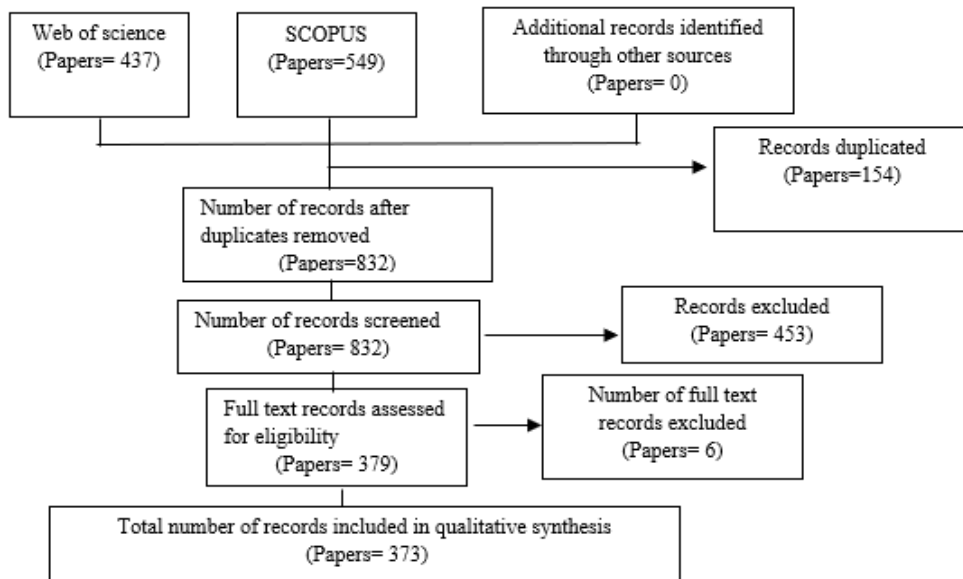


Figure 2. PRISMA diagram

The measurement of quality will be conducted after final selection of records. For any publication to pass this step, a quality assessment will be performed. The quality checklist contains the following questions as shown in Table 2.

Table 2. Quality assessment

Criteria	Notes
Is it clear how the contextual factors that affect the implementation of SCA or the relationship between SCA and its outcomes and/or formative capabilities were identified?	Yes= 1, No= 0 Partially = 2, NA= 3.
Is it clear how the concept of SCA was identified and measured?	Yes= 1, No= 0 Partially = 2, NA= 3.
Does the record contain a measurement instrument of supply chain agility?	Yes= 1, No= 0.
Does the record contain sufficient data/ sample size to support the findings?	Yes= 1, No= 0 Partially = 2, NA= 3.

Each of the above factors will be marked as "YES", "NO", "N.A", or "partially". A secondary reviewer will score a small subset for validation.

4.4 Data extraction strategy

The following sections are considered in the data extraction process:

- Primary study data
- Data extraction process
- Data codification
- Definitions of the classification themes

4.4.1 Primary study data

This process involves reading each source and coding its title, year of publication, journal title, research objective, research questions, details of research methodology, definitions of SCA, theoretical model and key contributions.

4.4.2 Data extraction process

Data extraction process is shown in Figure 3. In this step, the primary researcher will perform the data extraction process from all selected records. Simultaneously; the secondary researcher will perform data extraction from a randomly selected sample of the records. Subsequently, the results of data extraction obtained by the two researchers will be compared to ensure rigorous results.

4.4.3 Data codification

The analytical classification categories will be selected inductively, hence, the classification themes will be determined after the evaluation of the collected material, through an iterative process of category building, testing and revising. This approach was selected to ensure inclusion of all the aspects related to the research questions, and objectives of this study (Sharma et al., 2017).

Meetings will be conducted between the two authors to discuss each source, and the themes that emerge from the assessed source. Additional information beyond the identified themes will be noted and discussed through the meetings. The meetings will help in having an unbiased and varied perspective on each paper. It will also help in eliminating inconsistencies about interpretation of each paper among the authors. The discrepancies will be discussed by both authors until a consensus is reached (Sharma et al., 2017), and if deemed necessary a third researcher will act as a mediator in order to help resolve these discrepancies.

