

A Broader view of the Supply Chain Integration Challenges

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Abstract— in order to achieve efficient supply chain integration for the processes or activities; the organizations should recognize and understand all the integration challenges of supply chain. Our goal in this paper is to answer the following question, what are the supply chain integration challenges? The reason behind introducing those challenges is the absence of a single source in the literature able to present all those challenges in an organized and complete manner. This work is needed to integrate all supply chain integration challenges research findings. This paper contributes to the supply chain integration literature by two things, firstly; it will deliver all supply chain integration challenges in an organized and complete manner. Secondly; it will provide a new classification that encompasses all the supply chain integration challenges.

Index Terms— Supply chain, Supply chain integration, challenges of supply chain integration.

I. INTRODUCTION

To succeed in the digital economy, organizations must manage the integration of business, technology, people, and processes not only within the enterprise but also across extended enterprises. Supply Chain Management (SCM) system facilitates inter-enterprise cooperation and collaboration with suppliers, customers, and business partners. Although this system can bring benefits and competitive advantage to organizations, the management and implementation of this system pose significant challenges to organizations. Process integration and redesign is important component SCM implementations. Integration involves not only implementing Enterprise Resource Planning (ERP) systems and ensuring they communicate or interface with legacy systems, but it also involves integrating ERP and SCM systems with Customer Relationship Management (CRM), Product Lifecycle Management (PLM), e-procurement and e-marketplaces, as well as making them available over the Web to foster cooperation and collaboration across the entire value chain. In today's

dynamic business environment, many companies are expanding, merging, contracting, or otherwise redesigning their supply chain. Due to the rapid advancements of technology such as pervasive or ubiquitous wireless and internet networks, the basic supply chain is rapidly evolving into what is known as a Supply Chain Network. The supply chain network is a dynamic and integrated system in which all firms integrated to increase the value of every chain. Integration is a process of redefining and connecting parts of a whole in order to form a new one. [9]

In the 21st century, there have been a few changes in business environment that have contributed to the development of supply chain networks. First, as an outcome of globalization and the proliferation of multi-national companies, joint ventures, strategic alliances and business partnerships, there were found to be significant success factors, following the earlier "Just-In-Time", "Lean Management" and "Agile Manufacturing" practices. Second, technological changes, particularly the dramatic fall in information communication costs, which are a paramount component of transaction costs, have led to changes in coordination among the members of the supply chain network [32]. These factors created many challenges to the integration of supply chain network.

II. SUPPLY CHAIN INTEGRATION

A supply chain consists of all stages involved, either directly or indirectly, in fulfilling a customer request. A supply chain includes manufacturer, supplier, transporters, warehouses, retailer, third-party logistic provider, and customer. The objective of supply chain management is to maximize the overall value generated rather than profit generated in a particular supply chain. [32] The American professional association defined the SCM, "Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers". [6]

Throughout the 1980's and 1990's the concepts of customer and supplier integrative relationships gained renewed attention. Business in general began to develop extremely close relationships with selected clients, sometimes termed strategic customers, and significantly more emphasis was placed on improving working

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arrangements with suppliers. This trend with increased collaboration throughout the SC could be explained as a result of three factors [1], these factors are:

- 1) Manufacturing takes place in a global context where local markets are subject to global standards.
- 2) Manufacturing systems are required to develop and operate environmentally benign products and processes.
- 3) The business and organizational structures, within which manufacturing operates, are under increasing stress.

The driver behind such collaboration was the desire to extend the control and co-ordination of operations across the entire supply process, replacing both the market and vertical integration as the means of managing the flow process [33]. According to [12] the definition of integration is "the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment". While this definition refers to integration internal to a firm or organization, our emphasis here goes beyond the firm and encompasses external entities that are players in a supply chain.

Recent development in SCM offers the potential not just to cut cost but also to generate new revenues and high profits. The remaining challenge is to link those novel approaches together to garner the competitive advantage of a seamless flow of SC [33].

III. CHALLENGES AND OBSTACLES OF SUPPLY CHAIN INTEGRATION

Supply chain management (SCM) executives face unique challenges, with respect to integrating supply chain-specific strategies with the overall corporate business strategy. In recent years, given changing business realities related to globalization, the supply chain has moved up on the chief executive officer's (CEO's) list of priorities [8], but it's not always for the right reasons, in many cases, CEOs only pay attention to the supply chain when they want to cut costs or when something is wrong. Since the supply chain essentially moves the lifeblood of the organization, process efficiency on a global scale is essential to optimized business operations. The importance of global integration to the Multi-National Company (MNC) lies in the differential advantage to be gained from the ability to exploit differences in capital and product markets, to transfer learning and innovation throughout the firm, and manage uncertainty in the economic or political environment in different countries or regions. However, the general understanding of the business environment in most industries is that competition has increased and the conditions under which business is made are more turbulent. [16].

