The Impact of Big Data Analytics on Organizational Performance

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Abstract. Big data analytics is an advanced analytic technique that are applied on big data, and from the analytics, it can help to reveal and leverage business change. The aim of this study is to identify the impact of big data analytics on organizational performance. There are three dependent variables included in this study which comprises of better decision making, new opportunities and cost reductions. On the other hand, the impact of big data analytics on organizational performance is the independent variable. The methodology used in conducting this study is through purposive sampling where the respondents is confined to a specific organization in Selangor state that used big data analytics tools in order to achieve desired information. Findings shows that there is significance correlation between independent variable and dependent variables which resulting the hypotheses developed for this study were accepted.
Keywords: Big data analytics, big data, organizational performance, better decision making, new opportunities, cost reduction.

1   Introduction

Digital technologies have changed how the organizations are built and function which automatically need for fresh solutions and functioning applications. As storage capabilities have increased and the methods of data collection have changed, massive amounts of data have become easily created from various sources and it is available for public to access. These data area called big data or data with such volume, variety, velocity, veracity and value (5V) that it becomes difficult to manage even though

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through traditional database management systems or current tools developed by experts. Those 5Vs according to Fosso Wamba et al. (2015); White (2012), volume as data sets that are at least a petabyte in size, velocity as the pace at which data flow in from sources such as business processes, machines, networks and etc., variety as sources and types of big data are both structured and unstructured, veracity as uncertainty of data, and value as the economic benefits from the available big data.

Big data can comprise of text with social sentiments, clickstreams, audio and video, website log files, as well as spatial and geo-location data, multimedia, XML data, etc. (Chang et al., 2014; Elgendy and Ahmed, 2016). Additionally, these enormous amounts of big data need to be properly analysed in order for valuable and pertaining information to be extracted (Elgendy and Ahmed, 2016). Therefore, this kind of data needs new ways to be stored and analysed in order to extract value from them especially for organizations since the demand for using big data and taking advantage of its opportunities are increasing. Organizations are seeking for a clear, simple solutions and guidelines for big data management which lead to big data analytic (Elgendy and Ahmed, 2016).

Big data analytics (BDA) according to Elgendy and Ahmed (2016), is where advanced analytic techniques are applied on big datasets and from the analytics based on large data samples can help to reveal and leverage business change. Meanwhile Côrte-Real et al. (2016) define BDA as a new generation of technologies and architectures, designed to economically extract value from large volumes of a wide variety of data by enabling high velocity capture, discovery and analysis. Through the existence of BDA technologies, it offers business-centric practices and methodologies that provide a competitive advantage which allows organizations or firms to improve their existing applications. Thus, this article will emphasize focused on the importance of BDA and how impactful BDA can be towards organizational performance in creating business value.

2   Problem Statement

According to Watson (2014), collecting and storing big data does not create business value. Value is created only when the data is analysed and it had been difficult to process such big data without appropriate technology. It is true that through the usage of traditional databases, data warehouses and the new technologies such as Hadoop can store massive amounts of data in an appropriate manner yet, mining the appropriate data from big data then processing and analysing them is a hard work (Elgendy and Ahmed, 2016). But if this work is done seriously accordingly, it shall be able to assist organizations not only in conducting daily operational decisions but in creating new business values towards the organization. However, the larger the set of data, the more difficult it become to manage. To extract valuable insights from the big data requires new type of BDA as well as different storage and analysis methods (Marshall, Mueck and Shockley, 2015). Therefore, to analyse big data and fully utilized

the benefits of having them requires appropriate tools and skills so that it can assist organization in creating business values.

3   Purpose of Study

The article seeks to discover how big data analytics can help in the growth of an organization and its importance on organizations' business performance by providing better decision making, seeking new opportunities and cost reductions which automatically shows the importance of big data analytics in organizations performance.

Research Objective
1. To identify the impact of BDA on decision making in organizational performance.
2. To identify the impact of BDA on new opportunities in organizational performance.
3. To identify the impact of BDA on cost reductions in organizational performance.

Research Questions
1. What is the impact of BDA on decision making in organizational performance?
2. What is the impact of BDA on new opportunities in organizational performance?
3. What is the impact of BDA on cost reductions in organizational performance?

