# Big Data and Organizational Learning: Conceptualizing the Link

John Serbe Marfo(✉) and Richard Boateng

Operations Management and Information Systems,
University of Ghana Business School, Accra, Ghana
serbemarfo@gmail.com, richboateng@ug.edu.gh

**Abstract.** Organizational learning is key for organizations in creating and enhancing business processes as well as improving decision making to gain competitive advantage. Big data is becoming a source of competitive advantage, productivity growth, agility and innovation for organizations. Harnessing knowledge from big data has the potential to create individual and collective learning within organizations. Conceptualizing the link between big data and organizational learning is thus worth investigating if big data is to contribute to organizational learning. To understand the big data and organizational learning link, the characteristics of big data, the tools associated with big data and how organizations learn needs to be understood. Big data assist organizational learning by using its tools to aid the knowledge conversion process. The characteristics of big data are exhibited through the use of big data tools in the management of knowledge involved in organizational learning.

**Keywords:** Organizational learning · Big data

## 1 Introduction

Big data refers to large amounts of data that organizations gather in structured, semi-structured and unstructured forms and hold intrinsic value that can be extrapolated through analytics (Chen et al. 2012). This data emanates from everywhere: GPS, social media, purchases, corporate IS etc. Analyzing such big data is a source of competitive advantage, productivity growth, agility, innovation and an answer to questions that were previously beyond the reach of organizations (Boyd and Crawford 2012). Harnessing knowledge from such big data has the potential to create individual and more importantly collective learning within organizations (Kabir and Caraynamis 2013). Organizational learning is necessary if companies are to adjust their behavior to reflect their learning by creating new business processes, enhancing existing processes and by changing patterns of management decision making to make them gain competitive advantage (Laudon and Laudon 2013). Organizations that learn can sense and react to their environments rapidly. Such organizations survive longer than organizations that have poor learning mechanisms (Kabir and Caraynamis 2013). Conceptualizing the link between big data and organizational learning is thus worth investigating if big data is to contribute to organizational learning. This paper seeks to conceptualize the link between big data and organizational learning.


G. Vincenti et al. (Eds.): eLEOT 2015, LNICST 160, pp. 159–164, 2016.
DOI: 10.1007/978-3-319-28883-3_20

## 2 Understanding Big Data

To begin conceptualizing the link that exist between big data and organizational learning it is important to understand what makes up big data. According to Wamba et al. (2015), big data is characterized by 3 V's – volume, variety and velocity. However 2 V's – veracity and value – have been added in recent times. Thus the 5 V's of big data are;

- **Volume**: refers to the large sets of data being amassed by organizations ranging from terabytes to petabytes.
- **Variety**: aside structured data, big data includes semi-structured and unstructured data of all types (text, video, audio, logs, clicks, etc.)
- **Veracity**: The quality of data is vital to harness value from big data devoid of errors and misinterpretation.
- **Velocity**: to gain maximum value organizations should be able to use big data as it streams in and still archive it for future use.
- **Value**: obtaining value from big data is the ultimate goal of big data initiatives.

Big data also provides a collection of technological and analytical tools that define the value of data sources and translate the values into actionable elements (Ohlhorst 2012). These are;

- **Business intelligence (BI)**: A wide range of applications and technologies for data gathering, storage, analysis and provision of data access. BI is able to provide current, historic and predictive opinions on business operations.
- **Data mining**: It involves data analysis from varied perspectives to unearth new patterns in data and delivering them in summarized forms which are useful to organizations.
- **Statistical applications**: It involves statistical tools which work on statistical data sets such as census and polls. They normally lead to estimations, testing and predictive analysis to a large population from a sample size that has been analyzed.
- **Data modelling and visualization**. It comprises of multiple "what if" scenarios for whose algorithm multiple data sets can be used on to produce different models. Data modelling and data visualization works hand in hand to uncover insights for a particular business venture.

Organizations learn from tacit and explicit knowledge through individual or collective means (Nonaka and Takeuchi 1995). Big data facilitates this learning process based on the characteristics of big data and the tools associated with big data. Before going any further, it is important to understand how organizations learn so as to thoroughly analyze how big data is linked to organizational learning.