Many researches have mentioned a classification of supply chain integration challenges. According to [7], SC integration challenges can be classified through the challenge of system relationships; the SCM system has two kinds of relationships, which are the relation between sub-systems, and the relationship between SCM system and the business strategies, This classification emphasizes the technical challenges that came from the relation between

SCM system and internal business strategy, unfortunately this classification bypass the challenges that the companies may face from external environment.

Kussman in his paper [15], classify the challenges of SC integration to external and internal challenges, By reading Kussman classification details we found that his main emphasis was on the knowledge sharing challenges between supply chain partners, but in the other hand he omits other challenges such as; technical challenges, inter-organizational challenges, and SLEPT factors.[15]

Paigude in his paper [26] spotlight the challenges from two dimensions, first: planning to cater to real-time changes, and second: execution to facilitate dynamic collaboration among all the SC partners. The focus in this classification was on the managerial view, but the classification disregard the technical aspects of managing SC integration.

Macpherson, in his paper [4] decomposes the challenges that face the SC integration into two parts, first: challenges that come from dealing with suppliers. Second: challenges that come from dealing with competences. This classification focuses on the companies' relations with their suppliers; those relations considered as an external view for the supply chain, but he did not include the internal relationship challenges, and customer relationship.

After extensive reading to the supply chain integration challenges that the literature mentioned in different resources we found that the researchers take two direction; first: researches try to enumerate the challenges from one perspective such as [27, 30, 3, 21, 11, 13, 22, 25, 23, 5, 34, 2, 17, and others], second researches try to enumerate and classify the challenges such as [7, 15, 26, 4, 29]. The researchers in the previous tow directions discuss the challenges from three perspectives:

- 1) Technical perspective [27, 30, 3].
- 2) Managerial perspective [13, 22, 25, 5, 34, 2, 17, and others].
- 3) Relationships perspective [3, 21, 11, 13, 35].

We found that the previous two directions did not include the following issues:

- 1) No paper was able to present all Supply Chain integration challenges.
- 2) No paper was able to introduce a comprehensive classification that includes all perspectives (technical, managerial, and relationship).

our goal in this research is to integrate all challenges in a single comprehensive source and then classify these challenges in three main parts that deal with all previous perspectives and includes all the available supply chain challenges, our classification will be in three parts; first: the Business Micro-environmental challenges, second: the Business Macro-environmental challenges (relationships), and third: The Technical challenges of Supply Chain integration. Fig. 1 presents our classification for the challenges.

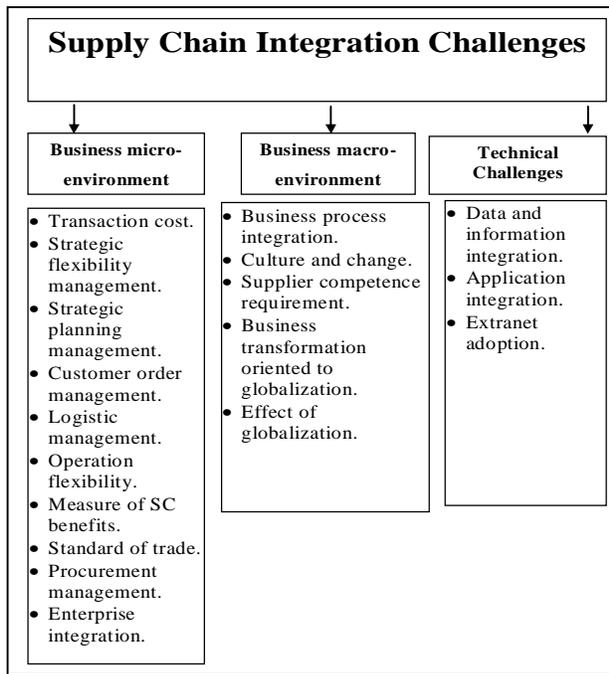


Fig 1: Classification of SC integration challenges

A. Business micro-environment challenges:

This part of challenges related to the challenges that effect the supply chain integration from inside the organization's environment.

