

The Mediating Effect of Supply Chain Agility on the Relationship Between SCOR Business Analytic Solution and Supply Chain Performance

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Abstract

At the global competition in the modern era, have different products to suit customer requirements contracts made available to them. As a result, companies can no longer afford to do all alone. In a competitive market, the enterprises and productive addition to the organization and the internal resources, required to manage and monitor resources and associated elements outside the organization. So today is the implementation of supply chain management as one of the foundations of e-business infrastructure around the world. This study with supply chain operation reference (SCOR) model investigated effect of supply chain agility and relationship between business analytic and supply chain performance.

Keywords

Supply Chain Management, Business Analytic, Supply Chain Performance, Supply Chain Agility

1. Introduction

Supply chain management (SCM) is a novel management concept and enterprise operation mode, and is increasingly attracting more attentions around the globe [1]. The emphasis of the literature review is to find the consequence of business analysis (BA) and supply chain integration (SCI) on supply chain performance (SCP) directly and through supply chain agility (SCA) considering moderating effect of information system and business process orientation. This review is focused on providing a clear understanding of theoretical foundations, frameworks, and empirical evidence of business analytic and supply chain integration, supply chain agility as well as information system.

2. Business Analytic

Business Analytic (BA) is the practice of iterative, methodical exploration of an organization's data with emphasis on statistical analysis. Companies committed to data-driven decision-making use BA. BA used to gain insights that inform business decisions and can used to automate and optimize business processes. Data-driven

companies treat their data as a corporate asset and leverage it for competitive advantage. Successful BA depends on data quality, skilled analysts who understand the technologies and the business and an organizational commitment to data-driven decision-making [2].

The field of BA has improved significantly over the last few years, with many millions of click stream records being generated on a daily basis and aggregated to records with hundreds of attributes, there is a clear need for automated techniques to find patterns in the data. In this study we discuss the technology and enterprise-adoption trends in the area of BA [2, 3]. Analytics are now regularly used in multiple areas, including sales, marketing, SC optimization, and fraud detection [4]. Kohavi et al. (2002), In their study on BA and its new trends, they mainly focused on the importance of IT in business and its analytical tools that considered to boost the business more rigorously than ever. From their point of view, the key consumer is the business user, whose job, possibly in merchandising, marketing, or sales, is not directly related to analytics process, but who typically uses analytical tools to improve the results of some business process along one or more dimensions [2].

According to Carlsson and El Sawy (2008), peoples' actions are based on their decisions therefore the

performance also is an output of how they decide and act, these differences in decisions are the main essence of organizational differences [5, 6]. Shapiro (2006) opines that being competitive motivated firms toward a fact-based SCM in which commitment receives more attention. Under this approach many different factors must be considered including companies, processes and data. In favor of conducting such approach, new BA models have emerged, which are proper tools in handling the operational and design issues of SC [7, 8]. However, it is hard to encompass all available data in decision-making. To this end, main question is how to extract the essence of available data from existing software's in SC, which is a big dilemma for decision makers [9].

Therefore, data analysis lies at the heart of decision-making in all business applications [10]. The same applies to the SC context as a correct relevant business decision based on bundles of very large volumes of both internal and external data that is only possible with BA that enable the analysis of data gathered in vast quantities on a regular basis [11, 12]. Since a large company may have thousands of different suppliers, the use of such frameworks is impossible without BA.

BA has been increasingly used in SCM. Improving SCP has become a continuous process that requires an analytical performance measurement system [13, 14]. Moreover, the use of BA aids a knowledge enterprise by promoting efficiency within an organization, particularly by using analytical methods to provide valuable decision-making knowledge to minimize operating costs and accurately forecast market trends [15, 16].

Companies with more mature SC practices, i.e. improved BA capabilities are thus reducing their costs faster and achieving higher profit margins than their less mature peers [17-19]. Moreover, higher levels of SCM practice such as a higher level and quality of information sharing can lead to an enhanced competitive advantage and improved performance [20]. Many organizations that already have systems in place to collect data and gather information often find themselves in a situation where they do not have a suitable approach to put their vast data and information into use for strategic decision-making [21].

It is also critical that the organization constantly evaluate its models to ensure their predictive validity [5]. Nevertheless, the most suitable organization and processes to enable the positive impact of these decision support tools are still to be clearly identified [22]. All above-mentioned argument support and justify the importance of BA in SC especially as a strong tool for decision-making, which represents its relation to both decisional and structural paradigms where its relationships with decision-making is evident and on the other hand we know that different situations in SC will require different approaching of BA.

3. SCOR Model

In favor of evaluating the role of BA in SCP as a broad

term, many models have been developed. Among these models, SCOR model is designed to simplify construction of a systematic SCP measurement and improvement tool [13], and to provide a common SC framework, standard terminology, common metrics and best practices [7].

