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Big Data in Supply Chain Management: A Review

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Abstract: Given the growing importance of service supply chain management (SSCM) in operations, we review a selection of papers in the operations research and the management science literature that focuses on innovative measures associated with the SSCM. First, we review and discuss the definitions of service supply chains (SSCs),Characteristics of supply chain management, Logistics, Supply Chain Challenges with Big Data Analytics and supply chain strategy.

Keyword*: Big Data,supply chain management.*

I. INTRODUCTION

The term Big Data refers to all the data that is being generated across the globe at an unprecedented rate. This data could be either structured or unstructured. Today's business enterprises owe a huge part of their success to an economy that is firmly knowledge-oriented [1]

Big Data is also data but with a huge size. Big Data is a term used to describe a collection of data that is huge in size and yet growing exponentially with time. In short such data is so large and complex that none of the traditional data management tools are able to store it or process it efficiently. [2]

The global logistics industry has a large ever-growing amount of Big Data and is flooded with real-time data ranging from smartphones, sensors, and digital machines to B2B data exchanges. Such Big Data brings a new source of competitive advantages for logistics involvers to carry out supply chain management so as to obtain enhanced visibility, the ability to adjust under demand and capacity fluctuations in a real-time basis, as well as the insights into customer behaviors and patterns to achieve smarter pricing and better products (Swami Nathan, 2012). The Council of Supply Chain Management Professionals (CSCMP) thus is currently pursuing two complementary projects which aim to address what Big Data means for logistics and supply chain management (CSCMP, 2014). One is ''Big Data: What does it mean for Supply Chain Management?" carried by Mark Barratt (Marquette University), AnnibalCamaraSodero (University of Arkansas), and Yao Jin (University of Arkansas) to:

1. Develop taxonomy of data sources including Big Data that could be considered for decision making in retail supply chains;
2. Explore the current and potential use of Big Data analytics in and across multiple industries; and
3. Identify the general and particular implications of the use of Big Data. The other is ''the What, How and Why of Big Data in Supply Chain Relationships [3]:

II. REVIEW OF LITERATURE

Krzysztof Witkowski[4], In previous studies of researcher explained the logistics companies are determined to implement product, technical, technological and organizational innovation. Enterprises are focused on creating value for the customer, who is becoming more aware and demanding in terms of increased customer requirements relating to lead time delivery services, product availability and reliability. The newest solutions such as Internet of Things, Big Data and Industry 4.0 create opportunities to meet the needs of customers and also contribute to the development of logistics and supply chains management.

Sunil Tilwari at el.,[5], provides a comprehensive literature review on the studies done in the field of big data analytics in supply chain management. To do so, we systematically reviewed and analyzed papers in the respective categories to identify the major advances, and highlight the research gaps. The increasing number of data in supply chain management requires tools to utilize the big data. Big data analytics has shown to be an important discipline that can provide the possible solutions to extract more useful information and wisdom for decision-making. From the current big data analytics methodologies and applications in supply chain management, opportunities and future perspectives from the supply chain management aspects are highlighted. Academia and industrial practitioners can be inspired to transform the supply chain management with the help of big data analytics. The present review paper can provide insights to both academia and practitioner in their application of big data analytics in supply chain management.

Gang Wang at el.,[6], has reviewed the literature on logistics and supply chain management and explored the application of BDBA in supply chain strategies and operations, that is SCA. SCA helps organizations measure the performance of various areas in logistics and supply chain management and provide them with the ability to establish a benchmark to determine value-added operations. Furthermore, SCA help companies monitor these metrics on an ongoing basis, troubleshoot poor performance, and identify root cause, as well as enable the delivery of better business decisions and provide tremendous benefits through the improvement of business processes.

Roy y.zhong at el.,[7], review on the studies done in the field of big data a analytics in supply chain management. They systematically reviewed and analyzed papers in the respective categories to identify the major advances, and highlight the research gaps. The increasing number of data in supply chain management requires tools to utilize the big data. Big Data analytics has shown to be an important discipline that can provide the possible solutions to extract more useful information and wisdom for decision-making. From the current big data analytics methodologies and applications in supply chain management, opportunities and future perspectives from the supply chain management aspects are highlighted. Academia and industrial practitioners can be inspired to transform the supply chain management with the help of big data analytics. The present review paper can provide insights to both academia and practitioner in their application of big data analytics in supply chain management.