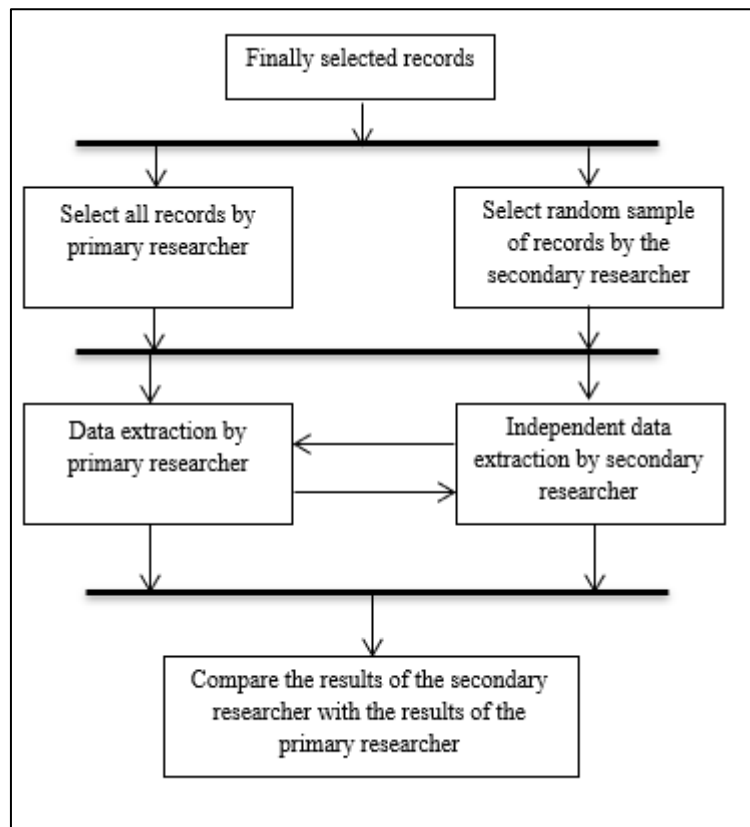


Figure 3. Data extraction process

Stemming from the inductive nature of the classification themes, the classification themes will be related to the research questions and will include, but will not be limited to:

- Practices used to make up the operational definition of SCA: operational practices, strategic practices, structural practices, behavioral practices, cultural practices, or SC orientations.
- Items used to measure SCA: proactive items, reactive items, and items that can be both proactive and reactive.
- Main contextual factors that affect the implementation and measurement of supply chain agility: complexity factors, non-complexity factors, environmental factors, internal factors, and supply chain orientations.
- Supply chain and firm strategies that facilitate the application and effectiveness of SCA: market strategy, product strategy, sourcing strategy, procurement strategy, IT strategy, corporate environmental strategy, distribution strategy, and competitive strategy.

The codes mentioned above and additional codes that will be used to extract the data are shown in Table 3 below. In addition, some coding examples for some of the codes are shown in Appendix 1.

The coding process will consist of two stages. In the first stage the two authors will independently code 20 randomly selected sources. Then a pooling will be performed to compare the degree of agreement reached. The goals of this first phase are to check if the authors have identified the same "false positives",

if there are any, and to test whether the codes set are clear, if there are problems in their use or interpretation, or if it is required to include additional codes.

In the second stage, one of the authors will codify the remaining sources taking into account the agreements and modifications that have been established in the first phase. Finally, the analysis of results and conclusions will be performed by the two authors. Each author will independently analyze the final selected sources (after having excluded false positives), subsequently, a common work session will be held to draw the final conclusions of the study (Sanchez-Ruiz et al., 2018).

4.4.4 Definitions of the classification themes

This section contains the operational definition of the themes that are used to classify the data. Explaining the essence of each of the themes helps in establishing a rigorous and clear criterion for data classification.

- Proactive items used to measure SCA: are items related to the practices that act as preventive mechanisms and risk alleviators in anticipating possible opportunities or threats. These practices are concerned with the supply side of the supply chain and centered on detecting changes in the market and in harmonizing operational capabilities.
- Reactive items used to measure SCA: are items related to practices that act as defensive mechanisms that enable the supply chain to respond to events after they have happened. These practices are effect oriented, aimed at countering the consequences of unanticipated incidents (Humdan et al., 2020).
- Operational practices: refers to a firm's ability to execute and coordinate the various tasks required to perform operational activities. Operational practices provide the means by which a firm function or operates to make a living in the present (Brusset, 2016).
- Strategic practices: are practices that influence the formulation or the execution of the common strategy of the SC (Sellitto et al., 2019), as well as, actions that are dedicated towards achieving the strategic goals of an organization (Humdan et al., 2020).
- Structural practices: are practices related to strategic decisions in structure (technology process, plant capacity and location, vertical integration degree) and in infrastructure (quality management systems, planning and control systems, inventory management, work force or organizational design) that influences a firm's abilities to obtain their competitive priorities (Garrido et al., 2007). Structural practices include the carefully planned and developed technological foundation on which present and future IT applications are built (Liu et al., 2013).
- Firm strategies: strategies that a firm or a supply chain applies: market strategy, product strategy, sourcing strategy, procurement strategy, IT strategy, corporate environmental strategy, distribution strategy, and competitive strategy. examples of these strategies are: Operational Excellence (e.g., JIT, lean supply chains) and Customer Closeness (e.g., customized and segmental logistics), and cost leadership, operational products strategy, customization strategy (Frohlich and Westbrook, 2001; Christopher et al., 2006).
- Supply chain orientations: the recognition by an organization of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain: market orientation, customer orientation, innovation orientation, and learning orientation (Braunscheidel and Surech, 2009; Gligor, 2014).

