

Readiness to Adopt Big Data Analytics in Private Sector Companies, Sri Lanka

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Abstract

The amount of data generated through various sources will continue to grow as people interact more with online. Businesses can gain actionable insights to improve their outcomes by analyzing these massive set of data. Private organizations, being more technology oriented, have concern on the opportunities provided by Big Data Analytics (BDA). But still they are postponing decisions on BDA as they are not competent whether they ready for take the advantage of such technology. The purpose of this study was to investigate the readiness to adopt BDA in private sector companies, Sri Lanka. The study collected data using a questionnaire that was developed based on the technology-organization-environment (TOE) framework. A sample was selected from listed private companies in Colombo Stock Exchange under twenty sectors. Collected data was analyzed using the statistical Package for Social Scientists (SPSS). The empirical findings of the analysis found that Sri Lankan private companies are having low tendency towards readiness for BDA and Information Technology (IT) infrastructure, security, firm size, management support and competitive advantage are found to be major constituents in assessing readiness to adopt BDA. The results of this study beneficial for the corporate managers and policy makers when preparing their business entities to adopt BDA. Further the findings of present study guide to the future researchers in the arena of BDA.

Keywords-: Big Data Analytics, Organizational Readiness, Private Sector, Sri Lanka

1. INTRODUCTION

The rapid changes in the business environment are making many

organizations to strive for competitiveness so as to keep abreast

with the global standards. Organizations expand their network by opening up branches both locally and internationally through increasing their operations by leveraging information technology (IT). These global trends can be seen in many large organizations across industries joining the data economy. By doing so, many of these organizations try to find how best they can improve their traditional data analytics in order to remain competitive in the business arena. It implies that these organizations need to prepare for change of skills, leadership, organizational structures, technologies architectures and other organizational settings in order to welcome new technology. This in turn will help organizations to cope with technological innovations and to gain competitive advantages acquiring wide global market share.

According to Ferguson (2012), for many years organizations have been building data warehouses to create insights for decision makers to act on improving business performance and to study their business activities. He noted that these traditional analytical systems capture, clean, transform and integrate data from several operational systems before loading it into a data warehouse. However, he argues that even though these traditional environments continue to advance, many new more complex types of data have now emerged that businesses ought to use in order to analyze and build on what they already know. In addition, Wielki

(2013) observed that new data is being created and generated at high speed. The Big Data (BD) concept may be looked at as the formation of datasets that continuously expand so much that it becomes challenging to manage using existing database management concepts and tools (Singh & Singh, 2012). Researchers Kaisler et al. (2013) describes the concept of BD as the amount of data just beyond technology's ability to process, manage and store efficiently. Notwithstanding the data volumes, BD can help an organization to gain insights and make better decisions (Goss & Veeramuthu, 2013).

BD Technology, being an emerging technology, is currently utilized in many echelons of business organizations and their management. Some organizations also use the special term —BD Analytics Technology, but the central idea behind them is the same (Mahesh et al, 2018). Although BD can produce exceptionally useful information, it also presents new challenges with respect to storage, cost and security and how long it must be sustained (Michael & Miller, 2013). BD also supplies more raw materials for statistical mischiefs and influenced fact finding excursions (Lohr, 2012). When an organization can leverage all the data available rather than just a subset of its data then it has a great advantage over the competitors (Singh & Singh, 2012). Organizations ought to start thinking deeply about whether they are prepared to exploit BD's potential benefits and also to

manage the threats it can pose. Once it is acknowledged that data is to be treated as a corporate resource, serving several 3 purposes, management of which must satisfy the three criteria that is too big, too fast and too hard the organizational implications may be startling (Motau & Kalema, 2016).

According to BD - Global Market Outlook (2017-2026) report, the Global BD market accounted for \$31.93 billion in 2017 and is expected to reach \$156.72 billion by 2026 growing at a rate of 19.3% during the forecast period. Increase in number of mobile devices & apps, the growth of the healthcare industry and BD solutions enhancing organizational return on investment are some of the factors influencing the market growth. However, factors such as lack of awareness of benefits of BD solutions & services as well as privacy & security concerns in BD are hindering the market.