This article intended to find meaningful positive impacts of implementing big data analytic in organizations and derive the benefits from it. The findings hopefully can assist other organizations or industries that handling with big data to understand the importance of big data analytics especially based on the three factors that will be discussed thus, applied big data analytic in their organizations.

4   Review of Related Literature

Big data became the most famous event in the last decade, many organizations like Google, eBay, Facebook and Twitter concern about big data since the beginning of it is shown on the business scene (Alsghaier et al., 2017). Data can be captured anywhere and at any time and are considered big when they cannot be processed using currently widespread technology, such as relational databases or spreadsheet applications (Bharadwaj et al., 2013; Chen and Zhang, 2014). However according to Elgendy & Elragal (2016), the term big data applies to datasets that grow so large that they become awkward to work with using traditional database management systems. Moreover, the size of big data has expanded beyond the ability of commonly used software tools and storage systems to capture, store, manage and process the data within a tolerable elapsed time (Kubick, 2012; Elgendy & Elragal, 2016).

Therefore, several academics and practitioners have stressed the need to understand how, why, and when big data analytics applications can be a valuable resource for companies to gain competitive advantage (Abbasi, Sarker, & Chiang, 2016;

Agarwal & Dhar, 2014; Corte Real, Oliveira, & Ruivo, 2014; La Velle et al., 2011). To add on, with the increasing capabilities of big data analytics, managers are looking to collect market information from vast pools of data and automatically analyse it to search meaningful knowledge (Feldman et al., 2010). This is especially useful for the extraction and coding of vast amounts of unstructured data in the form of text context such as product descriptions, expert reviews, blogs, customers reviews, employee testimonials, investor reports and media news (Doan et al., 2011).

A review of big data analytics in e-commerce analysed recent literature on the business value in organizations using big data analytics and the literature showed that big data analytics was used for personalization of services, improved customer service, and predictive analytics to demonstrate a few functions (Akter & Fosso Wamba, 2016). Based on the literature, it also shows that many potential uses and applications in various areas of organizations and it is found that nearly 50 percent of supply chain professionals were using big data analytics or had plans to use big data analytics in the near future.

5   Conceptual Framework

Based on the review of related literature that had been discussed above, a conceptual framework below demonstrates the impact of big data analytics in organizational peformance.
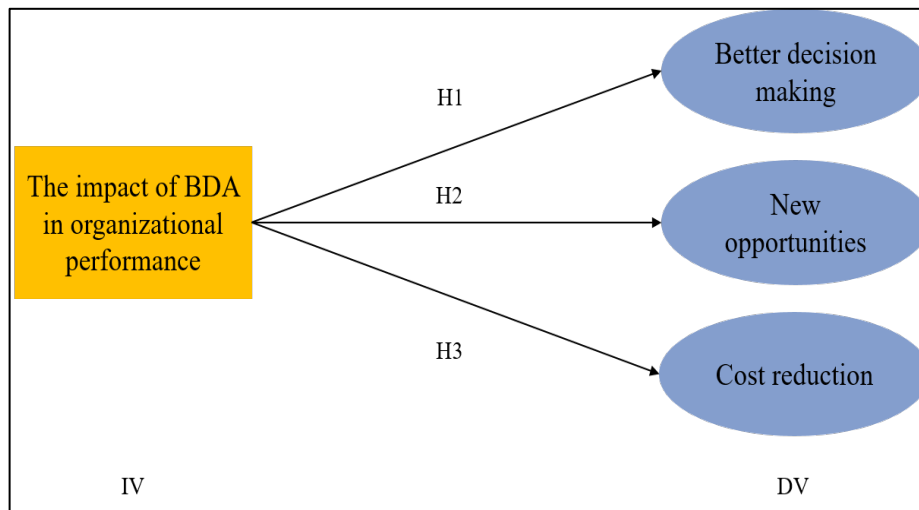

Fig 1. A conceptual framework on better decision making, new opportunities and cost reduction as the impact of BDA in organizational performance.

Based on the conceptual framework of big data analytics in organizations' business performance that has been identified, the hypotheses were created as follows:

1. H1: There is a significance relationship between the impact of big data analytics in organization and better decision making.
2. H2: There is a significance relationship between the impact of big data analytics in organization and new opportunities.
3. H3: There is a significance relationship between the impact of big data analytics in organization and cost reduction.

