NAI Research Highlight

**How Big Data Analytics Affects Supply Chain Decision-Making:
An Empirical Analysis**

NAI Research Highlight

How Big Data Analytics Affects Supply Chain Decision-Making:
An Empirical Analysis

Chen, D.Q., D.S. Preston, and M. Swink, "How Big Data Analytics Affects Supply Chain Decision-Making: An Empirical Analysis", Journal of the Association for Information Systems (forthcoming)

1. *What made you think about doing this research? Why is it important to study this phenomenon (from a practitioner perspective)?*

This is a follow-up study to one of our earlier papers[1] in which we studied various technological, organizational, and environmental factors driving supply chain organizations' decision to adopt big data analytics (BDA). We also found in that study that organizations that had adopted BDA exhibiting increased supply chain performance. However, we realized several unanswered important questions from the early study.

In particular, many companies appear to be slow in exploiting big data, because they do not know its true value. For example, despite the growing anecdotal evidence touting benefits of BDA, many businesses are not sure _how_ BDA is actually going to help with improving their decision-making capabilities. In addition, although different structures and applications of BDA exist, both scholarly and practical presses treat BDA monolithically. In other words, it is less clear whether different types of BDA usages exist, and if yes, whether and how altering types of BDA usages contribute to organizational decision-making differently.

The importance of the current study lies in its attempt to open the above black box. We aim to help supply chain practitioners explore different patterns of BDA usages, and more importantly, the varying paths via which different BAD usage patterns affect supply chain organizations' decision-making capabilities.

2. *What did you find? And how did you go about doing the research? Please be brief and non-technical. Feel free to use any images, figures, infographics to help your case.*
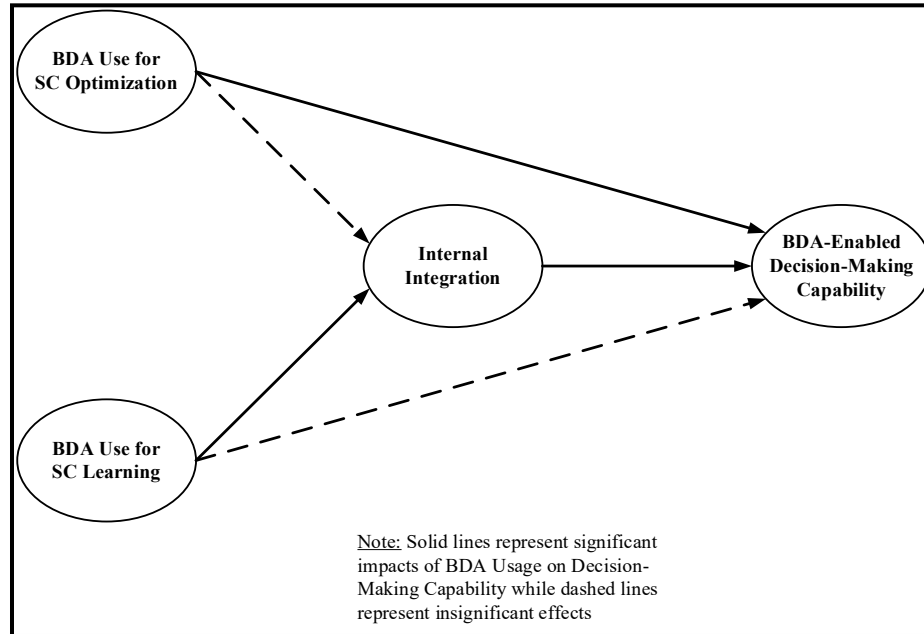
With the help of Computer Sciences Corporation, a major IT consulting firm, we collected survey data from supply chain executives of 157 North America-based companies to understand their current BDA practices. The analysis of the data reveals several interesting findings, which we highlight below:

---

[1] Chen, D.Q., D.S. Preston, M. Swink, "How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management" Journal of Management Information Systems 32(4), pp.1-36. March 2016

a. There are two salient patterns of BDA usage for supply chain (SC) activities:

1) BDA use for SC optimization – to solve structured problems with established SC objectives (e.g., inventory control, production scheduling, network design, etc.)
2) BDA use for SC learning – to solve unstructured problems aiming to identify new opportunities (e.g., exploring possible changes to transactions and relationships with suppliers, customers, as well as pointing up opportunities for new products and processes)

b. The two patterns of BDA usage involve different BDA approaches and applications:

1) SC optimization activities generally use advanced mathematical programming algorithms to evaluate alternative solutions to highly structured problems, using highly structured data

2) SC learning activities make use of BDA tools which are broader in the types of questions asked and in the tools applied. They may analyze both programmable and non-programmable) questions using structured or unstructured data

c. There are two complementary channels (as shown in the figure below) via which the two BDA usage patterns impact a supply chain organization's overall decision-making capability:

1) BDA use for SC optimization directly improves a supply organization's decision-making capability

2) The influence of BDA use for SC learning does not impact organizational decision making directly, but indirectly via the level of organizational integration

Note: Solid lines represent significant impacts of BDA Usage on Decision-Making Capability while dashed lines represent insignificant effects

3. *How can managers use this research in business practice? Does it change the way a manager might go about doing their job?*

Our findings offer an understanding of a mechanism and conditions through which BDA can influence decision-making capabilities within the supply chain context. For programmable routine activities (e.g., inventory monitoring, production scheduling, etc.), appropriate BDA usage may offer instant decision-making benefits. However, for non-routine strategic initiatives, managers should recognize that organizational factors are essential precursors to successful exploitation of BDA. Specifically, information technologies that serve to analyze, combine, and disseminate insights from BDA appear to be essential for enhancing decision-making capability. Meanwhile, managers should design processes, teams, and other integrative mechanisms to process BDA inputs from various functional areas, thus creating more holistic and globally optimal decisions.

4. *What would be the next steps with the research? Where do you see this research stream going?*

We plan to replicate and extend the current study in various settings. For example, most of the existing studies on organizational BDA practices (including the current study) target private businesses. There is a greater need to understand the status of organizations in public sectors to leverage BDA for decision-making. In addition, the research context of the study is supply chain practices, it will be interesting to explore how BDA may help with improve decision-making capability of other business functions.

In practice, technologies supporting BDA use for optimization and learning may be at different stages of development, respectively. As learning-oriented technologies become more mature, for example, their outputs may be more seamlessly integrated into operational plans and responses, thus requiring less interpretation and application by cross-functional teams. Given the considerable evolution of BDA technologies, it would be interesting for researchers to examine whether or not our findings continue to hold in the future.

5. *Can you give us a 1-2 sentence summary of the research?*

Our findings provide evidence that, one the one hand, BDA use for SC optimization has a direct influence on organizational decision-making capability without the need of human intervention. On the other hand, BDA use for SC learning does not have a direct, but an indirect effect to decision-making capability fully mediated by internal integration.