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A review of supply chain complexity drivers

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ABSTRACT

Studies on supply chain complexity mainly use the static and dynamic complexity distinction. While static complexity describes the structure of the supply chain, the number and the variety of its components and strengths of interactions between these; the dynamic complexity represents the uncertainty in the supply chain and involves the aspects of time and randomness. This distinction is also valid when classifying the drivers of supply chain complexity according to the way they are generated. Supply chain complexity drivers (e.g., number/variety of suppliers, number/variety of customers, number/variety of interactions, conflicting policies, demand amplification, differing/conflicting/non-synchronized decisions and actions, incompatible IT systems) play a significant and varying role in dealing with complexity of the different types of supply chains (e.g., food, chemical, electronics, automotive).

This paper reviews the typical complexity drivers that are faced in different types of supply chains and presents the complexity driver and solution strategy pairings, in the form of a matrix. Drivers and strategies are extracted from real-life supply chain situations gathered from multiple existing sources; such as reports, archives, observations, interviews. The synthesis of good practices would assist decision-makers in formulating appropriate strategies to deal with complexity in their supply chains.

1. Introduction

Supply chain is a complex network of business entities involved in the upstream and downstream flows of products and/or services, along with the related finances and information (Beamon, 1998; Lambert, Cooper, & Pagh, 1998; Mentzer et al., 2001). Supply chain management (SCM) involves the systemic and strategic coordination of these flows within and across companies in the supply chain with the aim of reducing costs, improving customer satisfaction and gaining competitive advantage for both independent companies and the supply chain as a whole (Cooper & Ellram, 1993; Cooper, Lambert, & Pagh, 1997; Mentzer et al., 2001). Operating in a dynamic and uncertain environment, a supply chain is definitely a complex system with various companies, high number and variety of relations, processes and interactions between and within the companies, dynamic processes and interactions in which many levels of the system are involved and vast amount of information needed to control this system.

Complexity inherent in the supply chain is observed in different forms and origins: *static complexity*, that is related to the connectivity and structure of the subsystems involved in the supply chain (e.g. companies, business functions and processes); *dynamic complexity*, that results from the operational behavior of the system and its environment; and *decision making complexity* that involves both static and dynamic aspects of complexity. The complex nature of supply chain adds to difficulty of managing the supply chain, so that it almost becomes common sense to say SCM is about managing the complexity of the supply chain.

Although there are certain difficulties in dealing with complexity in the supply chain, numerous studies support that managing complexity leads to achieving better supply chain performances (A.T. Kearney, 2004; Blecker, Kersten, & Meyer, 2005; Bozarth, Warsing, Flynn, & Flynn, 2009; Koudal & Engel, 2007; KPMG., 2011; Perona & Miragliotta, 2004; PricewaterhouseCoopers, 2006; Vachon & Klassen, 2002; van der Vorst & Beulens, 2002). Thus, integrating complexity management into SCM is a necessary action. Before reviewing the approaches to manage complexity in the supply chain, it is crucial to characterize the supply chain complexity and discuss its drivers. Understanding and analyzing the complexity drivers in advance may allow developing a clear strategy in efforts to manage the supply chain complexity.

The aim of this paper is to review the typical complexity drivers that are faced in different types of supply chains and present the complexity driver and solution strategy pairings based on good industry practices. A meta-synthesis of good practices serves as a guideline in developing supply chain complexity management system. The remainder of the paper is organized as follows. Section 2 gives a review of the literature on supply chain complexity and its drivers. Section 3 presents solution strategies to deal with complexity extracted from various good practices using a systematic review. Section 4 discusses complexity management approaches

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that would assist decision-makers in formulating appropriate strategies to deal with complexity in their supply chains. Section 5 concludes the paper and points out directions for future research.