Amongst type, unstructured data segment held considerable market growth during the forecast period as there is rising amount of unstructured data. Organizations are adopting more BD solutions to explore and handle unstructured data. By geography, North America is anticipated to dominate the global market during the forecast period owing to high adoption of analytics across countries of North America. In addition, Asia Pacific registered for highest growth rate due to growing amount of data generation as well as

high penetration of internet across the region (BD - Global Market Outlook (2017-2026) report). This is also supported by the BD Analytics Market Study (2017), by region, Asia Pacific is most likely to prioritize all BD use cases, with the exception of clickstream analytics.

According to International Data Corporation (2019) the industries currently making the largest investments in BD and business analytics solutions are banking, discrete manufacturing, professional services, process manufacturing, and federal/central government. Combined, these five industries will account for nearly half (\$91.4 billion) of worldwide BDA revenues this year. The industries that will deliver the fastest BDA growth are securities and investment services (15.3%) and retail (15.2%). Retail's strong growth will enable it to move ahead of federal/central government as the fifth largest industry in 2022. Mahesh et al (2018), explained that currently, the Sri Lankan market is already playing host to several important experiments into the field of BD, however the reason for their importance is more to do with the fact that these are historic first steps, rather than the fact that they are revolutionary steps forward.

In 2015, a study by the Business Application Research Center (BARC) analyzed how some of the biggest companies in the world are utilizing BD analytics. According to their study, over 40% of companies

worldwide use BD analytics. Further, companies who quantify their gains from data analytics reported an 8% increase in revenues and a 10% reduction in costs. Further in 61% of companies, where BD initiatives are a part of integrated business processes, senior management is the primary driver. In contrast, 34% of organizations considering using BD analytics have senior management as the primary driver.

Some leading large scale companies in developed countries in the world are actively and increasingly adopting BD Technology (BDT) to combat severe market competition, but many companies in developing countries such as Sri Lanka and India are still in the early stage of the adoption or sometimes they don't have even an intention of adopting BDT (Mahesh et al, 2018). As a result, almost all the empirical research studies have so far focused on BDT adoption in such developed economies (Verma and S. S. Bhattacharyya, 2017).

According to the findings of BD and AI Executive Survey(2018), nearly 3/4 of the executives surveyed (73.2%) claim that their firms have achieved measurable results from their BD and AI investments. This represents a significant increase over results from the 2017 executive survey, when a considerably lower 48.4% of executives reported achieving measurable results. A further breakdown indicates that 23.9% of executives characterize their results as highly transformative

and innovative. Overall, 40.8% of executives responding in 2018 believe that their BD and AI investments

But when consider the situation in Sri Lanka, still behind on making data driven decisions even though companies are generating massive amount of data through their daily business activities. Even some companies interested in accepting new technologies but having concerns on preparing for new technologies. As a new technology, most of Sri Lankan companies adopted Enterprise Resource Planning (ERP) system to streamline their operations, but there is no or rare evidences whether these companies ready to get use of data generated through these systems.

Sri Lanka is behind the BD and analytics curve, we will catch on fast. The big industries like retail, banking and finance will lead the way. Once the flood gates are open we may see some of the BD applications being adopted in Sri Lanka faster than in other countries (Daniel, 2015). According to the BD Executive Survey (2018) the firm that best understands its data assets, and how they can best be deployed to business advantage, is likely to be well positioned in the marketplace.

As the companies have to compete in a data driven economy, it is very much important to get ready for BD analytics. Because today the data has become one of the most powerful weapons that sometimes decides the

survival of the business organizations. The entities which can get best out of data will perform beating the rivals. BD analytics tools and techniques are rising in demand due to the use of BD in businesses. Organizations can find new opportunities and gain new insights to run their business efficiently. These tools help in providing meaningful information for making better business decisions. The companies can improve their strategies by keeping in mind the customer focus. BD analytics efficiently helps operations to become more effective. This helps in improving the profits of the company. BD analytics tools like Hadoop helps in reducing the cost of storage. This further increases the efficiency of the business. With latest analytics tools, analysis of data becomes easier and quicker. This, in turn, leads to faster decision making saving time and energy. By considering these avenues, it is very much important the organization's readiness for BDA. Organizational readiness for a system, technology or investment can be defined as those capabilities an organization needs to possess to be ready for a successful initiative (Williams & Williams, 2014). Since the mid of last decade, BD researchers and computer scientists mainly focused their research studies on technical and engineering aspects of BD (Kim et al, 2015).