Table 3. Codes for data extraction

Id	Code	Code description and sub- categories
SCL	Scale	SCA scale (author and version).
EXT	Scale- long/ short	Type of SCA scale (short: if it contains less than 8 items, long: if it contains more than 8 items).
SAM	Sample- size	Size of the sample.
COU	Sample- country	Country or countries where the people answering the questionnaire or the unit of analysis come from.
ORG	Sample- professionals	Yes/ no, if the sample is from professionals from organizations. If yes, indicate the type of organization (public, private, industry, services, others).
LAN	Scale- language	Language of the scale.
SDdim	Scale- dimensions	Number of dimensions used to measure SCA.
DIMtyp	Dimensions- types	Types of dimensions used to measure SCA (proactive items, reactive items, items that can be both proactive and reactive, and others).
VAL	Scale- validation	Yes/ no, if the scale was validated. If yes, indicate types of tests used to validate the scale (internal consistency, variance, goodness of fit, others).
ROLE	SCA role in the research	What role does the SCA construct play in research structure models? (Antecedent, consequence, moderator, mediator, adjustment / control).
DIF	SCA- definition	Definition of supply chain agility.
DIFptcs	SCA- practices	Practices used to make up the operational definition of SCA (operational practices, strategic practices, structural practices, others).
CVAR	Contextual variables	Main contextual variables that affect the implementation and measurement of SCA (complexity factors, non- complexity factors, environmental factors, internal factors, supply chain orientations).
GAP	Future research	Possible future research topics on SCA scales, SCA practices, and contextual factors related to the implementation or measurement of SCA.
PREV	Previous research	Relevant aspects of previous research that can help in identifying which SCA questionnaire is the most cited.
VVAR	Validation variables	Other variables that should be taken into account in the process of validation of SCA scales.
LIMs	Limitation: self	Limitations mentioned by the authors of the source.
LIMp	Limitation: peer	Limitations identified by the authors of this protocol that were not highlighted in the source.
FLSPOS	False positive	Sources that were included, but after a deep analysis were found to be irrelevant to the objectives and research questions.
ORIEN	SC orientation	What role does supply chain orientation plays in the research model (antecedent of SCA, moderator or mediator of the complex SCA- firm performance relationship)

5. Conclusion

Supply chain agility (SCA) has emerged as a vital survival strategy in today's dynamic and complex markets. Despite numerous studies in the past two decades following its inception, the concept of SCA seems to be vaguely defined and loosely structured (Humdan et al., 2020). More specifically, due to the lack of research in the supply chain management literature aimed at revisiting the different tools and constructs that are used to measure SCA, and the contextual factors inherent to its implementation and measurement (Eckstein et al., 2014; Abdelilah et al., 2018; Naughton et al., 2019).

It is now increasingly accepted that “one size does not fit all” when it comes to designing supply chain strategies to support a wide range of products with different characteristics sold in a diversity of markets. It has long been recognized that SC strategy should be tailored to match the required “order winning criteria” in the market place while at the same time it needs to match firm strategies and orientations. However, this idea of aligning the firm's operations with market place requirements has not always been extended to the wider supply chain (Christopher et al., 2006), and there is no comprehensive understanding in the previous literature regarding the alignment between SCA and other supply chain and firm strategies and orientations. This work attempts to develop a SLR protocol to identify definitions of SCA, the practices used to make up the operational definition of SCA, and its corresponding measurement items. It also attempts to study the contextual factors that affect supply chain's ability to implement and measure SCA. Finally, this work will provide a comprehensive literature review regarding the correlations and differences that exist between SCA and other SC related concepts, and the fit between SCA and different SC strategies.

The review will make a number of important contributions into the supply chain management literature through the identification of SCA agility operational definitions, and measurement scales and items, in conjunction with the identification of the contextual factors that affect supply chain's ability to implement and measure SCA, and the correlations between SCA and other firm strategies. The ultimate goal of the review will be refining and composing a supply chain-level measurement instrument of SCA.

6. Specific contribution of each author

Both authors contributed to the study conception and design, search protocol, selection and analysis of the records, interpretation of the data as well as revising and approval of the records. The first author had the main responsibility of drafting the manuscript, while the main responsibility of the second author was to critically review the manuscript and refine it, as well as, serving as a scientific advisor for the intellectual content of the study.

7. Declaration of conflicting interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

8. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

9. Work plan

Table 4 summarizes the work plan the authors want to follow in order to conduct the systematic literature review.

Table 4. Work plan

Material collection	
Phase 1: initial literature search	June 2021
Phase 2: scanning title, abstract, and references of the records	June 2021
Phase 3: full text record assessment	June- august 2021
Material evaluation and classification	August- December 2021
Synthesis	
Phase 1: Result analysis	December 2021
Phase 2: Writing final paper	December 2021
Phase 3: Submit paper to a journal	January 2022

Appendix 1

Code: LIMp “Limitation: peer”

Comment: Limitations identified by the authors of this protocol that were not highlighted in the source.

3:2 In order to measure agility, Kidd (1994) proposed five agility perform..... (15:201 [15:1673]) - D 3: Abdelilah et al. 2018_ flexibility and agility: evolution and relationship

In order to measure agility, Kidd (1994) proposed five agility performance measures: cost of change, time of change, stability of change, extent of change and frequency of change.

These performance measures can be applied to all elements of a firm that need modification if the firm is to react to environmental turbulence. On the other hand, every firm seeking to become agile will rely on the four enablers identified by Christopher (2000): process integration, network integration, market sensitivity and virtual SC. A fifth element, called measurement, was added by van Hoek et al. (2001) and shows the importance of measuring the four enablers with metrics such as quality, productivity, service level and delivery speed.