2. Drivers of supply chain complexity

Complexity in a supply chain grows, as customer requirements, competitive environment and industry standards change, and as the companies in the supply chain form strategic alliances, engage in mergers and acquisitions, outsource functions to third parties, adopt new technologies, launch new products/services, and extend their operations to new geographies, time zones and markets (A.T. Kearney, 2004; BCG., 2006; DeloitteToucheTohmatsu., 2003; KPMG, 2011; PricewaterhouseCoopers, 2006). In other words, the growth of supply chain complexity accelerates with trends such as globalization, sustainability, customization, outsourcing, innovation, and flexibility.

We can distinguish between three types of supply chain complexity: static, dynamic and decision making. While static (structural) complexity describes the structure of the supply chain, the variety of its components and strengths of interactions; dynamic (operational) complexity represents the uncertainty in the supply chain and involves the aspects of time and randomness. The static–dynamic distinction has been primarily used to study complexity in manufacturing systems (Calinescu, Efstathiou, Schirn, & Bermejo, 1998; Calinescu, Efstathiou, Sivadasan, & Huaccho Huatuco, 2001; Calinescu, Efstathiou, Sivadasan, Schirn, & Huaccho Huatuco, 2000; Deshmukh, Talavage, & Barash, 1992; Deshmukh, Talavage, & Barash, 1998; Frizelle & Woodcock, 1995; Huaccho Huatuco, Efstathiou, Calinescu, Sivadasan, & Kariuki, 2009) and supply chains (Isik, 2010; Sivadasan, Efstathiou, Frizelle, Shirazi, & Calinescu, 2002; Sivadasan et al., 1999). Decision making complexity involves both static and dynamic aspects of complexity (Calinescu, Efstathiou, Huaccho Huatuco, & Sivadasan, 2001; Calinescu, Efstathiou, Sivadasan, et al., 2001; Efstathiou, Calinescu, & Blackburn, 2002; Manuj & Sahin, 2011). From the static aspect, the supply chain system is made up of high number of elements, variety and interactions, and considering them all when making a decision goes beyond the capacity of the human decision maker (Miller, 1956; Simon, 1974; Warfield, 1988). From the dynamic aspect, the fact that the system is dynamic, non-predictable, and non-linear adds another layer of complexity to decision making in the supply chain. As a result, complexity of decision making in the supply chain is associated with the volume and nature of the information that should be considered when making a supply chain related decision (Efstathiou et al., 2002; Serdarasan, 2009). One should note that the three complexity types are interrelated, and they should not be considered in isolation.

A supply chain complexity driver is any property of a supply chain that increases its complexity. The classification of types of supply chain complexity (i.e., static, dynamic, decision making) corresponds with the classification of complexity drivers according to the way they are generated: via physical situation (e.g., number of products), operational characteristics (e.g., process uncertainties), dynamic behavior (e.g., demand amplification), and organizational characteristics (e.g., decision making process, IT systems) (Childerhouse & Towill, 2004; Towill, 1999). Another classification of drivers is according to their origin: internal, supply/demand interface, and external/environmental drivers (Blecker et al., 2005; Childerhouse & Towill, 2004; Isik, 2011; Mason-Jones & Towill, 1998; Wildemann, 2000). Internal drivers are generated by decisions and factors within the organization such as the product and processes design. These drivers are relatively easier to leverage since they remain within the span of control. Drivers generated within supply and/or demand interface (in cooperation with suppliers/customers) are related to the material and information flows between suppliers, customers and/or service providers. These drivers are somewhat manageable since they remain within the span of influence and the level of coordination between supply chain partners plays a significant role when dealing with these drivers. Thus, power and trust mechanisms that affect the nature of supplier/customer relations are also important factors which need to be considered as complexity drivers. External drivers are generated through mechanisms that the company has little, if any, control over such as market trends, regulations and other various environmental factors. Table 1 gives an overview of classification of supply chain complexity drivers according to type and origin and Table 2 summarizes the related literature. As seen in Table 2 the related literature mainly focuses on internal and interface complexities and the number of studies dealing with the external complexity drivers appears to be smaller in number. This is mainly due to the fact that the external drivers are outside the system boundary of the supply chain, i.e. out of the span of control of the decision maker, yet they can be monitored, analyzed, and acted upon with robust decisions to adapt and change. Größler, Grübner, and Milling (2006)'s framework that discusses this issue from the manufacturing company's perspective could be extended throughout the supply chain. Examining how the supply chain system interacts with its environment in this way allows us to gain a greater understanding of its behavior. When we look at the number of papers categorized according to type of complexity, it appears that decision making complexity has attracted much less scholarly attention than the static and dynamic types. It should

Table 1
Some drivers of supply chain complexity.