Transaction Costs: the decision to outsource business processes and create a supply chain outside the organization requires an assessment of where the boundary of the organization should reside. As such, an economic assessment is required of the various merits of integration versus market provision, thus, the decision is based on a transaction costs approach where there is an "examination of the comparative costs of planning, adapting and monitoring task completion under alternative governance structures" [24]. The outsourcing decision is focused primarily on the management of recurrent transactions; the key dimensions of this context are the uncertainty and asset specificity germane to the transaction. Since these dimensions will vary, this creates a variety of contexts and the result will be diversity within governance structures.

Strategy and planning: SCM is an essential component of long-term business competitiveness, so it is sensible to consider how SCM relates to strategy theory and concepts [19]. An effective supply chain must be able to cope with uncertainty; it follows that it must also be flexible. Therefore, supply chain management will be one of the organizational processes, or functions, that are a key to strategic success if the organizations look for achieving its mission in an adaptive and changing environment [13].

Customer order management: Customers are becoming more demanding; their expectations are evolving toward greater levels of service and response with higher degrees of product and service customization [14]. Value chain partners (suppliers, service providers) integrated to provide

differentiated customer segment product/service bundling and superior customer service levels. Increased profitability is the top driver of customer order management performance. This centered attention on profitability is probably resulting from the economic market conditions of the past few years, but may be a short-term view. Customer responsiveness leads to customer retention and revenue growth. In the longer term view, concentration on customer-facing initiatives and improvements will be significant to profitability achievement. [25]

Logistic management: The supply chain logistics problems facing multi-site companies can be complex, involving multiple stakeholders and constraints across the entire enterprise. The more complex the supply chain, the more difficult it becomes for companies to answer basic questions, such as which crude should they purchase and how should they transport it? Which facilities should process it? What will the best product slate be? Which components should they buy and which should they make? In many cases, different departments or divisions within a company trade, supply chain planning, operations and blending to name a few have a hand in these decisions, but communication among these entities is not always clear or consistent, and each may optimize to their own objectives without regard for others. The results can drastically affect profitability [23].

Manage operation flexibility: A firm gains flexibility to quickly realign the supply/demand mix to satisfy changing global demand. Switching costs and Coordination costs are a barrier to operating flexibility. Switching costs can be reduced if all SC partners standardizing their products and processes globally which is seams to be challenge. Coordination costs can be significant for global integration of cross-functional supply chain processes. A well-structured global demand forecasting and planning process is an important mechanism for global coordination across functions. Regional representation to ensure all relevant input is considered important [20]. A globally integrated process with regional representation requires costly resources, information infrastructure, and travel. Globally integrated information systems are critical to reduce the cost of communications and to make relevant information readily accessible or to reduce coordination costs [5].

Measure SC benefits: Another problem is that the companies often tend to optimize their own performance, while doing this; companies disregarding the benefits of the SC as a whole (local instead of global optimization). The maximum efficiency of each chain however does not necessarily lead to global optimization [2]. In addition, human factors should also be taken into consideration since the decision-makers at various points along the SC do not usually have a whole view to the SC due to the lack of information or their personal hindrances [34].

Setting up standards of trade: For Small and Medium Enterprises (SME) and their suppliers, the high cost of technology is exacerbated by the lack of a widely accepted international electronic information standards governing the financial supply chain. The solution is a standard mechanism

for communications protocols, rather than many standards. Several organizations have made some headway towards creating such standards, but there are no comprehensive and internally consistent open standards now, which is why automating the supply chain is so costly. [17]

Procurement management: A typical manufacturing company needs to procure thousands of products from hundreds of suppliers; the challenge here is how to manage the complexity of the procurement process, and establishing a strong procurement infrastructure to execute on strategic supply initiatives, using an empowered organization structure, fully integrated to the stakeholder and finance organization. More over, People training and development was the key challenge for procurement organizations, includes skill development; the right recruiting and retention practices, and career paths in other functions outside of procurement. That is, how to set up and how to manage global sourcing offices. [2]

Enterprise integration: Enterprise integration doesn't happen naturally, it needs to be planned, yet the planning cannot be precise, as business processes and facilitating technologies will change, creating different needs and different potential solutions [28]. The reference architecture efforts mentioned define methodologies for building integrated architectures. The problem of integration is exacerbated by the limits of human cognition, by behavioral issues, by the difficulty of aligning the goals of individuals with organizational units, and by the relentless need for faster changes [3].