Following a different approach, Giachetti et al. (2003) used relational theory and divided the measures into two groups: the first group includes structural measures, which are intrinsic properties of the system and are independent of its environment; and the second group consists of operational measures from the system's operational decisions, which thus change according to the environment. The authors identified two structural agility measures: distance metric and time delay metric, two metrics proposed by Goranson (2000).

However, Giachetti et al. (2003) argued that these measures assess complexity instead of agility, and hence belong to the study of change and the mastering of uncertainty (Arteta and Giachetti, 2004)

Comment 3:2: In the previous literature, agility has been measured using different tools and measurement items, and this has contributed to having contradictory results regarding the SCA- Performance relationship in the SCA literature. Thus, indicating the need to refine and validate a supply chain- level measurement instrument of SCA.

Code: GAP “Future research”

Comment: Possible future research topics on SCA scales, SCA practices, and contextual factors related to the implementation or measurement of SCA.

1:1 Is the proactive–reactive nature of SCA valid in and across different..... (21:1073 [21:1487]) - D 1: Humdam et al 2020_ SCA a systematic review of definitions

Is the proactive–reactive nature of SCA valid in and across different national cultures? Do the enablers change according to different global regions and across different types of companies? Are there any regional differences regarding the financial benefits of SCA? More empirical studies from different regions and cultures may be conducted in this area to confirm the general findings presented in this study

2:3 Further questions may be addressed in the future as to how supply chai..... (16:2304 [16:2735]) - D 2: Eckstein et al., 2014_ The performance impact of supply chain agility and supply chain adaptability: the moderating effect of product complexity

Further questions may be addressed in the future as to how supply chain agility and supply chain adaptability manifest themselves in different cultural settings, and what kind of conditions need to be in place to facilitate them. We investigated the moderating effects of product complexity. However, various other contextual factors exist that may influence the effectiveness of supply chain agility and supply chain adaptability

3:1 understanding how flexibility and agility are implemented in differen..... (20:728 [20:1221]) - D 3: Abdelilah et al. 2018_ flexibility and agility: evolution and relationship

Understanding how flexibility and agility are implemented in different industries would allow a comparative study between industries to be conducted and would determine the usefulness of each concept in relation to firms in a particular industry. This would also provide data about the percentage of the firms in each industry that invest in agility and those that consider that flexibility is enough, in addition to giving knowledge about the obstacles to the implementation of agility.

4:1 Third, the limitation of the definition and measures of a firm's supply..... (9:4830 [9:5385]) - D 4: yang, 2014_ Supply chain agility: Securing performance for Chinese manufacturers

Third, the limitation of the definition and measures of a firm's supply chain agility warrants another line of further research. For the supply chain agility, this study emphasizes a firm's ability to customize products, adjust production volumes, respond to changes in delivery performance, and produce a range of products. However, the issue as to whether a firm can achieve a certain level of agility fast enough and in a cost-efficient way is not addressed. Future research may consider these factors as well in the study of flexibility and agility.

5:1 Qualitative methods should be used to develop a deeper understanding..... (17:548 [17:1229]) - D 5: Gligor et al., 2019_ distinguishing between the concepts of supply chain agility and resilience a multidisciplinary literature review

Qualitative methods should be used to develop a deeper understanding of each concept and refine the dimensions associated with them. Field studies can provide insight into how supply chain managers define and interpret the two concepts. Considering that agility and resilience exhibit common characteristics, future studies should empirically examine whether the constructs discriminate adequately. It is also important for future studies to operationalize these constructs in a comprehensive manner accounting for all their characteristics. Such studies can also offer additional insights on the differences and commonalities of the two concepts at the operational level.

7:1 Finally, this research did not find a direct relationship between SCA a..... (24:1587 [24:1947]) - D 7: Gligor, 2016_ The Role of Supply Chain Agility in Achieving Supply Chain Fit

Finally, this research did not find a direct relationship between SCA and financial performance. SCF was found to fully mediate this relationship. Future research should investigate additional mediators of the SCA–financial performance relationship. Such research would offer a better understanding of the mechanisms through which SCA impacts firm performance.

8:1 researchers have neglected to highlight the use of information techno..... (10:2532 [10:2964]) - D 8: alkahtani et al., 2018_ Agile Supply Chain Assessment: An Empirical Study on Concepts, Research and Issues

Researchers have neglected to highlight the use of information technologies in the assessment of agile supply chains and its effect on manufacturing strategies. Researchers have presented a number of different models and approaches for the assessment of supply chain agility, but when it comes to examining the efficiency, applicability, reliability and practicability of those models and assessment approaches, there is a gap

9:1 In particular, even though supply chain agility (SCA) has been consid..... (2:3887 [2:4340]) - D 9: Naughton et al., 2019_ supply chain agility as an acclimatisation process to environmental uncertainty and organisational vulnerabilities: insights from British SMEs

In particular, even though supply chain agility (SCA) has been considered an essential concept in SCM research (Gligor and Holcomb 2012b; Ying Kei et al. 2016; Gligor, Esmark, and Holcomb 2015), the way it is experienced and manifested has received much less attention (Ismail, Poolton, and Sharifi 2011). This gap highlights an essential yet overlooked issue, and there is a need for an in-depth and contextualised understanding of SCA in SMEs.