According to type	According to origin		
	Internal	Supply/demand interface	External
Static	Number/variety of products Number/variety of processes	Type of product Number/variety of suppliers Number/variety of customers Process interactions Conflicting policies	Changing needs of customers Changing resource requirements New technologies
Dynamic	Lack of control over processes Process uncertainties Employee related uncertainties Unhealthy forecasts/plans	Lack of process synchronization Demand amplification Parallel interactions	Changes in the geopolitical environment Shorter product lifecycles Trends in the market Market uncertainties Developments in the future
Decision-making	Organizational structure Decision making process IT systems	Differing/conflicting decisions and actions Non-synchronized decision making, Information gaps Incompatible IT systems	Changes in the environment Factors that are out of span of control Uncertainty of the unknown/uncontrollable factors

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Table 2
Review of the literature on supply chain complexity.

Authors (year)	Internal	Interf.	Extern.	Static	Dyna.	DM
Frizelle and Woodcock (1995)	■			■	■	
Wilding (1998)		■			■	
Sivadasan et al. (1999)					■	
Towill (1999)				■	■	■
Calinescu et al. (2000)				■	■	
Wildemann (2000)	■	■	■			
Calinescu et al. (2001)						■
Efstathiou et al. (2002)				■	■	■
Meijer (2002)						■
Sivadasan et al. (2002)	■	■		■	■	
Vachon and Klassen (2002)	■	■		■	■	
van der Vorst and Beulens (2002)	■	■				■
Zhou (2002)				■	■	
P. Childerhouse and Towill (2003)	■	■			■	
Kovacs and Paganelli (2003)		■				
Blecker, Abdelkafi, Kaluza, and Kreutler (2004)	■					
Childerhouse and Towill (2004)	■	■			■	
Perona and Miragliotta (2004)	■	■		■		
Seuring, Goldbach, and Koplin (2004)	■	■		■		
Sivadasan et al. (2004)	■	■	■	■	■	
Blecker et al. (2005)	■	■	■	■	■	
Hoole (2005)	■	■		■		
Klaus (2005)		■		■	■	
Größler et al. (2006)			■			
Sivadasan, Efstathiou, Calinescu, and Huatuco (2006)	■	■			■	
Soydan, Miragliotta, and Brun (2007)					■	■
Koudal and Engel (2007)				■	■	
Wu et al. (2007)		■			■	
Martinez-Olvera (2008)	■	■				
Hu, Zhu, Wang, and Koren (2008)		■		■	■	
Bozarth et al. (2009)	■	■		■	■	
Huaccho Huatuco et al. (2009)	■				■	
Sivadasan, Smart, Huaccho Huatuco, and Calinescu (2009)		■			■	
Huatuco, Burgess, and Shaw (2010)		■			■	
Isik (2010)	■	■			■	
Raj and Lakshminarayanan (2010)		■			■	
Isik (2011)	■	■		■	■	
Manuj and Sahin (2011)	■	■	■			■

be noted that a majority of the reviewed papers involve issues related to complexity of the supply chain decision making, since decision making complexity is a combination of dynamic and static complexities perceived by the decision maker during the decision making process. However their particular focus is not primarily on decision making complexity, which is the reason why decision making complexity seems to receive relatively little interest.

Due to systemic nature of the supply chain, decisions targeting any of the drivers may have a positive or negative effect on another driver. In practice, decision makers can make use of this property to shift complexity of the supply chain from one driver to another, preferably on which they have more control over. This is sensible, since the success in dealing with complexity of a system is not only determined by the level of its complexity, but also by the degree of our control and influence over the system (see Fig. 1).