From SCOR perspective, SC involves four major areas of plan, source, make and deliver, which are suitable for BA applied in all these four areas where its role in production planning points to Plan, its relationships with ordering and optimal decision is a representative of Source [23], and finally its notable role in developing an optimal model for production and distribution planning points to Make and Deliver [14] and an algorithm for vehicle routing problem in Deliver [24].

BA is becoming an important tool to improve the efficiency, competitiveness and profitability of businesses. BA is defined here as set of innovative and advanced analytic techniques, which assists manager to solve the SC related problems and issues. In fact, BA consists of a set of approaches, processes, procedures and tools, which are mixed together that, are used to collect data, analyze them and provide solutions for all four aforementioned groups [25, 26].

Previous literature, i.e. Bruce Dehning *et al.* (2007) suggests that SCM systems are suitable tools for improving financial performance, which has been competitive edge for companies in recent decades [12, 27]. Despite of its obvious role in performance, still there is not a well-defined method of measuring the value behind these systems [28, 29]. Most of the existing literatures mainly focus on the experiences rather than improvement, which indicate the lack of BA procedures in companies.

As shown, the potential positive impact of BA on SC performance is well established; however, the potential ways and moderating influences of this impact are not so well understood. Most previous research papers have used SCM as an umbrella term to analyze this impact [30]. SCM is therefore still largely eclectic with little consensus on its conceptualization [31] and can basically encompass every business activity in a company. In this sense, a more precise reference is needed to analyze the impact of BA. Since SCOR has been widely employed for SC optimization in recent years [7, 13].

4. Why SCOR

SCOR has often been recognized as a systematic approach to identifying, evaluating and monitoring SCP [13, 32]. In the SCOR model, a balanced performance measurement system at multiple levels, covering four core SC processes (Plan, Source, Make, Deliver, and later Return was also added), was developed [13]. SCOR is supposed to be the most promising model for SC strategic decision-making [7, 33]. It provides a common SC framework, standard terminology and metrics that can be used for evaluating, positioning and implementing SC processes [7]. The choice of SCOR model also reflects the fact that SC analytics include planning,

sourcing, making and delivery [12].

According to Oliveira et al. (2012), all businesses related to procedures need an innovative approach based on decision-making, which is supported by BA. Recent innovations and trends in BA spanning organizations and technical processes, new technologies, user interface design and system integration are all driven by business value. Business value is measured in terms of progress toward bridging the gap between the needs of the business user and the accessibility and usability of analytic tools. In order to make analytics more relevant and tangible for business users, solutions increasingly focus on specific vertical applications tailoring results and interfaces for these users, yielding human-level insight. The same situations would apply in SC as a business an application where there are bundles of very large volumes of both internal and external data that is only possible with BA that enable the analysis of data gathered in vast quantities on a regular basis [11, 14].

In this regard it should be noted that any kind of evaluation of performance in SC requires implementing various factors to assist, for example, calculation of a supplier performance score. In such a case, we know that a manufacturing company has many different suppliers therefore implementing any SC framework requires BA to perform a logical analysis. Since the major motivation of SC is to improve the performance therefore use of BA became an integral part of analytical performance measurement system [13].

5. Supply Chain Agility

The concept of agility has experienced increasing attention in production and supply chain management research due to its importance for managerial practice. The context in which the idea has received most consideration to date is that of manufacturing, in which agility was seen as an emerging competitive weapon [34], a requirement for world class manufacturing performance [35], and as a new paradigm in manufacturing [36]. For example, Narasimhan et al. (2006) combine agility with leanness [37], Ismail et al. (2007), consider agility as a building block for mass customization [38], and Ismail et al. (2010), investigate the role of agile strategic capabilities in achieving resilience in manufacturing-based small companies [39]. One of the first scholars to consider agility within the SCM context was Fisher (1997) [40], with subsequent works further stressing SC agility as a business wide capability, enabling the firm to respond to changing market environments [41, 42]. As such, agility is characterized by flexibility and speed/responsiveness, and spans organizational structures, processes, information systems and mindsets [43, 44]. SC agility thus extends beyond a single firm and involves alignment with major customers and suppliers [41]. Recent work includes the studies by Swafford et al. (2006) and Braunscheidel and Suresh (2009) [41, 42]. While the former investigates the relationship between flexibility and SC agility, the latter examines the link between integration and

SC agility. The authors of both studies stress the importance of research in SC agility, and note the limited amount of scientific evidence pertaining to its study.