Code: SCL “Scale”

Comment: SCA scale (author and version).

10:1 Supply chain agility is defined as a manufacturer’s rapid response an..... (12:685 [12:953]) - D 10: chen 2018_ Developing a model for supply chain agility and innovativeness to enhance firms’ competitive advantage

Supply chain agility is defined as a manufacturer’s rapid response and adjustment to the supply chain to cope with dramatic changes in the market environment. Thus, supply chain agility is measured with eight items by Zhang et al. (2002) and Swafford et al. (2008).

13:1 Supply chain agility is measured as joint planning, demand response..... (20:1767 [21:439]) - D 13: Kim and Chai, 2017_ The impact of supplier innovativeness, information sharing and strategic sourcing on improving supply chain agility: Global supply chain perspective

Supply chain agility is measured as joint planning, demand response, visibility, and customer responsiveness in the supply chain (Our supply chain is capable of forecasting market demand and responding to real market demand. Joint planning with suppliers is important in purchasing, production and logistics. Improving delivery reliability is a high priority. Improving responsiveness to changing market needs is a high priority. Inventory and demand levels are visible throughout the supply chain).

15:1 In order to measure agility, we used a 10-item instrument following Sh..... (7:576 [7:894]) - D 15: Pantouvakis and Bouranta, 2015_ Agility, organisational learning culture and relationship quality in the port sector

In order to measure agility, we used a 10-item instrument following Sharif and Zhang’s (1999) proposal based on the four distinct capabilities that a company must use to achieve and maintain agility (responsiveness, competency, flexibility and quickness), adapted to the port sector by Pantouvakis and Dimas (2013).

18:3 SC agility can be defined as an SC's ability to rapidly..... (6:343[6:712]) – D 18: Alfalla-Luque et al., 2018_ Triple-A and competitive advantage in supply chains: Empirical research in developed countries

SC agility can be defined as an SC's ability to rapidly detect and respond to unexpected short-term changes in supply and demand in order to generate or preserve a CA (Arana-Solares et al., 2011), thus allowing companies to remain fully aware of variations in customers' preferences and requirements and offer them the right product at the right time and price (Brusset, 2016). Despite the literature Taking into account the previous research, market sensitivity in the short term and response to market changes (volume and variety flexibility) are what generate the dimensions of SC agility

Code: ROLE “SCA role in the research”

Comment: What role does the SCA construct play in research structure models? (Antecedent, consequence, moderator, mediator, adjustment / control).

13:2 This study investigates the impact of supplier innovativeness on suppl..... (2:547 [2:936]) - D 13: kim and Chai, 2017_ The impact of supplier innovativeness, information sharing and strategic sourcing on improving supply chain agility: Global supply chain perspective

This study investigates the impact of supplier innovativeness on supply chain collaboration and agility. The paper applies the diffusion of innovation theory to explain how supplier innovativeness has been diffused into the supply chain and how global sourcing moderates the relationship among supplier innovativeness, information sharing, strategic sourcing, and supply chain agility.

Comment 13:2: SCA in this study appears as a dependent variable.

14:1 SC agility acts as a valuable operational capability, which is crucial..... (3:3679 [3:4113]) - D 14: um, 2016_ The impact of supply chain agility on business performance in a high level customization environment

SC agility acts as a valuable operational capability, which is crucial to improving business performance (Swafford et al. 2008; Chiang et al. 2016). Tse et al. (2016) support the notion that SC agility positively influences firm performance. To sum up, rapid customer responsiveness in SCs can improve business performance by increasing opportunities in the market through enhanced customer service and differentiation.

Comment 14:1: SCA in this study appears as an independent variable.

16:1 Moreover, most of the related literatures focus on identifying the di..... (13:762 [13:1695]) - D 16: Tse et al., 2016_ Embracing supply chain agility: an investigation in the electronics industry

Moreover, most of the related literatures focus on identifying the direct causality of SC agility (i.e. what influence on SC agility and what impact by SC agility), but few of them has tried to posit the mediation role of SC agility in potential relationship between the management practice and firm performance.

Apparently, a seamless supply chain network would help companies to improve their firm performance, because the transactional costs could be lower (Cao and Zhang, 2011).

Nevertheless, an integrated supply chain without agility (such as customer responsiveness and demand response) might bring risks to companies in coping with the turbulence from market. We argue that the SC integration is not capable of providing the benefits to the firm performance until enhancing SC agility. Specifically, SC agility can utilize the advantages of SC integration, then transfer them to the competitive advantages of firms

Comment 16:1: SCA in this study appears as a mediator variable.

Code: EXT “Scale- long/ short”

Comment: Type of SCA scale (short: if it contains less than 8 items, long: if it contains more than 8 items).