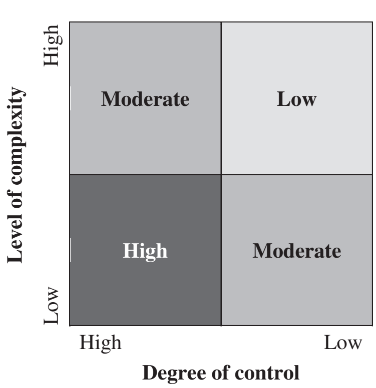

Fig. 1. Level of ability to deal with complexity of a system.

Different approaches may be adopted to cope with the complexity drivers considering the degree of control over the system (e.g., for the internal-static drivers approaches may be: product modularization, reducing the product variety, mass customization, business process reengineering). The next section provides a more detailed discussion of the strategies for managing supply chain complexity.

3. Synthesis of good practices for managing complexity in the supply chain

Analyzing and understanding complexity drivers helps us to develop and implement right strategies when dealing with complexity. An effective way of developing strategies is making use of good practices. Here, a good practice is defined as "any proven working practice which is far enough ahead of the norm to provide significant performance gains if implemented" (Zairi & Whymark, 2000). At this stage of the study, good practices of complexity management in the supply chain were examined by means of a qualitative meta-synthesis. Qualitative meta-synthesis is an interpretive approach that seeks to discern meaningful patterns from various existing qualitative studies of the same or closely related topic by means of a systematic review (Finlayson & Dixon, 2008; Noblit & Hare, 1988; Walsh & Downe, 2005; Zimmer, 2006). Good practices have been identified and gathered from various sources, such as reports of companies, consulting firms, service providers and other knowledge bases (e.g. articles, books, case studies, industry reports, and conferences). After an initial screening 23 practices that are fulfilling the following criteria were further examined: (1) the complexity reported in the practice must be supply chain related; (2) the practice must have produced successful results; (3) the documents must be accessible and provide clear and detailed enough information to continue with the survey. The selected good practices were reviewed systematically using a review protocol. In this study, information on the following characteristics have been used: type of the company, type of supply chain, complexities involved in the supply chain, the challenge the company is facing, complexity drivers of the challenge/problem, solution to overcome the challenge/problem, tools and techniques used, results achieved. The list of the reviewed practices and their primary references are provided in Appendix A (a full version of the 'systematic review' is available from the author upon request).

The reviewed practices represent different supply chains ranging from retail and FMCG to chemical, automotive, electronics, and humanitarian, all of which involve a variety of complexities. In the retail and FMCG supply chains the main complexity drivers are high variety of products and SKUs, variation in demand, variation in capacity requirements, a complex network with high number of suppliers and distribution points that are also geographically dispersed. These supply chains depend on collaborative planning and forecasting, well defined processes, and visibility into many details (e.g. inventory levels, shipments, promotions, POS data) throughout the network. Demand forecasting is of particular importance for decision makers and while there are advanced statistical forecasting methods that accommodate seasonality and trend, they fail to accurately forecast the impact of new product launches, fashion trends, promotions, price changes, discounts, shelf availability and similar factors that are typical in retail and FMCG industries. These are considered as unpredictable events/factors, yet most are known or predictable at one point of the supply chain, which makes information sharing and collaboration the best answer to overcome the complexity caused by these uncertainties. Overall, use of IT systems that are able to synchronize data throughout the supply chain, collaborative planning, well defined processes and standardized procedures are the frequent solutions with common results such as reduced lead times, reduced inventory levels, improved on time deliveries, increased availability of products.

In chemical supply chains, main complexity drivers are complex supply chain network, geographical dispersion, changing laws, reg-

Table 3
Complexity driver–solution strategy pairings.