B. Business macro-environment challenges:

This part of challenges related to the challenges that effect the supply chain integration from outside the organization's environment.

Business process integration: Processes must be coordinated between all the firms in the value chain to achieve improved performance and service [10]. This form of external process integration, which is called value chain coordination, is the focus of modern supply chain management. The E-commerce helps organizations to be able to connect its internal processes with its stakeholders. The challenge in business process improvement is that the processes must be coordinated between all firms in the value chain to achieve improvement in performance and service. Integration must happen between decision making and business process layers which occur whenever human operator (or software agent) makes a decision that change the flow of work through a process. Decision makers must care about the compatibility issues; business process integration effected by compatibility challenges in a technical, operational, strategic, and political/legal environment. [3]

Culture and Change: "The pattern of beliefs, values and learned ways of coping with experience that have developed during the course of an organization's history, and which tend to be manifested in its material arrangements and in the behavior of its members" [1]. This definition of culture clearly foregrounds the cumulative effects of history and

experience which have important practical outcomes that are manifest in employee behaviors. This is important for supply chain integration, since the accumulated history of relationships and experience, within and between organizations, will provide part of the context within which the inter-organizational activities are enacted. If there is a drive to closer relations within supply chains, this will involve the replacement of existing governance structures and will challenge existing supply chain behaviors associated with traditional bid-buy relations. [21]

Supplier competence requirements: If customers are moving to fewer suppliers, and investing in strategically important supply chain relations, then SME suppliers that cannot make themselves attractive purely through economies of scale and scope must increase their asset specificity and decrease uncertainty. This requires the supplier to invest in activities that are alien to traditional bid-buy supplier interactions. Thus, it will require suppliers to respond to the changing context and develop stronger relational and organizational competences. Since those issues of quality and performance are the baseline measure for the customer-supplier interaction, any existing competences must support the achievement of this standard. Thereafter, it is the capabilities that create differentiation that will be a key. [11]

Globalization: The forces of globalization and commoditization in today's business world are unstoppable. Globalization and commoditization have created a challenge for companies, which it's How to cut costs and grow simultaneously. During the industrial revolution, companies looked for new markets, new sources of raw material and new sources of labor. The revolution was fueled by globalization and companies thrived by taking advantage of economies of scale. Senior executives now understand that they can't just focus on supply chain operations to create efficiencies. The challenge is to integrate supply chain execution with the overall corporate business strategy, and to use the supply chain as a catalyst for business transformation or business reinvention. [13].

C. Technical challenges:

This part of challenges related to the technical challenges that effect the supply chain integration from inside-outside the organization's environment.

Data and information integration: Information integration refers to the sharing of information among members of the supply chain. The ability to seamlessly connect with customers, partners, and co-workers is vital for success; yet most enterprises store and exchange data in dissimilar formats, such as databases, Electronic Data Interchange (EDI) systems, text files, and, increasingly, XML-based applications. The ability to map between these different formats is mission-critical. This includes any type of data that could influence the actions and performance of other members of the supply chain [10]. The meaning of all data items must be understood and the same data item must have the same definition across multiple applications both within and outside the firm. To make the integration process worth

the effort, the data must be of high quality - timely, accurate and relevant [3].

Application Integration: ERP systems achieve application integration because ERP vendor-developed applications that perform common business functions are united through a common database (also providing data integration – one of the selling points of ERP systems.) The integration of the functional applications also implies that integration at the next layer, business processes, is achieved. However a major issue with ERP systems is that they fail to bridge the gap between the application and process layers in a flexible fashion. To reach the application integration firms must break down complex processing; to cope with application integration they must support interactive process. Finally Applications must integrate with the business processes [30]

Extranet adapting challenges: There are several issues to consider while adopting extranet as a facility of SC integration. A firm must be committed to using the system, as phone, fax, and written record, (instead relying on the automated supply chain system) and it influences the firm's processes as well [27]. Issues that we should consider while adapting the extranet include; costs of implementation, loss of trust, unable to adapt to change, losing the inimitability of Product, unnecessary liability, lack of security, uneven partner benefit, increased independences, and keeping up with the change in expectations.

IV. CONCLUSION

In this paper we surveyed and discussed the state-of-the-art studies related to the supply chain integration challenges, we have integrated the supply chain integration challenges research findings. We also introduced new and comprehensive classification for the supply chain integration challenges.

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