7:2 The measurement items for SCA were adopted from Gligor et al. (2013)..... (9:213 [9:712]) - D 7: Gligor, 2016_ The Role of Supply Chain Agility in Achieving Supply Chain Fit

The measurement items for SCA were adopted from Gligor et al. (2013). These authors did not find discriminant between the different domains of SCA (i.e., alertness, accessibility, decisiveness, swiftness, and flexibility) but established that all items loaded on the same construct and, therefore, operationalized SCA as a first-order construct. This operationalization was adopted in this study. A total of 14 items were used to capture the construct. These items are presented in the Appendix.

Comment 7:2: long scale.

17:1 The construct supply chain agility is measured by indicators assessin..... (14:2214 [14:2473]) - D 17: Blome et al., 2013_ Antecedents and enablers of supply chain agility and its effect on performance: a dynamic capabilities perspective

The construct supply chain agility is measured by indicators assessing the firm’s adaptability to changing market and customer developments, and by items measuring its supply, production and demand flexibility (Narasimhan et al. 2006, Swafford et al. 2006).

Comment 17:1: short scale. SCA in this research paper was measured using 5 items.

Code: CVAR “Contextual variables”

Comment: Main contextual variables that affect the implementation and measurement of SCA (complexity factors, non- complexity factors, environmental factors, internal factors, supply chain orientations).

18:1 The manuscript makes a key contribution to the agility literature by..... (2:1303 [2:2020]) - D 18: Gligor et al., 2015_ Performance outcomes of supply chain agility: When should you be agile?

The manuscript makes a key contribution to the agility literature by examining the association between supply chain agility (FSCA), cost efficiency and customer effectiveness across various environmental situations. We use archival data to examine the moderating effects of environmental munificence, dynamism, and complexity. It has been argued that firms should embrace agile strategies when operating in highly uncertain environments, and embrace lean strategies when operating in more stable environments (Lee, 2002; Sebastiao and Golcic, 2008). We empirically question this premise to determine whether supply chain agility can also lead to superior performance for firms operating in stable environments.

Comment 18:1: environmental munificence, dynamism, and complexity.

6:1 The current research hypothesizes that market orientation has (4:445 [4:1371]) - D 6: Gligor et al., 2016_ distinguishing between the concepts of supply chain agility and resilience: A multidisciplinary literature review

The current research hypothesizes that market orientation has a direct impact on firm supply chain agility. Further, it is not enough to be market oriented to achieve a high level of supply chain agility; rather, a supply chain orientation also needs to be developed. In order to increase the explanatory power of our model we account for the impact of environmental uncertainty (Dess and Beard 1984).

Comment 6:1: Market orientation and supply chain orientation.

12:1 The control variables organization age and organizational size (OS) do..... (13:185 [13:382]) - D 12: dubey et al., 2018_ Big data analytics capability in supply chain agility The moderating effect of organizational flexibility

The control variables organization age and organizational size (OS) do not have significant effect in this model (see Table IV). However, industry dynamism has a significant effect on SCA and CA.

Comment 12:1: organization age and organizational size (OS)

14:2 At its simplest, the lean paradigm that typically employs a low level..... (1:3182 [1:3592]) - D 14: um, 2016_ The impact of supply chain agility on business performance in a high level customization environment

- 1- At its simplest, the lean paradigm that typically employs a low level of customization is most suitable when the market-winning criterion is cost (i.e., cost leadership). However, when service and customer value enhancement (i.e., differentiation) are prime market-winning criteria with a high level of customization, then flexibility and agility become the critical acquisition (Mason et al. 2000).
- 2- The findings concerning H1 and H2 suggest that SC agility has a greater influence on both customer service and differentiation in a high-level customization context.

Comment 14:2: Customization.

9:2 It will also take into account the fact that previous studies have still not considered any contextual factors, ev... (5:678[5:992]- D 9: Machuca et al., 2020_ The country context in Triple-A supply chains: an advanced PLS–SEM research study in emerging vs developed countries

It will also take into account the fact that previous studies have still not considered any contextual factors, even though these may influence the impact on performance (Flynn et al., 2010), and that they have not analyzed a sample of firms composed of emerging and developed countries. Therefore, no evidence of any possible differences between these two country typologies has been reported to date (Attia, 2016), although the divergence perspective (Ralston et al., 1997) and the contingency theory (Lawrence and Lorsch, 1967) argue that contextual variables (such as the country context) influence the level of achievement of business practices.

Code: PREV “Previous research”

Comment: Relevant aspects of previous research that can help in identifying which SCA questionnaire is the most cited.

3:3 Moreover, according to these authors, there are two operational measu..... (15:1675 [16:739]) -

D 3: Abdelilah et al. 2018_ flexibility and agility: evolution and relationship

Moreover, according to these authors, there are two operational measures for evaluating agility: the agility scorecard and the agility index. The agility scorecard was elaborated by Metes et al. (1998). It is created in six steps and encompasses a dashboard that allows agility areas to be evaluated and mapped. The dashboard is a matrix that could be used to balance agility capabilities within the firm. On the other hand, the agility index is a metric that allows the degree of a firm’s agility to be calculated. This indicator relies on all organizational aspects to assess the overall performance of the firm (Dimitropoulos, 2009). Measuring the agility index at regular time intervals helps to keep track of the progression over time. The agility index is one of the most commonly used methods to evaluate agility (Kumar and Motwani, 1995; Yang and Li, 2002; Vinodh et al., 2010), and can be combined with fuzzy logic in order to avoid the problem of data ambiguity.