There were very few research studies performed on technology management areas of BD. Hence,

now it is high time to extend the research on BD in terms of its readiness by practitioners on the industry. There can be witnessed a dearth of in-depth research studies on the factors that impact the Readiness to adopt BDA by organizations. It clearly emphasized that there is a clear knowledge gap in the arena BD readiness. Hence, it is vital to conduct a holistic study to understand the level of readiness for BDA from the practitioners 'standpoint. Above practical and knowledge gaps confirm the necessity of further investigation on BD readiness. Motivated by these gaps, the present study aims to understand the readiness to adopt BDA in private sector organizations, Sri Lanka.

The goal of this study is to investigate the readiness to adopt BDA by private sector organizations, Sri Lanka. The specific objectives are:

1. To identify the level of readiness to adopt BD analytics
2. To examine the relationship between technological, organizational and environmental factors with readiness to adopt BD analytics
3. To identify the impact of technological, organizational and environmental factors on readiness to adopt BD analytics

Singh and Singh (2012) that looks at BD as the datasets which continue to grow so much that it becomes difficult to manage using existing database management concepts and

tools. From this perspective, BD refers to that data that is too big, too fast, or too hard for existing tools to process. Here, —too big means that organizations must increasingly deal with petabyte-scale collections of data that come from click streams, transaction histories, sensors, and elsewhere. —Too fast means that not only is data big, but it must be processed quickly. —Too hard is all-encompassing for data that an existing processing tool is unable to manage and so it needs some improved analysis (Madden, 2012).

In addition to the issues of data size, Laney (2012) presented a well-known definition (also called 3Vs) to explain what is the —big data: volume, velocity, and variety. The definition of 3Vs implies that the data size is large, the data will be created rapidly, and the data will be existed in multiple types and captured from different sources, respectively. Later studies pointed out that the definition of 3Vs is insufficient to explain the BD we face now. Thus, veracity, validity, value, variability, venue, vocabulary, and vagueness were added to make some complement explanation of BD.

BD provides significant opportunities for enterprises to impact a wide range of business processes in organizations (Izhar et al., 2016). Organizations can create huge volume of data in their daily business activities. The problem though is that, this data was created and captured in many different formats, which make it almost

impossible to understand the existing relationships between different data. As a result, this huge volume of data may get redundant and hard to identify which data is relevant to the organization's goals. BD may be created in petabytes or exabytes scale and much of which cannot be integrated easily. For example, the government agencies, the large, medium and small private enterprises in many domains such as engineering, education, manufacturing, are drowning in an ever-increasing deluge of data. Companies like Google, eBay, LinkedIn, and Facebook were built around BD from the beginning (Davenport & Dyché, 2013).

The use of BD technologies should be done by architectural groups and analytics groups with an operations research title, that exist within IT organizations. In most cases these central service organizations are aligned to BD initiatives with analytically-oriented functions or business units marketing. Furthermore, the organizations that have close relationships between the business groups addressing BD and the IT organizations supporting them, had initiatives that seemed most effective and likely possible to succeed (Davenport & Dyché, 2013). It is important to note that BD is not a single technology, but a combination of new and old technologies that support companies gain insight while effectively handling data load and storage problems. BD analytics require the ability to collect, manage,

and analyze potentially massive volumes of different data, at the right speed, within the right time frame, while providing the right-time analysis and activity to the end consumer (Halper & Krishnan, 2013).