Big data analytics in organization

Organizations used big data analytics in order to seek out opportunities, reduce costs, create efficiencies, make better and faster decisions and ultimately increase customer satisfaction (Alexander, 2017). Therefore, the importance of big data analytics will be measured through form of data commonly needed in organizations, business functions that used data and analytics, and type of BDA tools used in order to acknowledge whether the organizations used BDA tools or vice versa based on the hypothesis that had been developed.

Better decision making

Supply chain professionals saw better decision making as one of the primary benefits of using big data analytics as a predictive analytics tool (Bumblauskas et al., 2016). Better decision making is independent variable where it will affect the dependent variable when it being measured. This variable will be measured through several dimensions in terms of either BDA tools enable organizations to gain unprecedented insights, gain accurate predictive analysis, able to analyse data and information immediately, able to decrease time cycle for decision making, and able to make precise and accurate decisions.

New products and services

With the evolution of big data analytics, it can improve decision making and insight that are possible to see and used to create business value (Watson, 2014; Fosso et al., 2016). Based on that statement, big data analytics helps to provide unprecedented insights which can be used in making decisions for better opportunity and business values towards the organization in terms of new opportunities which refers to products and services. Therefore, the dimensions to be measured in this variable are whether BDA tools enable organizations to produce variety and good quality products also services towards their clients accordingly.

Cost reductions

It is found that big data analytics would not only improve the business performance and data management but also increase the revenue and decrease the operational costs (Verma & Bahttacharyya, 2017). Big data technologies such as Hadoop and cloud-based analytics bring significant cost advantages when it comes to storing large amounts of data and they can identify more efficient ways of doing business (Liu, 2014). Therefore, the dimensions that can be used in measuring this variable are whether BDA tools able to help organizations to reduce volume of data to store, find and reduce operational inefficiencies.

6   Methodology

The respondent will be included to all types of companies and organizations existed in Selangor, Malaysia. Since the most appropriate number of sample size for a research is larger than 30 but less than 200, this study chooses to have 100 respondents so that the outcome of this research will achieve the objectives of this study. The chosen technique in this study is purposive sampling in which the respondents is confined to a specific organization that can provide the desired information. Therefore, a set of questionnaires were distributed. However, among 464 set of questionnaires distributes, only 112 of them were returned back to the researcher and 16 of the answered questionnaires were invalid which makes only 96 answered questionnaires in total that can be used.

7   Findings and Analysis

Based on the table below, the value of Cronbach 's Alpha for decision making is 0.919, new opportunities are 0.927 and cost reduction is 0.785. Meanwhile the value of Cronbach's Alpha for big data analytic is 0.925. According to all values listed above, it clearly shows that all of the values are more than 0.5 therefore, it proves that data instrument of this study is trustworthy and reliable to be used.

Table 1. Cronbach's Alpha value for all variables

Construct	Cronbach Alpha	No of item
Decision making	0.919	6
New opportunities	0.927	4
Cost reduction	0.785	3
Big data analytic	0.925	4

There are five area discussed in the respondent demographic profiles which comprises of company's field operation, year's company has been operating, type of the company, the existence of special unit handling data and analytics, and data analyser in the company.

Table 2. Summary of statistics frequencies for demographic profiles

		Frequency	Percent age (%)
Company's field operation	Architecture	3	3.1
	Engineering	12	12.5
	Healthcare	2	2.1
	Information Technology	30	31.3
	Management	38	39.6
	Other	11	11.5
Year's company operating	1-10 years	27	28.1
	10-20 years	27	28.1
	20-30 years	25	26.0
	30-40 years	5	5.2
	>50 years	12	12.5
Type of company	Sole proprietorship	11	11.5
	Partnership	6	6.3
	Limited Liability Partnership (LLP)	1	1.0
	Private Limited Company (Sdn Bhd)	48	50.0
	Public Limited Company (Berhad)	16	16.7
	Companies limited by guarantee	7	7.3
	Foreign companies	7	7.3
Special unit / department	Yes	55	57.3
	No	41	42.7
Data analyser in company	Chief information officer	7	7.3
	Data analyst	39	40.6
	Head of department	20	20.8
	Managers	27	28.1
	Other	3	3.1