## 3 How Organizations Learn

Organizational learning is the process of creating, retaining, and transferring knowledge within an organization (Argote and Miron-Spektor 2011). At the basic level knowledge is created by individuals with the organization supporting creative

individuals or providing the context for such individuals to create knowledge (Abel 2014). Thus the organization amplifies individual knowledge creation and crystallizes the knowledge as part of knowledge network of the organization to aid organizational learning. Beyond knowledge creation at the organizational leve, l inter-organizational level knowledge can also be created and made part of the knowledge network of the organization to aid organizational learning. Inter-organizational level knowledge is created based on the interaction that spans between the organization and its customers, suppliers, distributors and competitors (Argote and Miron-Spektor 2011). As knowledge creation occurs, there is a conversion process that exist as tacit knowledge of individuals and explicit knowledge interact. This leads to a knowledge conversion process (Nonaka et al. 1994) which can be classified into four modes.

- **Socialization**: Tacit to tacit conversion, a process of sharing experiences through observations, imitation and other mental practices.
- **Externalization**: Tacit to explicit conversion, a process of articulating tacit knowledge into explicit through the use of abstractions, metaphors, analogies, or models;
- **Combination**: Explicit to explicit conversion, a process of creating explicit knowledge by bringing together other explicit knowledge from a number of sources; and
- **Internalization**: Explicit to tacit, a process of embodying explicit knowledge into tacit knowledge. Internalization is facilitated if the knowledge is codified or conveyed in terms of explicit knowledge.

Beyond the creation of knowledge and its conversion process lies the greater role of knowledge management which ensures that knowledge is retained and transferred within an organization. Knowledge management refers to the set of business processes developed in an organization to acquire, create, store, transfer, and apply knowledge. (Singh Sandhawalia and Dalcher 2011). Knowledge management increases the ability of the organization to learn from its environment and to incorporate knowledge into its business processes. Big data can play a vital role in all these processes of knowledge acquisition, creation, storage, transfer, application and the knowledge conversion process to aid organizational learning. The next section looks at the vital role big data can play in organizational learning.

## 4 Organizational Learning Using Big Data

Big data plays two key roles in organizational learning based on the characteristics and tools big data offers. The first is the role big data plays in the knowledge conversion process and the second is the role big data plays in the knowledge management process or value chain. Table 1 summarizes the role big data plays in the knowledge conversion process.

In organization learning, big data facilitates the process of knowledge management through its characteristics at different stages of knowledge management. Variety in the form of structured, semi-structured and unstructured data are exhibited at the creation stage of managing knowledge using BI tools. Veracity of data and how quick (velocity)

**Table 1.** The role of big data in the knowledge conversion process for organization learning

| Conversion Mode | Knowledge Conversion Process | Big Data Tool Support |
|---|---|---|
| **Tacit to Tacit (Socialization)** | • Capturing individual knowledge<br>• Sharing individual knowledge<br>• Interaction of shared experiences<br>• Feedback without criticism | BI tools are used to harness knowledge as is shared or experienced by collecting them from several social media platforms in the form of unstructured and semi-structured data for analysis and making it part of the organizations knowledge network. Issues of privacy normally arise. |
| **Tacit to Explicit (Externalization)** | • Communication (dialogue)<br>• Capturing collective knowledge and explicit knowledge creation<br>• Diffusion of knowledge at the collective level<br>• Instant feedbacks and exchange | BI tools are used to assist the capturing of tacit knowledge in structured form from individuals and groups by intelligently and predictively aiding the capturing process with interfaces that suit either real time processing or batch processing or other procedures. |
| **Explicit to Explicit (Combination)** | • Organizing and categorizing of knowledge<br>• Integration of sources of knowledge<br>• Platform for collective/collaborative knowledge creation<br>• Searchable/accessible and distribution<br>• Collecting internal and external knowledge | BI, data modelling, statistical application and data mining tools are used to review existing explicit knowledge to generate an improved explicit knowledge. |
| **Explicit to Tacit (Internalization)** | • Access to explicit knowledge<br>• Re-experience others explicit knowledge<br>• Asynchronous learning (any place any time)<br>• Experiential (actualizing concepts and methods) | BI tools, data modelling tools, statistical application tools and data mining tools are used to present analyzed explicit knowledge for decision making and intuitive learning by individuals and groups. Individuals and groups form mental pictures based on analyzed knowledge to share now or later. |

**Source**: Adapted from Boateng, Mbarika & Thomas, (2010)

data arrives are crucial at the creation stage. Volume exhibits itself through the use of BI tools to store data at the storage stage with velocity being crucial at the transfer stage. Finally a combination of BI, data modelling, data mining and statistical applications tools are used to harness value from big data at the application stage.