Complexity drivers	Solution strategies
High number and variety of SKUs (necessary complexity)	• Improving demand management, forecasting, and logistics management abilities through a decision platform supported by SCM solutions.
High number and variety of SKUs (unnecessary complexity)	• Offering a limited range of products
Product complexity	• Measuring product complexity in terms of supply chain impacts, • Redesigning the products that have a high complexity index
Diverse IT solutions	• Implementing an IT service management solution
High variety of requirements to be met by the IT solution	• Implementing a customized Software as a Service logistics solution
Incapable and incompatible planning systems	• Developing and implementing a new planning system • Making process and technological adjustments • Developing new performance metrics
Large planning models	• Implementing a supply chain planning software modified to handle planning requirements
Demand uncertainty/demand volatility	• Profiling uncertain demand • Planning of operations on a daily basis
Lack of demand information/unpredictable order patterns	• Proactive order management • Collaborative planning • Capacity forecast sharing with partners
Incapable transportation management processes and technology	• Forming a partnership with a partner that has expertise in transportation management • Adopting new technology and processes
Incompatible supply chain network design/Incapable supply chain operations	• Redesigning the supply chain, • Reorganizing the distribution network, • Collaboration with suppliers
Lack of a well-defined procurement system	• Developing an end to end procurement process • Integrating the procurement processes and systems with the ERP system
Laborious and complex (software) license sales process	• Process automation • Integrating license sales process into the online e-commerce facility
Lack of effective means of control over the processes	• Automating decision making process using a business rules management system
Outsourcing of manufacturing	• Supplier integration • Gaining visibility into operations through B2B platform
Lack of experience to build and operate a dry distribution network	• Outsourcing the operations to a partner that has the experience
Lack of know how	• Forming a partnership with a partner that has the know how
Lack of control due to outsourcing	• Reducing number of outsourcing partners • Working in close collaboration with the outsourcing partners
Changing requirements of the industry	• Adapting to changes by providing synchronized services
Market pressure and changing customer requirements	• Adopting adaptive supply chain strategies

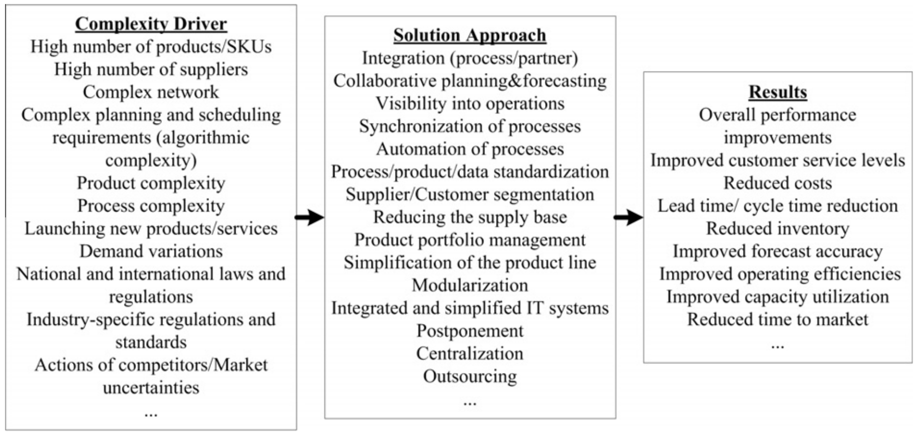

Fig. 2. Summary of the drivers, solution strategies and results.

ulations and directives, transportation structure, mode selection and in particular regulations on hazardous materials and their transportation process (Ferrio & Wassick, 2008; McKinnon, 2004; Mohrschladt, 2007; Shah, 2005). These supply chains are faced mainly with operational complexity and the solution to overcome their problems lies in standardization of products, shipment methods, etc., automation of decision processes via business rules management and collaboration with supply chain partners. Network optimization or redesigning the network is another way to deal with complexities in chemical supply chains.