Theories of BD and Technology Readiness

The rapid initiation and convergence of ICT have triggered a vast array of cultural, social and economic changes. Global ICT, which are growing in capacity and improving in terms of interactive and dynamic operations have become major drivers of competitiveness in the organizations. This is achieved by taking into consideration the benefits in the adoption and effective use of technologies (Yunis, 2011). Toufani and Montazer (2010) also argues that the high level of technology readiness allows organizations to manage business electronically in order to achieve less turn-around time, faster delivery of services, enhanced product selection, international competitiveness, a broader market reach, reduced costs, faster and limitless access to new customers and suppliers, increased depth of communication, exchange of information. Information Technology has long been applied to support the exchange of goods, services and information among organizations (Naseebullah et al., 2011). To meet the intensifying market needs, one of the primary duties of technology forecasting within organization is to; identify relevant technologies,

determine technology readiness, predict future development and to estimate suitability of technology within the organization (Ardilio et al., 2012). The importance of information and communications technologies as powerful tools for socio-economic development is now widely acknowledged not only among large organizations but also among the small organizations (Mutula & Brakel, 2007). The need to identify and explain the factors that address technology readiness and its assessment has been the basis for several researches. In this viewpoint several theories have been at the lead of many studies. These theories are the Technology Readiness Index (Parasuraman, 2000), Technology Acceptance Model (Davis et al., 1989) and Technological Organizational and Environment framework (Tornatzky & Fleischer, 1990).

Factors Influencing Readiness to Adopt BD Analytics

Several researchers have discussed and argued that numerous factors influence BD readiness within an organization. These factors may differ from one organization to another and they include but not limited to;

a) Reliability

Traditionally organizations use data management and analysis systems, mainly based on relational database management system (RDBMS) to store and analyze data, produce reports and make decisions (Al-

Najran & Dahanayake, 2015). However, these traditional RDBMS could be overwhelmed with BD due to many reasons. Kelly (2013) indicates that due to the various dissimilar data sources and the aggregated volume, it could be difficult to collect and integrate data with reliability from distributed locations. Another reason is the failure to aggregate massive and heterogeneous datasets, while at the same time provide function and performance guarantee for retrieval, scalability, and privacy protection. Lastly, the mining of the massive datasets in real time to do visualization and prediction could be a challenge. Hence, to deal with the voluminous data, innovative solutions for data models, algorithms and architectures have to be designed providing the necessary reliability and flexibility for novel BD analytics applications (Al-Najran & Dahanayake, 2015). Accordingly following hypothesis is derived.

H1: There is a significant relationship between reliability and readiness for BDA

b) IT infrastructure

As the data grows in the industry, new techniques and approaches need to be adopted (Bakshi, 2012). BD difficulties affect information technology infrastructures. The capability to collect and process BD necessitates sufficient transmission and storage capacities, as well as computing power. Technological resource competency mainly consists

of IT infrastructure and IT related skills. Organizations that are equipped with technological resource competency tend to adopt BDT faster than others (Chatterjee et al, 2002). Hence, the following hypothesis can be obtained.

H2: There is a significant relationship between IT infrastructure and readiness for BDA

c) Security

BD forces decision makers to adopt cloud computing but security are on their minds for every cloud project. Researchers (Chen et al., 2012) state that organizations of different sizes are facing the daunting task of defending against cybersecurity threats and protecting their intellectual assets and infrastructure. Processing and analyzing security-related data, however, is increasingly difficult. The privacy of data is another big concern, and one that rises in the context of BD (Jagadish et al., 2014). As cited in BD Executive survey(2018), executives were asked to cite what they see as the greatest data threat to their organization. Majority (35.2%) of executives viewed cyber security breaches as the single greatest threat to their firms. This translate in to following hypothesis.

H3: There is a significant relationship between security and readiness for BDA

d) Management Support

Management support is usually stated as a critical success factor in the field

of data business intelligence, warehousing and BD analysis (Chen et al., 2012). Rajpurohit (2013) also argues that in order to resolve the BD problem, managers need to realize that BD ownership can no more be left simply to statisticians or business intelligence units. Deriving the maximum value from analytics would need configuring and customizing the analytics implementation to meet the business goals. Accordingly following hypothesis is suggested.