## 5 Conclusion

To understand the big data and organization learning link, the first recommendation is to understand the characteristics and tools associated with big data. Secondly, an understanding of how organizations learn and manage the knowledge involved in the learning process is essential. Finally, the role of big data in the knowledge conversion process (Table 1) and role of big data in the management of knowledge (Fig. 1) in the learning process is essential.

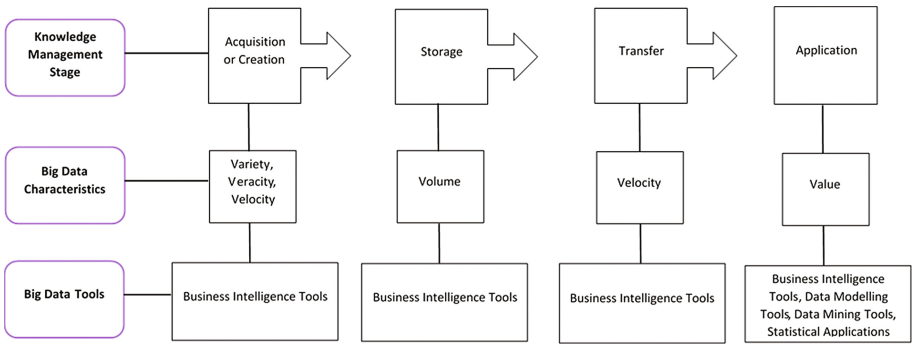


**Fig. 1.** Big Data Characteristics and Tools associated with managing knowledge for organizational learning

In conclusion, the constructs presented in the paper are just a start in fully showing how big data is linked to organizational learning. More research is need to concretely establish these constructs.

## References

Abel, M.H.: Knowledge map-based web platform to facilitate organizational learning return of experiences. Comput. Hum. Behav. (2014)

Argote, L., Miron-Spektor, E.: Organizational learning: from experience to knowledge. Organ. Sci. **22**(5), 1123–1137 (2011)

Boateng, R., Mbarika, V., Thomas, C.: When Web 2.0 becomes an organizational learning tool: evaluating Web 2.0 tools. Devel. Learn. Organ. Int. J. **24**(3), 17–20 (2010)

Boyd, D., Crawford, K.: Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. Inf. Commun. Soc. **15**(5), 662–679 (2012)

Chen, H., Chiang, R.H., Storey, V.C.: Business Intelligence and Analytics: From Big Data to Big Impact. MIS Q. **36**(4), 1165–1188 (2012)

Kabir, N., Carayannis, E.: Big data, tacit knowledge and organizational competitiveness. In: Proceedings of the 10th International Conference on Intellectual Capital, Knowledge Management and Organisational Learning: ICICKM 2013, p. 220. Academic Conferences Limited, January 2013

Laudon, K.C., Laudon, J.P: Management Information Systems 11e (2013)

Nonaka, I., Takeuchi, H.: The Knowledge-creating Company. Oxford University Press, Oxford (1995)

Nonaka, I., Byosiere, P., Borucki, C.C., Konno, N.: Organizational knowledge creation theory: a first comprehensive test. Int. Bus. Rev. **3**(4), 337–351 (1994)

Ohlhorst, F.J.: Big data analytics: turning big data into big money. John Wiley & Sons, Hoboken (2012)

Singh Sandhawalia, B., Dalcher, D.: Developing knowledge management capabilities: a structured approach. J. Knowl. Manage. **15**(2), 313–328 (2011)

Wamba, S.F., Akter, S., Edwards, A., Chopin, G., Gnanzou, D.: How 'big data'can make big impact: findings from a systematic review and a longitudinal case study. Int. J. Prod. Econ. **165**, 234–246 (2015)