Automotive supply chains are characterized by high number and variety of parts (complex products) and suppliers, and their lean approaches (Turner & Williams, 2005). Although lean practices enable reduction of inventory and streamline information and material flows, there is still need for flexibility and responsiveness in automotive supply chains. Accordingly, the solutions in the reviewed cases are aimed at improving efficiency and responsiveness through pull based replenishment, information sharing and centralized logistics operations. These changes resulted in reduced inventories across the supply chain, reduced lead times and improved customer service levels as intended.

In electronics supply chains, the complexity drivers tend to be mostly static in nature, such as high number of SKUs, wide variety of complex products, high number and variety of suppliers and customers and a complex supply chain network, bundled with demand and market uncertainties. In one of the reviewed cases, Motorola Inc., redesign of product to reduce complexity of the supply chain was used as a strategy (Handfield 2004a, 2004b). Motorola devised measures of product complexity in terms of supply chain effects and redesigned their products whenever they have higher complexity than their competitors' products. In three of the practices (LSI Corp., KLA-Tencor and HP) the companies adopted a series of transformation strategies that would help them deal with complexity. The strategies facilitated end-to-end integration, collaboration with partners, visibility into operations and continuous improvement.

In humanitarian supply chains the main complexities are involvement of multiple governmental and non-governmental organizations in the process, geographical characteristics of and the general political situation in the aid-receiving region, unstable nature of the funding processes, insufficient and inaccurate communication and information flows, geographical dispersion, difficulty and uncertainty of mobilizing logistics assets on a global scale, diversity of the characteristics of the humanitarian personnel (Oloruntoba, 2007; Van Wassenhove, 2006). In WFP practice, where the aim was to improve disaster response capability, outsourcing of logistics operations to a capable partner was adopted to deal with complexity.

Table 3 lists the complexity driver solution strategy pairings extracted from the reviewed practices. The identification of the complexity drivers can be simple, such that they stand out just by looking at the situation. However, most supply chain situations are highly complex and the effects we observe/experience are a result of interaction of many variables. In such cases, a logical representation of the situation was used to understand the interdependencies in the system and to identify the complexity drivers.

There is a common pattern followed in the practices: The companies are aware of the complexities in their supply chains and that some of these complexities are hindering their supply chain improvement efforts; they search for solution alternatives; they develop and implement solutions – in most of the cases in collaboration with a third party that has experience in the relevant area –; and through ongoing efforts they achieve desired improvements. The drivers, solution strategies and results are summarized in Fig. 2.

4. Results and discussion

The results of the survey provide a general overview of supply chain complexity management initiatives that can be utilized to assist decision-makers in formulating strategies to deal with complexity. The solution strategies and supporting tools & techniques that are used to overcome complexity related problems have been synthesized and presented in Table 4. The synthesis outlines that when dealing with static complexity the companies tend to use strategies to reduce complexity while with dynamic and decision making complexity they try to manage the complexity and adjust their operations to cope with it. The use of tools and technologies to support complexity management is widely used and recognized (Serdarasan & Tanyas, in press).

These results are in line with the literature, where we observe three generic approaches when dealing with complexity in the supply chain: complexity reduction, complexity management, and complexity prevention (A.T. Kearney, 2004; Childerhouse & Towill, 2003; Hoole, 2005; Perona & Miragliotta, 2004; Serdarasan, 2009; Sivadasan, Efstathiou, Calinescu, & Huaccho Huatuco, 2004; Wildemann, 2000; Wu, Frizelle, & Efstathiou, 2007). The common approach is to reduce/eliminate the unnecessary complexity, then to manage the necessary complexity in the system, and finally to prevent any additional unnecessary complexity (Fig. 3). The necessary complexity can be defined as what the customer/market is

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Table 4
Categorization of the solutions according to type of complexity.