H4: There is a significant relationship between management support and readiness for BDA

e) Firm size

Organization that have long handled massive volumes of data are beginning to enthuse about the ability to handle a new type of data while organizational size is often positively correlated with the availability of resources (Ebner et al., 2014). Organizational size is another important factor and it includes the firm's annual revenue and number of employees that could support the adoption of technology. Several past studies have also found that firm size is an important factor affecting IT adoption (Dholakia, N. Kshetri, 2004). It is generally believed that larger organizations are more resourceful and as result, organizational size positively affects BDT adoption intention (Agrawal, 2015). Taking these factors into consideration, following hypothesis is suggested.

H5: There is a significant relationship between firm size and readiness for BDA

f) Financial Resources

Most organization prefer to archive a large amount of data that is not even being used since there is no cost effective way to process it and get value out of it. BD analytics can reveal insights previously hidden by data that were too costly to process, such as sensor logs (Goss & Veeramuthu, 2013). There is also the issue of resource constraints in some organization when deciding on appropriate strategies to tackle BD. Resource availability in terms of money and human resources is a major factor when assessing BD readiness in an organization. Businesses operating in the BD space continue to face obstacles in accessing finance and skilled labour. Thus, following hypothesis is suggested.

H6: There is a significant relationship between financial resources and readiness for BDA

g) Regulatory support

Regulatory support encompasses the various types of incentives and assistances provided by the governments and related regulatory authorities. The studies investigated the influence of this aspect on similar technology related adoptions have affirmed that it has a positive impact on adoption decision (Zhu et al, 2006). Therefore, it can be considered that regulatory support influences readiness for BDA in a positive

manner. Regulatory support is a critical factor influencing innovation diffusion (Zhu & Kraemer 2004; Zhu et al., 2006). Another study investigates the adoption of e-business and finds that governments can encourage e-business legislation by supportive regulations and policies (Zhu et al., 2006). These issues are particularly important in Asian countries. Another study investigates, for example, the adoption process of Internet technologies in China and finds that Chinese companies have the highest concern for the regulatory environment in which they and their business reside (Chau et al., 2008). Regulatory support from the government can form an encouraging environment that will make decision makers aware of this technology and consider adopting it in their enterprises (Agrawal, 2015). Therefore following hypothesis is proposed.

H7: There is a significant relationship between regulatory support and readiness for BDA

h) Competitive advantage

As organizations work to extract competitive business values and ultimately revenue from a growing sea of data, BD implementations leverage diverse sets of distributed semi-unstructured and unstructured data types, which frequently start with mathematics, statistics and data aggregation efforts (Villars & Olofson, 2011). Villars & Olofson, (2011) also noted that competitive advantage can be greatly improved by

leveraging the right data. When an enterprise can leverage all the information available with large data rather than just a subset of its data then it has a powerful advantage over the market competitors. BD can help to gain insights and make better decisions (Singh & Singh, 2012). Considering these factors following hypothesis is developed.

H8: There is a significant relationship between competitive advantage and readiness for BDA

i) Environmental Uncertainty

Environmental uncertainty behaves in two ways in developed and developing nations (Agrawal, 2015). In developing countries, it particularly shows a negative impact on BDT adoption (Mahesh, 2018). As indicated in an earlier research, firms facing environmental uncertainty have greater incentives to adopt IOS (inter-organizational innovation) to improve information exchange and to reduce uncertainty between trading partners. Firms facing higher environmental uncertainty will sense more opportunities, are proactive and innovate more than other firms (Sharma, 2000). Furthermore, environmental and/or market uncertainty forces organizations to adopt and implement new technological innovations to stay competitive (Bolloju & Turban, 2007). However, this situation might be different in developing countries. Environmental uncertainty may have a negative influence on such firm's proactive and innovative strategies

and behaviors. The reason is that firms in these emerging economies are more risk averse than say, firms in western developed countries. Consequently, without external support from their business partners in the industry they are less likely to take initiative to adopt BDA and associated technologies (Agrawal,2015). Accordingly following hypothesis is derived.

H9: There is a significant relationship between environmental uncertainty and readiness for BD analytics.