Code: DIMtyp “Dimensions- types”

Comment: Types of dimensions used to measure SCA (proactive items, reactive items, items that can be both proactive and reactive, and others).

20:2 Supply chain agility (SAG): identifies the firm practices that capital..... (11:1 [11:531]) - D

20: Aslam et al., 2018_ Dynamic supply chain capabilities How market sensing, supply chain agility and adaptability affect supply chain ambidexterity

Supply chain agility (SAG): identifies the firm practices that capitalize on market opportunities. This scale is based on the supply chain agility scale developed by Blome, Schoenherr and Rexhausen (2013) and is measured on the scale of 1 (strongly disagree) to 7 (strongly agree). It measures the firm’s ability to adapt its offering quickly according to changing customer needs, the ability to cope with the changing demands and requirements to modify product portfolios, and the ability to cope with supply side problems.

Comment 20:1: reactive items.

7:3 SCA1 We can quickly detect changes in our environment SCA2 Our firm ca..... (30:188 [30:1210]) - D 7: Gligor, 2016_ The Role of Supply Chain Agility in Achieving Supply Chain Fit

SCA1 We can quickly detect changes in our environment SCA2 Our firm can promptly identify opportunities in its environment SCA3 My organization can rapidly sense threats in its environment SCA4 We always receive the information we demand from our suppliers SCA5 We always obtain the information we request from our customers SCA6 My company can make resolute decisions to deal with changes in its environment SCA7 We can make definite decisions to address opportunities in our environment SCA8 My organization can make firm decisions to respond to threats in its environment SCA9 My firm can quickly respond to changes in the business environment SCA10 We can rapidly address opportunities in our environment SCA11 We can swiftly deal with threats in our environment SCA12 When needed, we

can adjust our supply chain operations to the extent necessary to execute our decisions SCA13 My firm can increase its short-term capacity as needed SCA14 We can adjust the specification of orders as requested by our customers

Comment 7:3: Both proactive and reactive items.

2:5 Dynamic sensing measures the ability of the firm to sense short-term, t..... (9:191 [9:1359]) - D 2: Eckstein et al., 2014_ The performance impact of supply chain agility and supply chain adaptability: the moderating effect of product complexity

Dynamic sensing measures the ability of the firm to sense short-term, temporary changes in the supply chain and market environment by measuring latent variable explanations towards changes in technology, competition, demand and supply (Overby, Bharadwaj, and Sambamurthy 2006; Li, Goldsby, and Holsapple 2009). A complementary measurement instrument was applied to structural sensing, however, addressing firm capabilities related to sensing long-term, fundamental changes.

Dynamic flexibility measures the ability of the firm to flexibly respond to short-term, temporary changes in the supply chain and market environment with the existing supply chain (i.e. manufacturing, demand and supply). Items refer, for example, to the firm's flexibility throughput times, production processes, or delivery times (Swafford, Ghosh, and Murthy 2006).

Dynamic speed refers to ability of the firm to rapidly respond to short-term, temporary changes in the supply chain and market environment with the existing supply chain (i.e. manufacturing, demand and supply), indicating the speediness in, for example set-up times or delivery times (Swafford, Ghosh, and Murthy 2006).

Comment 2:5: Both proactive and reactive items.

Code: VAL "Scale- validation"

Comment: Yes/ no, if the scale was validated. If yes, indicate types of tests used to validate the scale (internal consistency, variance, goodness of fit, others).

17:2 However, rather than blindly applying previously utilised measurement..... (14:1 [14:1605]) - D 17: Blome et al., 2013_ Antecedents and enablers of supply chain agility and its effect on performance: a dynamic capabilities perspective

However, rather than blindly applying previously utilised measurement items, we used them as a starting point, and developed them further based on the feedback of an expert panel of practitioners. The expert panel knew the scope and purpose of our study and as such was able to tailor the measurement items with their feedback to fit exactly the content domain and how they would understand each measurement item to most accurately measure the underlying construct. As such, commencing with established measurement items, we utilised a grounded approach to develop the items to be as accurate as possible, given our study context. This rigorous approach to develop the final items provides for a very high level of face and content validity, also increasing the practical relevance and applicability of our research. Following the feedback of the expert panel, we specifically had to accommodate changes in the supply chain agility construct, which practitioners critiqued to be too complicated and having limited face validity. Using a grounded approach, the measures for supply chain agility were thus deductively and inductively devel-

oped with the help of practitioners. Once the set of measures had been finalized, the complete survey instrument underwent additional pre-testing for content validity. Specifically, five researchers and 22 practitioners, all having had extended experience in the domain of supply chain management, were asked to critique the measurement items for the underlying constructs, resulting in slight modifications related to structure, clarity, and expression.

Comment 17:2: Yes. Content validity, and face validity.

Code: DIFpts “SCA-practices”

Comment: Practices used to make up the operational definition of SCA (operational practices, strategic practices, structural practices, others).