	SCM Initiatives	
	Solution strategy	Supporting tools and technologies
Static complexity	• Reducing the number of products • Reducing the options in the product and the SKUs (product complexity) • Reducing the number of outsourcing partners • Reducing the number of distribution centers	
Dynamic complexity	• Supply chain integration • Collaboration with suppliers, customers, and service providers • Supply chain visibility • Standardization of operations • Process automation • Synchronization of data • Information sharing • Logistics outsourcing • Planning on a daily basis • Process improvement and redesign	• VMI, CPFR • ERP software • Logistics management software • Supply chain planning software, APS • SRM software • WMS software • Transportation optimization software • IT service management solution • B2B platform • EDI • Barcoding, RFID • Profiling uncertain demand
Decision-making complexity	• Centralized decision making • Automation of decision making	• Business rules management system • SCM software

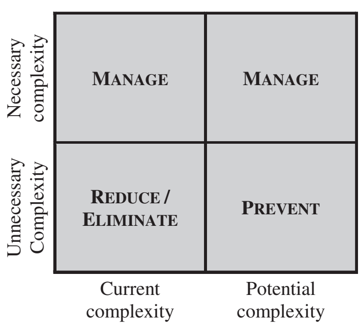

Fig. 3. A matrix of the approaches to dealing with supply chain complexity.

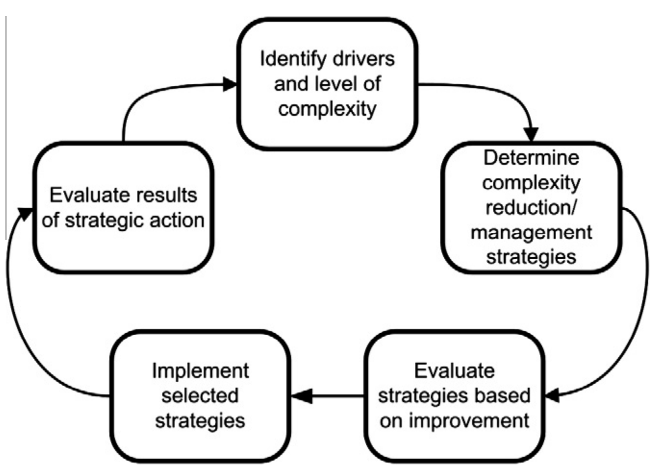

Fig. 4. A generalized outline of supply chain complexity management approach.

willing to pay for and what would provide a significant competitive advantage for the added complexity and unnecessary complexity as what brings no additional benefits to the company/supply chain, but involves additional costs. In the long run, when dealing with a complex system, all types of approaches should be considered to maintain the balance and the entirety of the system.

Grounded in the good practices of complexity management in the supply chain, a complexity management system can be broadly outlined as a series of actions (see Fig. 4). Starting with identification of the current drivers and level of complexity in the supply chain, next step is determining strategies for complexity reduction/management succeeded by evaluation of these strategies based on the opportunities for improvement and determination of the desired level of complexity. Once actions based on the selected strategies are executed, the results should be assessed and fed back to the cycle to evaluate the overall success of the complexity management system.

5. Conclusion

Supply chain is a complex system and integrating complexity management into SCM is a necessary action. Understanding the inherent complexity of the supply chain and taking necessary actions to reduce-manage-prevent it, would lead to better performances and higher customer satisfaction. In this study, we have defined supply chain complexity and classified the drivers of supply chain complexity according to type and origin of complexity. For the success of a complexity management system, it is important to identify and understand the drivers since these account for the undesirabilities observed in the supply chain.

The solution strategies to deal with complexity have been extracted from good practices of supply chain complexity management. The meta-synthesis of good practices provide a decision matrix that would assist decision-makers in identifying and transferring these good practices as well as applying them in a new configuration which would match the requirements of their own problem.

Another outcome of the study is the broad outline of a supply chain complexity management approach. A further research would be to expand this outline into an interpretive approach to managing complexity in the supply chain. A common framework to measure and manage the complexity would maintain the balance between the internal, interface, and environmental varieties; and assist companies in dealing with complexity in the supply chain. Another future research issue is the need to distinguish between necessary (value adding) and unnecessary (non-value adding complexity).

Appendix A

See Table A1.

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Table A1
Good practices of supply chain complexity management.