In the first question of demographic profile shows that the highest profile used BDA is Management companies with frequencies value 38 respondents, followed by Information Technology companies with frequencies value 30 respondents. This clearly shows that companies in Management and Information Technology (IT) field is the biggest user of big data analytics tools. This might be due to the daily tasks and their employees' job scope that relates with big data thus, requires them to use big data analytic tools to assist them in analysing big data. Second demographic profile

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questions is regarding year's company had been operating. Findings shows that companies that had been operating from 1 to 10 years and 10 to 20 years were highly involved in this study. This might be due to the advancement of technologies that each company need to cope in order to improve their business efficiency and effectiveness because of its high operational and strategic potential (Wamba et al., 2017).

Based on the fourth question in demographic profile, findings shows that most of the companies involved in this study have their own special unit or department to handle with data and analytics. This because, having a specialized department or unit in handling big data should bring great support and help towards companies and organization performance since BDA allows organizations to analyse and manage strategy through data lens (Verma & Bhattacharyya, 2017). Findings from fifth question in demographic profiles shows that data analyst profession is the most highly involved in this study as a data analyser in company. Therefore, it clearly shows that data analyst is the most preferable profession in handling big data and BDA since it is their specialties and main job scope.

Table 3. Correlation test result between independent and dependent variables

		BDA in organiza-tion	BDA in decision making	BDA in new opportuni ties	BDA in cost reducti ons
BDA in organizati on	*Pearson Correlation*	1	.158**	.178**	.141**
	Sig.(2-tailed)		.000	.000	.000
	N	96	96	96	96

Table 3 above shows the correlation between independent variable (BDA in organization) with three dependent variables. Basically, all of the correlations test results are significant. BDA in organization is positively correlate with BDA in decision making with economical (r=0.158; p<0.01), BDA in new opportunities with economical (r=0.178; p<0.01) and BDA in cost reductions with economical (r=0.141; p<0.01). Even though all of the correlations value is quiet low, yet the significant between dependent variable and independent variables are still valid thus, confirm the validity of the hypothesis of this study.

8   Discussion

Based on the finding, the respondents agreed that using BDA tools enable companies to gain unprecedented insights, gain accurate predictive analysis, analyse data and information immediately, decrease time cycle for decision making, improved

decision-making process, and making precise and accurate decisions. To relate, BDA helps to facilitate employee in an organization to analyse big data so that it can be used to provide positive business value towards the organization in particular and decision support is one of the crucial BDA capabilities due to its ability to create meaningful clinical reports (Wang et al., 2017).

As for the relationship between BDA and new opportunities, it is clearly shown in the findings that through BDA tools, it assists decision makers and the top managers to make decision from the insights BDA produced and thus, use it to come up with new ideas and opportunities for them in enhancing their organization assets. Davenport (1998) also points out that with BDA, more companies are creating new products or services to meet their customers' needs and requirements.

To add on, majority of the respondents also agreed to the statements where using BDA tools helps to reduce the volume of data to store, find operational inefficiencies, and reduce operational inefficiencies. To relate, even though some of the studies conducted stated that in implementing BDA itself requires some cost associated with it, yet BDA still can save up an organizations financial statement in terms of cost failure and maintenance. Verma and Bahttacharyya (2017) once stated in their study where they found out that BDA would not only improve business performance and data management, but also increase the revenue and decrease the operational cost.

9 Recommendations and Conclusions

Although this study has fulfilled its objectives, there are still many areas for additional studies and empirical research. Further study also can be developed by investigating the impacts of BDA in organizational performance in terms of other dimensions such as risk management, BDA capabilities and strategic values it has. This study also can be adopted in different setting and environment where the impact of BDA in organizational performance can be compared between government and private sector. Last but not least, further study also can used other data collection instrument rather than questionnaire such as interview and observation.

Therefore, based on the result that have been discussed earlier, what can be concluded by the researcher is BDA does gives impact towards organizational performance in terms of better decision making, new opportunities and cost reductions. All of the results basically showing moderate answers from the respondents thus, this demonstrate that BDA should be widely introduced and used by companies and organizations in order to enhance knowledge about BDA benefits and capabilities. It is not arguable that implementing BDA could be a little expensive yet, adopters can increase their understanding on how to extract the maximum benefits from BDA so that, the money spend in implementing BDA would not be wasted.

