Business Analytics Capability and Supply Chain Management

Emergent Research Forum (ERF)

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Abstract

This study proposes that BI&A decentralized governance and BI&A modular architecture are important to leverage the basic BI&A capabilities for supply chain, in an interactive manner, to improve organization’s integrated supply chain information and analytical outcomes. A survey instrument anchoring to existing first and second order constructs is developed. Structural modeling approach with primary data is the proposed methodology for testing the model and hypotheses. This study will contribute to cross-discipline of supply chain and business intelligence.

Keywords

Business Analytics, Modular architecture, Decentralized governance, Supply chain information integration.

Introduction

Using Business Intelligence & Analytics (BI&A) in supply chain management has become quite prominent due to the overarching relevance of it with organizational performance objectives. Although firms BI&A investments are increasing, but the realization from BI&A for value creation by firm is still low. Possible reasons may be the lack of strategic leverage, value alignment, and complementary capabilities for BI&A appropriation (Elbashir et al., 2013). Indeed, 70% BI initiatives have failed in the recent past (King, 2018; Rand, 2017). Examples of failures of BI&A integration is also reflected in major companies such as Apple not been able to utilize information and visibility for shipping (Spence, 2016), and KFC closing branches due to lack of managing supply chain relevant information using analytics (O’Marah, 2018). These specific examples demonstrate that BI&A is being critical for information integration and supply chain visibility management and to avoid ‘bullwhip effects’, inventory run-overs, and predict-and-match supply and demands.

Research relevant to BI&A in supply chain has been sparse. Studies have suggested that it is important to assist a firm’s competitive advantage by improving supplier or customer relations, attaining operational flexibility, and/or by lowering production costs using BI&A (Rubin & Rubin, 2013). Innovations in SCM such as location-based inventory system and use of tags to track moving items in the supply chain paired with BI&A have helped organizations to achieve better information integration and coordination (Rai et al., 2006). Information coordination, sharing and integration have the potential to provide better vendor and inventory management, logistical efficiencies, higher supply chain profit and better product innovation. BI&A that helps in the supply chain integration, as a capability, is an important factor for a firm’s competitiveness and growth prospects (Kohavi et al., 2002). Implementing analytical techniques some of the advanced or sophisticated process has the potential to improve supply chain activities and thereby improving the organizational performance (Trkman et al., 2010).

This study extends the existing discussions to explore governance, modularity and capability-based effects of BI&A in supply chain management. This study suggests to advance the BI&A research area in three ways: (1) Expanding the conceptualization to differing analytical capabilities in a focused SCM area, yet retaining the organizational or functional relatedness—that is the modular BI&A architecture, (2) Incorporating
governance BI&A governance as a construct, with the argument that the analytics governance is often decentralized and does not necessarily reside within the information technology managing (architecture) departments—thereby, focusing on BI&A governance decentralization. (3) Exploring how the integration and governance of the BI&A capabilities in SCM help to improve overall analytical capabilities. In terms of operationalization, we take a robust approach to operationalize the BI&A capabilities as a second order construct consisting of Analytical Capabilities of Plan (ACP), Analytical Capabilities of Source (ACS), Analytical Capabilities of Make (ACM), and Analytical Capabilities of Deliver (ACD).

**Conceptual Model and Hypotheses**

Supply chain analytics refer to the applications of BI&A with regards to helping decision-making related to supply chain management (Trkman et al., 2010). These operational systems alone may not have the capability to provide the required information in the right format at the right time to decision makers. Thus, a supply chain analytics that has the capabilities to glean the information from these disparate sources is required. Figure 1 provides an overview of our conceptual model.

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<tr>
<th>BI&amp;A Modular Architecture</th>
<th>BI&amp;A Decentralized Governance</th>
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<td>Supply Chain Analytical Ability</td>
<td>Integrated Supply Chain Information and Analytical Outcome</td>
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Figure 1: Conceptual Model

BI&A architecture comprises of a complex system consisting of data warehouse environment, business analytics environment, performance and strategy environment, and user interface (Ramakrishnan et al., 2012; Sharda et al., 2018). Data warehousing involves extracting, transforming, and loading data from different disparate data sources into a data warehouse. As much as current business environment is characterized by rapidly changing global market with more and more volatile consumer and market behavior, and increasingly short product life cycles (Gangadharan and Swamy, 2004). As the business environment becomes more and more dynamic, the need for analyzing accurate, relevant, and timely information becomes imperative for gaining competitive advantage. The traditional BI does not have the ability to proactively respond to situations and hence it would be difficult for managers to take critical timely decisions in real time (Azvine et al., 2007).

Centralization and Decentralization refers to the degree to which the decision-making authorities on IT decision lies with the IT function and the line functions. In a highly decentralized environment, the IT-Decision making authority is shared between IT function and Line function where as in a highly centralized environment IT function has the authority to make IT-related decisions. Along, the same lines, we refer to BI&A decentralized governance as the sharing of BI&A related decision-making authority between line functions and IT.