6. Supply Chain Performance

A typical supply (SC) chain generally contains four echelons (supply, manufacturing, distribution, and consumers), where each level of the chain may comprise numerous facilities. Thus, the complexity of the SC arises from the number of levels in the chain and the number of facilities in each level [45]. The subject of SCM was already investigated by the pioneers and reported in the literature. While there are many ongoing research efforts on various aspects of SCM, so far little attention was given to the performance evaluation, and hence, to the measures and metrics of supply chains [46]. Gunasekaran et al. (2004) used taxonomy to discuss a framework for improving SCP [47]. As a pitfall in managing supply chain inventories, Lee and Billington (1992), also drew attention to the lack of SC metrics. SCM can be viewed as a philosophy based on faith that each firm in the SC directly [48] and indirectly affects the performance of all the other SC members, as well as ultimately, overall SCP extent [49]. The effective utilization of this philosophy requires that functional and SC partner activities need to be aligned with company strategy and harmonized with organizational structure, processes, culture, incentives and people [50]. Additionally, the chain wide deployment of SCM practices consistent with the aforementioned philosophy is needed to provide maximum benefit to its members [32].

In recent years, a number of firms have realized potential benefits of adapting supply chain management in day-to-day operations management. However, they often lack the insight for the development of effective performance measures and metrics required to achieve a fully integrated SCM due to lack of a balanced approach and lack of clear distinction between metrics at strategic, tactical, as well as operational levels [51, 52]. Therefore, it is clear that for effective SCM, measurement goals must consider the overall scenario and the metrics to be explored [53].

These should represent a balanced approach and should be classified at strategic, tactical, and operational levels, and include financial as well as non-financial measures of SCP extent [54]. Gunasekaran et al. (2001), claimed the existence of a greater need towards studying different measures and metrics in the context of SCM for two reasons [51]: (a) Lack of a balanced approach; and (b) Lack of clear distinction between metrics at strategic, tactical, and operational levels.

During the past decade, a number of SC research topics and methodologies were articulated [55]. Optimization criteria in SC models were included cost [56], inventory levels [57], profit [58], fill rate [59], stock out probability [60], product demand variance [61], and system capacity [62]. Most deterministic and stochastic models dealt with isolated parts of the SC system such as supply production, production-distribution, or inventory-distribution systems.

Some models were emphasized with strategic issues for SCs such as the most cost-effective location of plants and warehouses, flow of goods, etc., while others were concerned with operational issues such as order size, fill rate, inventory levels, etc. However, measuring SCP must be considered as an important source of competitive information [63].

Given the inherent complexity of the typical SC, selecting appropriate performance measures for SC analysis is indeed particularly critical, since the system of interest is generally large and complex. Performance improvement at an individual supply chain echelon does not lead to improvement in the SC as a whole. To measure the SCP effectively, it is necessary to consider the complex multilayered internal linking activities between multiple entities [64]. In order to analyze the efficiency and benefits of SC scientifically and objectively, the performance evaluation system and method of SC should be established accordingly Shepherd and Günter (2011) [8].

For a balanced approach, Maskell (1991), suggests that companies should understand that, while financial performance measurements are important for strategic decisions and external reporting, day to day control of manufacturing and distribution operations is often handled better with non-financial measures [65]. Quite often companies have a large number of performance measures to which they continue to add based on suggestions from employees and consultants.

The measures that usually are used in measuring the SCP should be those that are most relevant to organizational performance. Those who select or define the measures must be able to distinguish between measures to choose those that are most appropriate to measuring the performance. Thus these selected measures and metrics must represent a combination of financial and non-financial aspects of strategic, operational and tactical levels of activities that influence decision-making and control in organizations [54].

SC links in current competitive global market make firms to join those links rather than operating under their brands' names. Lambert and Cooper (2000) opined that nowadays firms' success is rooted in their managerial ability to incorporate with those links and relationships among SC members [66]. Therefore, a SC is an integrated system in which many business related processes are incorporated that desire to achieve specific objectives as: 1) find raw materials and some of the required parts; 2) convert them into final products; 3) add value; 4) distribute them to retailers and customers; 5) provide backup services.

Its main objective is to enhance the operational efficiency, profitability and competitive position of a firm and its SC partners. More concisely, SCM is defined as "the integration of key business processes from end-users through original suppliers that provide products, services, and information and add value for customers and other stakeholders" [67]. To this end, a concept of SCM evolves around a customer-focused corporate vision, which drives changes throughout a firm's internal and external linkages and then captures the synergy of inter-functional, inter-organizational integration and

coordination [68]. The successful integration of the entire SC process, however, depends heavily on the availability of accurate and timely information that can be shared by all members of the SC [69]. From this perspective, it is required to be considered that there are many methodologies that have been used in decisional, structural and decision-structural paradigms. Major methodologies are as mathematical modeling, statistical modeling, simulation modeling, case and field study and theoretical conceptual method.

7. Conclusion

The role of information sharing in achieving competitiveness, something that in recent years at various levels of the company, business and supply chain management has been of interest to many researchers. The evolution supply chain to supply chain agility to identify the current status and determine the optimal situation begins due to relationship between business analytic and supply chain performance. Purpose using a SCOR practical model, supply chain to evaluate is possible.

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