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Citation: SPANAKI, K. ... et al, 2016. A research agenda on Data Supply Chains (DSC). British Academy of Management (BAM) Conference, Newcastle, UK, 6th-8th July 2016

Additional Information:

- This is a conference paper.

Metadata Record: <https://dspace.lboro.ac.uk/2134/24560>

Version: Accepted for publication

Publisher: British Academy of Management (© the authors)

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Please cite the published version.

A RESEARCH AGENDA ON DATA SUPPLY CHAINS (DSC)

Developmental Paper

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Abstract

Competition among organizations supports initiatives and collaborative use of data while creating value based on the strategy and best performance of each data supply chain. Supporting this direction, and building on the theoretical background of the supply chain, we propose the Data Supply Chain (DSC) as a novel concept to aid investigations for data-driven collaboration impacting organizational performance. In this study we initially propose a definition for the DSC paying particular attention to the need for collaboration for the supply chains of data. Furthermore, we develop a conceptual model of DSC collaboration coupling theoretical background of strategy and operations literature including, the resource-based view (RBV), supply chain management (SCM) and collaboration (SCC). Finally, we set propositions and a future research agenda including testing and validating the model fit.

Keywords: Data Supply Chain (DSC); Supply Chain Management (SCM); Supply Chain Collaboration (SCC); Survey research; Structural Equation Modelling (SEM).

Word count: 1732

1. Introduction

As an organizational resource, data have grown in importance in recent years. The effective management of data streams, originating both endogenously and exogenously from the focal firm and exhibiting the characteristics of big data, has become a critical strategic and managerial concern. For that reason, initially we propose the concept of the Data Supply Chain (DSC) to capture and describe the emergent organizational collaborative strategies for the integration and use of data from internal and external sources. These data supply chains are created across organizations not as a part of the core business, and therefore there is interest of how organizations can gain strategic advantage through their use. Exploring the emerging concept of Data Supply Chains and the promising role of Big Data in this revolution, can give a further insight of how these supply chains are formed and how organizations mobilize their capabilities and capacities around them.

The question motivating this research is: *What is the impact of Data Supply Chains on organizational performance?* The aim of the study is to uncover the nature of data supply chain and explore its relationship with strategic advantage based on the associated value for the organizations. Following Crook et al (2005), we take a growth-oriented approach to organizational performance. Specifically, we draw on the largely conceptual work in the business model literature to develop a measure of organizational performance conceived in terms of value. We conceive organizational performance as enhanced strategic advantage and consequently enhanced value creation. The objectives of this research are to: a) Introduce the concept of the data supply chain, b) extend previous research on supply chains into the context of the knowledge economy and big data and explore the data supply chain/organizational performance relationship.

2. Literature Review and Theoretical Background

A systematic literature review of 'Big Data' term (Wamba et al., 2015) showed different perspectives of defining the phenomenon. For example, McKinsey reports Big Data as those datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze (Manyika et al., 2011), this approach gives a specific focus on the size of the data which makes them 'big' and varies in different sectors and industries as well as while technology evolves. Thus, Chen et al (2012) describe Big Data as "the data sets and analytical techniques in applications that are so large (from terabytes to exabytes) and complex (from sensor to social media data) that they require advanced and unique data storage, management, analysis, and visualization technologies" (Chen, Chiang & Storey, 2012) and mostly perceive big data in terms of their implications in analytic functions. Following the Big Data era, we can claim that it is a term coined to describe this quantity of data though it is something of a slippery concept: a generalized, imprecise term (Crawford & Schultz, 2014) and usually normal data becomes big data when it exceeds our ability to process and analyze it with traditional tools (Bradshaw 2013).

Big Data has introduced an evolution in the world economy taking a fundamental position, as the data streams pouring out of different devices and in different formats are massively produced on a daily basis and introduce a vast amount of opportunities and challenges for organizations and individuals.

Following the logic above, there is a new supply chain where the data gathered from different sources is used as a resource and can provide information products/services. These information products/services are based on data combined in any number of ways improving internal and external organizational processes; this change presented by the digital economy

may seem without great significance, however it introduces new business strategies around data and more importantly disrupts the already existing business models.

2.1. Theoretical Foundations

As it was discussed above, increasing availability and quantity of data can now be viewed as a new form of resource for companies improving efficiency and effectiveness and introducing new products. For this reason our study is initially based on the theory of Resource-Based View (RSV) and Dynamic Capabilities. Data supply chain and data collaboration is based on the theoretical background of management and collaboration of physical supply chains (Cao & Zhang, 2011; Li et al., 2006; Li et al., 2005; Chen & Paulraj, 2004) and follows the logic of collaborative advantage (Cao & Zhang, 2011; Cao et al., 2010; Dyer, 1996; Kanter, 1994) rather than competitive advantage (Cao & Zhang, 2011; Porter, 1985).