Supply chain analytics comprises of four capabilities that can enhance the process of supply chain activities in the areas of plan, make, source, and deliver. High SCA capability provides organizations the ability to combine information from multiple internal and external sources, thereby improving the information supply chain information and analytical outcome. Similarly, loose coupling and standardization form the two dimensions of BI&A modular architecture. An increase in either of these dimensions may increase the overall BI Architecture modularity without affecting the other dimension. Therefore, BI modular architecture is operationalized as a second order formative construct with loose coupling and standardization forming the two dimensions of this construct. Increasing loose coupling when designing the BI&A architecture will help in enhancing supply chain analytical capabilities. At the same time, it is also important to have highly standard interfaces that allows each of these applications to communicate with each other and with other systems such as the ERP systems, SCM systems, and the CRM systems that collects customer data and data regarding the supply chain activities. Therefore, we hypothesize:

**Hypothesis H1:** There is a positive relationship between higher supply chain analytics capabilities and integrated supply chain information & analytical outcome.
Hypothesis H2: Higher supply chain analytics capabilities in conjunction with higher BI&A modular architecture is positively associated with higher integrated supply chain information and analytical outcome.

BI&A specification decentralization and BI&A implementation decentralization form the two dimensions of BI Decentralized Governance. An increase in either of these dimensions may increase the overall BI Decentralized Governance without affecting the other dimension. Line functions are more familiar to their own operational needs (Sambamurthy and Zmud, 2000). They may have a good understanding of their data, the source of their data, the analytic techniques that can provide them with better information. They are in a better position to recognize opportunities, trends, and the problems that can be solved using BI&A concerning their department (Tiwana and Konsynski, 2009).

Integrated supply chain information and analytical outcome (ISCA) refers to the integrated outcome of the BI&A efforts in the organization specific to the supply chain management activities. A higher degree of ISCA implies firms derive value from their BI&A in supply chain area by using it efficiently to detect and access data and information that resides within and outside of the firm. Efficient leverage of ISCA will enable organizations to improve their performance. Therefore, we hypothesize that:

Hypothesis H3: Higher supply chain analytics Capabilities in conjunction with higher BI&A decentralized governance is positively associated with higher integrated supply chain information and analytical outcome.

Hypothesis H4: Higher supply chain analytics Capabilities in conjunction with the interaction of higher BI&A decentralized governance and higher BI&A modular architecture is positively associated with higher integrated supply chain information and analytical outcome.

Proposed Method and Summary

We developed multi-item scales for measuring each these second order formative constructs. The questionnaire for measuring the constructs along with the definition of the constructs is given in Table 1. Structured Equation Modeling (SEM) technique with SmartPLS3.0 will be used to analyze the data. Measurement model will be assessed through examining the reliability, convergent validity, and discriminant validity. Upon satisfactory results of the measurement model, hypotheses will be tested with the structural model.

To summarize, this study proposes a model for exploring the different BI&A capabilities in supply chain and to examine the factors that can improve organization’s integrated supply chain information and analytical outcome and thereby improve the firm performance. We further propose empirical research methodology to validate our instrument and test the model. Overall, this study provides contribution to the emerging IS literature focusing in the area of BI&A for supply chain.

<table>
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<th>Table 1. Abbreviated Survey Instrument</th>
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<td><strong>Construct</strong></td>
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<tr>
<td>Integrated Supply Chain Information and Analytical Outcome (Rai et al., 2006)</td>
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<td>BI&amp;A Modular Architecture (Tiwana &amp; Konsynski, 2009)</td>
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BI&A Decentralized Governance (Tiwana & Konsynski, 2009)  
Second order formative construct consisting of BI specification decentralization and BI implementation decentralization.  
BI&A Specification decentralization: Please indicate the extent to which the following statements describe your organization’s BI&A systems used in supply chain management context: (1) Defining the role of BI in line function activities, (2) Identifying new ways in which line function can leverage BI, (3) Establishing line function BI priorities, (4) Setting scope for BI initiatives  
BI&A Implementation decentralization: Please indicate the extent to which the following statements describe your organization’s BI&A systems used in supply chain management context: (1) BI applications development, (2) BI systems integration and testing, (3) Choosing platform to run BI applications, (4) Defining BI infrastructure strategy.

Supply Chain Analytical Capabilities (Chae & Olson 2013)  
Second order formative construct consisting of Analytics of Plan, Analytics of Source, Analytics of Make, and Analytics of Delivery. The items below are indicative and modified to plan/source/make/delivery measures. Please indicate the extent to which the following statements describe your organization’s BI&A systems used in supply chain management context: (1) We have well established supply chain performance measures, (2) We evaluate the impact of analytics strategy on supply chain performance measures, (3) We use adequate analysis tools to examine the impact before a decision is made, (4) We analyze the variability of demand for our products.

REFERENCES