21:1 Next, supply chain agility represents the speed with which a firm’s in..... (6:2725 [6:3056]) - D 21: Swafford et al., 2008_ Achieving supply chain agility through IT integration and flexibility

Next, supply chain agility represents the speed with which a firm’s internal supply chain can be responsive to customer expectations. Customer satisfaction is impacted by an organization’s ability to offer and deliver innovative products and its delivery abilities; thereby an organization must have certain unique capabilities.

Speed in reducing manufacturing lead-time. Speed in reducing development cycle time. Speed in increasing frequencies of new product introductions. Speed in increasing levels of product customization. Speed in adjusting delivery capability. Speed in improving customer service. Speed in improving delivery reliability. Speed in improving responsiveness to changing market need

Comment 21:1: operational practices.

Code: DIF “SCA- definition”

Comment: Definition of supply chain agility.

12:2 Hence, we can argue that agility is a desired property of a supply ch..... (5:3110 [5:3305]) - D 12: dubey et al., 2018_ Big data analytics capability in supply chain agility The moderating effect of organizational flexibility

Hence, we can argue that agility is a desired property of a supply chain that enables it to respond to short-term changes in demand and supply quickly and handle external disruptions smoothly.

21:2 Agility has been defined as “the ability to cope with unexpected chal..... (1:2133 [1:2322]) - D 21: swafford et al., 2008_ Achieving supply chain agility through IT integration and flexibility

Agility has been defined as “the ability to cope with unexpected challenges, to survive unprecedented threats of business environment, and to take advantage of changes as opportunities”

22:1 A firm’s supply chain agility (FSCA) is defined as the capability of th..... (1:1599 [1:1920]) - D 22: Braunscheidel and Suresh, 2009_ The organizational antecedents of a firm’s supply chain agility for risk

A firm's supply chain agility (FSCA) is defined as the capability of the firm, both internally and in conjunction with its key suppliers and customers, to adapt or respond in a speedy manner to marketplace changes as well as to potential and actual disruptions, contributing to the agility of the extended supply chain.

23:1 ASC strategy is defined as a supply chain strategy that has the obj..... (3:2298 [3:2508]) - D 23: Tarafdar and Qrunfleh, 2016_ Agile supply chain strategy and supply chain performance: complementary roles of supply chain practices and information systems capability for agility

ASC strategy is defined as a supply chain strategy that has the objective of quick and effective response of the supply chain to changing customer needs (Huang, Uppal, and Shi 2002; Lin, Chiu, and Chu 2006).

24:1 Agility is the result of integrating an alertness to changes (opportun..... (14:2548 [14:2802]) - D 24: Li et al., 2008_ A unified model of supply chain agility: the work-design perspective

Agility is the result of integrating an alertness to changes (opportunities/challenges) – both internal and environmental – with a capability to use resources in responding (proactively/reactively) to such changes, all in a timely and flexible manner.

Code: ORIEN “SC orientation”

Comment: role that supply chain orientation plays in the model.

14:1 such “agile strategies” must be developed in consideration of the firm’s supply chain orientation.... (12:2318 [15:3501]) – D25: Gligor, 2016_ The role of demand management in achieving supply chain agility

such “agile strategies” must be developed in consideration of the firm’s supply chain orientation. Supply chain orientation has been defined as “the recognition by an organization of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain” (Mentzer et al., 2001, p. 12). Mentzer et al. (2001) further suggest that companies implementing SCM must first possess a supply chain orientation. Considering that all supply chain members must work together to achieve an integrated supply chain (Christopher, 2000), firms aspiring to SCA must have an inclination for managing their supply chain (i.e., supply chain orientation) and develop firm-level strategies consistent with their supply chain orientation.

30:2 SCO concept advocates that all the members of the supply chain must devote (11:2663 [15:6210]) – D26: Dhaigude and Kapoor, 2017_ The mediation role of supply chain agility on supply chain orientation-supply chain performance link

SCO concept advocates that all the members of the supply chain must devote their resources, skills and capabilities to create value for the ultimate consumer. As a subset of the total supply chain, each organization in the supply chain (other than the ultimate supplier and consumer) deals with the remaining subsets, and collectively they form the ultimate supply chain as shown in Figure 1. SCO is a crucial antecedent to SCP that connects various supply chain activities.

23:4 Prior research within the domain of dynamic capabilities also indicates that strategic orientations influence (19:3443 [19:5265]) – D27: Gligor et al., 2016_ An exploration of the strategic antecedents of firm supply chain agility: The role of a firm’s orientations

Prior research within the domain of dynamic capabilities also indicates that strategic orientations influence the building of dynamic capabilities (Zhou & Li, 2010). In addition, the strategy-structure-performance (SSP) paradigm contributes theoretical support for considering MO a direct antecedent to FSCA. MO is considered a firm strategy (Taghian, 2010) that drives the development of processes and capabilities needed to respond to customers expressed and latent needs (Slater & Narver, 2000). Supply chain agility has been recognized as a capability that firms must possess in order to provide a real time response to customers' unique and changing needs (Christopher, 2000). Therefore, as MO increases so will the recognition and development of increased FSCA capabilities to respond to customer needs.

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