2.1.1. Resource-Based View and Dynamic Capabilities

Resource based view (RBV) of the firm receives much attention in explaining supply chain collaboration; the key concepts of RBV are resources, capabilities, and strategic assets (Barney, 1991). The resource-based view (RBV) of the firm (Eisenhardt & Martin, 2000; Teece, Pisano & Shuen, 1997; Barney, 1991) gives emphasis at resources and capabilities for gaining competitive advantage. RBV theory however could not explain the ‘timely responsiveness and rapid and flexible product innovation, along with management capability to effectively coordinate and redeploy internal and external competencies’ (Teece, Pisano & Shuen, 1997) and it was therefore elaborated and redeveloped as the theory of dynamic capabilities. Dynamic capabilities explain how companies adopting continuously changing resource strategy can achieve a sustainable competitive advantage. This has been defined as ‘the firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments’ (Teece, Pisano & Shuen, 1997). Dynamic capabilities have been defined as ‘the firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments’ (Teece, Pisano & Shuen, 1997)

2.1.2. Supply Chain Management (SCM) and Collaboration (SCC)

As defined by the Supply Chain Council, a supply chain encompasses every effort involved in producing and delivering a final product from the supplier’s supplier to the customer’s customer (Stephens, 2001). Council of Logistics Management defines SCM as the systemic, strategic coordination of the traditional business functions and tactics across these businesses functions within a particular organization and across businesses within the supply chain for the purposes of improving the long-term performance of the individual organizations and the supply chain as a whole (Global Logistics Research Team, 1995). SCM has been defined to explicitly recognize the strategic nature of coordination between trading partners and to explain the dual purpose of SCM: to improve the performance of an individual organization, and to improve the performance of the whole supply chain. The goal of SCM is to integrate both information and material flows seamlessly across the supply chain as an effective competitive weapon (Li et al., 2006; Stephens, 2001).

The concept of SCM has received increasing attention from academics, consultants, and business managers alike. Many organizations have begun to recognize that SCM is the key to building sustainable competitive edge for their products and/or services in an increasingly crowded marketplace. The concept of SCM has been considered from different points of view in different bodies of literature (Croom, Romano & Giannakis, 2000) such as purchasing and supply management, logistics and transportation, operations management, marketing, organizational theory, and management information systems. Various theories have offered

insights on specific aspects or perspectives of SCM, such as industrial organization and associated transaction cost analysis, resource-based and resource-dependency theory, competitive strategy, and social–political perspective.

Supply chain collaboration has been defined in many different ways, and basically they fall into two groups of conceptualization: process focus and relationship focus. Supply chain collaboration has been viewed as a business process whereby two or more supply chain partners work together towards common goals (Sheu, Rebecca Yen & Chae, 2006; Manthou, Vlachopoulou & Folinas, 2004; Bowersox, Closs & Stank, 2003; Golicic, Foggin & Mentzer, 2003; Mentzer, Foggin & Golicic, 2000) while SCC has also been defined as the formation of close, long-term partnerships where supply chain members work together and share information, resources, and risk to accomplish mutual objectives (Cao & Zhang, 2011; Bowersox, Closs & Stank, 2003; Golicic, Foggin & Mentzer, 2003)

3. Research Design and Methodological Approach

To address the over-arching research question, we identify the following sub-set of questions which define our 3-step approach (Table 1). First, we will explain the emergence of data supply chain through an extensive literature review of the digital economy landscape putting data strategies on the core of attention alongside the resource-based view of the firm and dynamic capabilities. Building on this, we conceptualize and explore the dimensions of the phenomenon to underpin our investigation of its relation with organizational performance. Next, we develop hypotheses relating data supply chain with strategic advantage and organizational value.

Question	Step
What is a Data Supply Chain?	Define the concept of Data Supply Chain
What are the key dimensions and characteristics of a Data Supply Chain?	Identify the characteristics of a Data Supply Chain
What is the relationship between Data Supply Chains and Organizational Performance?	Understand the links between the constructs and evaluate the structural model

Table 1: 3-step approach

This research will conceptualize, develop, and validate the dimensions of data supply chains through empirical analysis (structural equation modelling techniques). Data will be collected through an online survey of data-intensive organizations in a cross-section of selected industries.

4. Contributions and expected findings:

The results will test the proposed model and will contribute to our knowledge on data supply chain by providing theoretical insights and empirical findings. The research also intends to develop reliable and valid instruments linking data supply chains with strategic advantage and organizational performance.

5. Acknowledgements

The authors would like to acknowledge Grants EP/ K039504/1 and EP/L022729/1 from Engineering and Physical Sciences Research Council (EPSRC), which funded this research.

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