References

Alsghaier, H., Akour, M., Shehabat, I., & Aldiabat, S. (2017). The importance of big data analytics in business: A case Study. American Journal of Software Engineering and Applications, 6(4), 111–115. https://doi.org/10.11648/j.ajsea.20170604.12

Bumblauskas, D., Nold, H., Bumblauskas, P., & Igou, A. (2017). Big data analytics: transforming data to action. Business Process Management Journal, 23(3), 703–720. https://doi.org/10.1108/

Cervone, H. F. (2016). Organizational considerations initiating a big data and analytics implementation. Digital Library Perspectives, 32(3), 137–141. https://doi.org/10.1108/DLP-05-2016-0013

Cross, R., & Sproull, L. (2004). More Than an Answer: Information Relationships for Actionable Knowledge. Organization Science, 15(4), 446–462. https://doi.org/10.1287/orsc.1040.0075

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of Big Data Analytics in European firms. Journal of Business Research, 70, 379–390. https://doi.org/10.1016/j.jbusres.2016.08.011

Davenport, T. H., & Prusak, L. (1998). Working Knowledge: How Organizations Manage What They Know. Knowledge Creation Diffusion Utilization, 309. https://doi.org/10.1109/EMR.2003.1267012

Elgendy, N., & Elragal, A. (2016). Big Data Analytics in Support of the Decision Making Process. Procedia Computer Science, 100, 1071–1084. https://doi.org/10.1016/j.procs.2016.09.251

Germann, F., Lilien, G. L., Fiedler, L., & Kraus, M. (2014). Do Retailers Benefit from Deploying Customer Analytics? Journal of Retailing, 90(4), 587–593. https://doi.org/10.1016/j.jretai.2014.08.002

Kache, F., & Seuring, S. (2017). Challenges and opportunities of digital information at the intersection of Big Data Analytics and supply chain management. International Journal of Operations & Production Management, 37(1), 10–36. https://doi.org/10.1108/IJOPM-02-2015-0078

Liu, Y. (2014). Big Data and Predictive Business Analytics. Journal of Business Forecasting, 33(4), 40–42. https://doi.org/http://dx.doi.org/10.1108/17506200710779521

Marshall, A., Mueck, S., & Shockley, R. (2015). How leading organizations use big data and analytics to innovate. Strategy and Leadership, 43(5), 32–39. https://doi.org/10.1108/SL-06-2015-0054

Motamarri, S., Akter, S., & Yanamandram, V. (2017). Does big data analytics influence front-line employees in services marketing? Business Process Management Journal, 23(3), 623–644. https://doi.org/10.1108/BPMJ-12-2015-0182

Mousannif, H., Sabah, H., Douiji, Y., & Oulad Sayad, Y. (2016). Big data projects: just jump right in! International Journal of Pervasive Computing and Communications, 12(2), 260–288. https://doi.org/10.1108/IJPCC-04-2016-0023

Ram, J., Zhang, C., & Koronios, A. (2016). The Implications of Big Data Analytics on Business Intelligence: A Qualitative Study in China. Procedia Computer Science, 87, 221–226. https://doi.org/10.1016/j.procs.2016.05.152

Tsao, Y. C. (2017). Managing default risk under trade credit: Who should implement Big-Data analytics in supply chains? Transportation Research Part E: Logistics and Transportation Review, 106, 276–293. https://doi.org/10.1016/j.tre.2017.08.013

Verma, S., & Bhattacharyya, S. S. (2017). Perceived strategic value-based adoption of Big Data Analytics in emerging economy. Journal of Enterprise Information Management, 30(3), 354–382. https://doi.org/10.1108/JEIM-10-2015-0099

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. Journal of Business Research, 70, 356–365. https://doi.org/10.1016/j.jbusres.2016.08.009

Wang, Y., Kung, L., Wang, W. Y. C., & Cegielski, C. G. (2017). An integrated big data analytics-enabled transformation model: Application to health care. Information & Management, (March), 1–16. https://doi.org/10.1016/j.im.2017.04.001

Watson, H. J. (2014). Tutorial: Big Data Analytics: Concepts, Technologies, and Applications Tutorial: Big Data Analytics: Concepts, Technologies, and Applications, 34.