Richard Addo-Tenkorang at el.,[8]In this paper explained a number of available big data mining and analytical tools now, including professional and non-professional software, expensive industrial or commercial software, and open source ones. some of this industrial and/or open source big data software available to enable and enhance the streamlining of

industrial big data in a much more value-adding and sustainable perspective. Although there have been a number of research papers in the area of big data applications attempting to identify and understand the challenges in industrial or supply-chain "big data" applications, effectively implementing big data analytics in real-time and in IoT process is a huge and extremely complex undertaking for most industrial operations. Therefore, it is imperative for industrial management to holistically perform effective and efficient operational assessment of the tasks/processes and re-organise them into smaller and more manageable chunks. This process will streamline and enhance the "Velocity" attribute of huge "Voluminous" big data into a more preferable "Variety" structural attribute and into "Veracious" analytical processes, Samir K. Srivastava[9], review on SCM find that the depth of research in various categories has been different. Many specific empirical studies have been carried out, and categories such as remanufacturing have been studied to a great depth. Even, within remanufacturing disassembly has been studied to a very detailed level. Of late, other categories such as RL have started getting more attention. Focus more on relatively unexplored categories, as they offer potential for further exploration and research Nathalie Fabbe-Costes[10].

Study reinforces the usefulness of systematic critical literature reviews for the purpose of theory-building and suggests that such reflective research is particularly useful when managerial issues are complex and strategic. Our paper contributes to a clarification of the concept of integration and a better understanding of the phenomenon by providing a "state-of-the-art" of the empirical evidence. The multidimensional framework provides a structure for the identification of convergences and divergences as well as of themes that have been in focus and themes that are missing. The review also provides a starting point for raising new research questions and for improved operationalisation of the integration concept for use in practical applications and in further studies.

Mondher Feki at el.,[11]This study analyzes and provides an overview of the existing literature. Developed and implemented a classification framework on big data enabled supply chain transformation. review showed that the transformation is caused by big data through internal elements of supply chain. Thus, it is interesting to study the impact of big data on external supply chain including flows between a firm and its customers, suppliers and partners and to examine inter-organizational business process transformation.

Thanos Papadopoulos at el., [12], This study and analyse the focus on data-driven supply chains (DDSC). They claim that although research on big datain OSCM has investigated their benefits and potential as well as the relationship between characteristics of big data and multiple manufacturing capability dimensions, the relationship between DDSC and multiple manufacturing capability dimensions, that is, flexibility, delivery, quality, and cost that lead to customer satisfaction improvement has not been in-depth investigated. To address this gap, Chavez et al. created and tested empirically a model based on survey data from the Chinese manufacturing sector. Their results suggested that DDSC are positively associated with multiple manufacturing capability dimensions.

Dubey, R [13],In this explained and highlighted the role of BD on WCSM. The application of BDA can be largely used in the field of supply chain network design in terms of rationalization of warehouse footprints,reducing supply chain risk by improving prediction of unpredictable disasters, vehicle routing and improving customer service by reducing stock out and managing product life cycle. Fawcett and Waller (2014) have argued in their seminal work that there are five emerging "game changers" that can redefine the operations management field the use of BD can further help to address the four identified concerns. Using BD new innovations can be made, for instance in terms of developing new materials such as biodegradable materials which cause less harm to the environment and can play significant role in improving the life of people.

Vieri Maestrini at el., [14] We believe that this study is relevant for both performance measurement and supply chain management scholars, SCPMS being at the crossroads of the two areas. the explanation provided helps to shed light on the topic, as the comprehensive label SCPMS was broken down into its components and relevant definitions were provided, offers fruitful suggestions to overcome some of the inherent limitations of the literature. Specifically, limited our analysis to the dimensions included in the codebook, thus inevitably leaving aside other elements: for example, we eventually did not provide taxonomy of metrics .CPMS research, clarifying the as SCPMS research, clarifying the as is situation of academic research on the topic. Thirdly, the research agenda at the end lists clear streams for scholars to follow, outlining two main challenges .On the one hand, empirical testing is needed regarding the antecedents, outcomes and contextualvariables related to the adoption of consolidated external SCPMSs, like supplier PMSs. On the other hand, new exploratory, theory-building research could address largely unexplored, such as customer PMSs, multitier supplier PMSs and many to many SCPMSs

III. SUPPLY CHAIN MANAGEMENT

During the 1990s several authors tried to put the essence of SCM into a single definition. Its constituents are

- The object of the management philosophy
- The target group
- The objective(s)
- The broad means for achieving these objectives.