Company name	Company type	Supply chain type	References
Goodyear Tire and Rubber Co.	Tire company	Automotive supply chain	*Goodyear's logistics outsourcing program faces a moment of truth*, Robert J. Bowman, Global Logistics and Supply Chain Strategies, March 2006
Mahindra and Mahindra Limited	Manufacturer of farm equipment	Automotive supply chain	Mahindra & Mahindra uses mySAP SCM to reduce inventory by 30% and replenishment lead times to 19 days, SAP Customer Success Story, 2002, www.sap.com
Air Products and Chemicals Inc.	Supplier of industrial gases and selected chemicals.	Chemical supply chain	Air Products masters supply chain complexity with Fair Isaac business rules, Success Story: Business Rules Management, 2008, www.fico.com
Shell Chemicals Europe	Chemical company	Chemical supply chain	Christoph Tyssen, *Supply Network Redesigning: Shell Chemicals Europe and Bertschi AG*, In Sustainable Supply Chain Management: Practical Ideas for Moving Towards Best Practice, Eds. Cetinkaya et al., Springer-Verlag, 2011
Bell Microproducts Inc.	Distributor of high-tech products, services and solutions	Electronics supply chain	Charles Abrams, *Software Licencing: A supply chain success story*, Gartner Case Studies, CS-17–8856, 2002, Gartner, Inc., www.bus.umich.edu/KresgePublic/Journals/Gartner/
Hewlett–Packard	Technology company	Electronics supply chain	Jerry Huang, *The Adaptive Supply Chain*, 2004, Hewlett–Packard Development Company, presented at the 1st APEC e-Commerce Business Alliance Forum, June 15–16, Yantai, China
KLA-Tencor	Manufacturer of semiconductor equipments	Electronics supply chain	Joseph J. Chamberlain and John Nunes, *Service Parts Management: A Real-life Success Story*, Supply Chain Management Review, September 2004, Reed Business Information
LSI Corp.	Provider of semiconductors and technologies	Electronics supply chain	*Transforming to a Flexible and Lean Supply Chain*, E2open Case Studies, September 2007, www.e2open.com
Molex Inc.	Supplier of interconnect products and systems	Electronics supply chain	MOLEX: The SAP® Demand Planning Service Select Package Brings New Levels of Forecasting Accuracy and Efficiency to Global Company, SAP Customer Success Story, 2005, www.sap.com
Motorola	Provider of communication products and services	Electronics supply chain	Rob Handfield, Managing Complexity in the Supply Chain: Motorola's War on Supply Chain Complexity - Part 2, Supply Chain Resource Cooperative (SCRC), July 2004, scm.ncsu.edu
British American Tobacco	Tobacco company	FMCG supply chain	*5-Year Procurement Target at British American Tobacco*, Capgemini Success Stories, MRD_20060215_096, 2006, www.capgemini.com
Church & Dwight Co.	Manufacturer of consumer goods	FMCG supply chain	Arming an Industrial-strength Supply Chain, JDA Case study, 2007, www.jda.com
J.R. Simplot	Food processing and agricultural company	FMCG supply chain	*A Frozen-Food Expert Seeks Help in Dry Distribution*, Robert J. Bowman, Global Logistics and Supply Chain Strategies, February 2005
Swire Beverages	Bottling company	FMCG supply chain	Swire Beverages Unlocks the Full Potential of its Coca-Cola Supply Chain Network in China, JDA Case Study, 2009, www.jda.com
Unilever	Manufacturer of consumer goods	FMCG supply chain	Unilever Holistically Manages the Order/Shipment Process for Better Customer Service, LeanLogistics Client Case, 2009, www.leanlogistics.com
ALDI	Discount retailer	Retail supply chain	Michael L. George, Stephen A. Wilson, 2004, *ALDI International: A case study in strategic complexity*, in Conquering Complexity in Your Business, 2004, McGraw-Hill
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s.Oliver	Apparel Company	Retail supply chain	Fashion retailer s.Oliver boosts productivity with streamlined IT management services and ITIL best practices, CA Customer Success Story, 2007, www.ca.com
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