The object of SCM obviously is the supply chain which represents a ".. . network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer". In a broad sense a supply chain consists of two or more legally separated organizations, being linked by material, information and financial flows. These organizations may be firms producing parts, components and end products, logistic service providers and even the ultimate consumer (synonym: customer) himself. So, the above definition of a supply chain also incorporates the target group—the ultimate customer [04].It has been noted that discussions of SCM often use complicated terminology, thus limiting management's understanding of the concept and its effectiveness for practical application. This section is, thus, dedicated to reviewing, classifying, and synthesizing some of the widely-used definitions of "supply chain" and "supply chain management" in both academia and practice. The goal of this discussion is the development of one, comprehensive definition upon which managers and future researchers can build.

A. Logistics and supply chain

Strategic sourcing is collaborative, focusing on supplier relationship management by analyzing organizational spend

costs and acquiring commodities and services on a cost-effective basis. Strategic sourcing helps companies optimize financial performance, minimize operations cost, and improve their suppliers' performance (Talluri and Narasimhan, 2004). At the core of strategic sourcing is commodity management, which involves identifying and implementing both cost savings and performance-enhancing opportunities. SCA can help achieve these objectives as follows: firstly, SCA analyzes organizational spend profiles, procurement processes and future demand to ensure that sourcing strategies are aligned to the organization's strategic goals and objectives (Bartels, 2006; Scott et al., 2013); secondly, SCA facilitates the development of optimal sourcing strategies by evaluating supply market trends and suppliers' inputs and economics. To formulate sourcing strategies, SCA uses analytics and assessment tools including, for instance, cost modeling and risk assessment, to define appropriate contracting terms, create optimal bid processes and parameters, and select suppliers on the basis of their optimal value offerings (Apte et al., 2011; Shen and Willems, 2012; Jain et al., 2013). Another important aspect of strategic sourcing is suppliers' evaluation and selection (Romano, 2012). SCA can enable organizations to benchmark industry best practices, set performance targets, and implement customized metrics (Chai and Ngai, 2015; Choi, 2013). When trying to evaluate suppliers' performance, multi-criteria decision-making techniques (Ho et al., 2010; Ekici, 2013) have been widely used (e.g., analytic hierarchy process (AHP)). AHP decomposes complex problems into separate small size sub problems in terms of different evaluation objectives such as cost optimization, timely delivery, and flexibility, among others. Each sub-problem is a single objective decision making problem that can be solved quite easily (Ho, 2008). Furthermore, SCA is used to predict supply disruptions by supply chain mapping and enterprise social networking to identify the sources of supply uncertainties and

B. Supply Chain Challenges with Big Data Analytics

Better Predict Customer Needs and Wishes
Improve Supply Chain Efficiency
Better Assess Supply Chain Risk
Improve Supply Chain Traceability
Agility - Improve Reaction Time and Order-to-Cycle Delivery Times

- Discover and manage supplier relationships more effectively, and understand who is doing business with whom. While many vendors use big data to learn more about their customers, the most successful supplier managers will also use big data to better understand their vendors.
- Create comprehensive supplier profiles, including data from external sources – such as Dun & Bradstreet – for financial, risk or performance metrics and provide risk managers with real-time analytics dashboards.
- Better understand customers and their relationships with the company.
- Learn how customers interact through different channels and offer better product recommendations. [15].

CONCLUSION

Supply chain management is being practiced in many organizations as a tool to leverage their overall performance. It is also helpful to increase the profit by minimizing the cost and to satisfy the efficacy of supply chain management in Indian manufacturing organizations. The main aim of effective logistics management is to improve the efficiency of the operations, ensuring customer satisfaction, and increase productivity. These tips and strategies are necessary for process optimization.

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