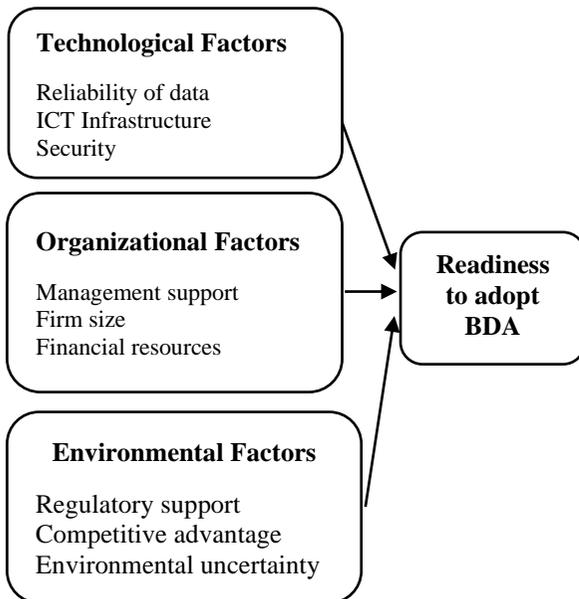


Figure 1: Research Framework

2. METHODS

Quantitative approach is adopted for this study as it was considered to be the best approach in order to effectively address the objectives of the study. The targeted population for this study was comprised IT Managers in private sector companies

listed in Colombo Stock Exchange. Thereby a private company is considered as a unit of analysis. There were 290 companies registered under 20 sectors. Out of the listed private companies of 290, a sample of 114 companies were selected according to G*Power sample size calculator. The sample was selected using stratified random sampling method by taking the participants proportionately from each sector. The primary data collection included administering surveys with closed-ended questions in the form of questionnaire. The questionnaire items were developed based on the instruments which were validated in previous studies; Kalema, B. M., & Mokgadi, M. (2017). Agrawal, K. (2015). Salleh, K. A., & Janczewski, L. J. (2016, May) and Jorge Garcia, (2016). The responses were recorded using 5 point likert scale (Strongly Agree to Strongly Disagree). Descriptive statistics and multiple regression analysis performed to analyze the data with the aid of SPSS Package.

3. RESULTS

A structured questionnaire was distributed among a sample of 141 IT managers who represents 20 sectors in Sri Lanka. The questionnaires were sent both manual and online bases to achieve high response rate. The researcher was able to collect 111 questionnaires achieving 78% response rate. According to the demograhic analysis of the sample, majority of the sample (77%) were

included IS/IT Management/staff and they represented 14 sectors. Accordingly, 78% companies employ more than 2000 employees where 95% of majority handle more than 100 TB of data per month.

Validity Test

Exploratory Factor Analysis

Prior to the extraction of the factors, several tests should be used to assess the suitability of the respondent data for factor analysis. These tests include Kaiser Meyer-Olkin (KMO) Measure of Sampling Adequacy (Kaiser,1970,1974) and Bartlett's Test of Sphericity. The KMO index, in particular, is recommended when the cases to variable ratio are less than 1:5. The KMO index ranges from 0 to 1, with 0.50 considered suitable for factor analysis (Hair,1995;Tabachnick and Fidell, 2007). The Bartlett's Test of Sphericity should be significant (p (p<.05) for factor analysis to be suitable (Hair,1995; Tabachnick and Fidell, 2007). According the researcher carried out the KMO test and Bartlett's Test of Sphericity and the results presented on the below Table 1.

Table 1: Results of KMO test and Bartlett's Test of Sphericity

Variable	Items	Value of KMO Test	Value of Bartlett's Test of Sphericity
Reliability	03	.778	.000

ICT Infrastructure	03	.638	.000
Security	03	.574	.000
Management support	03	.638	.000
Firm size	03	.884	.000
Financial resources	02	.600	.000
Regulatory support	03	.532	.000
Competitive advantage	03	.585	.000
Environmental uncertainty	03	.500	.000
Readiness to adopt BDA	06	.582	.000

Source: Survey Data, 2019

Based on the results presented on Table 1, the values of KMO for all variables are greater than 0.5 which satisfy adequacy level of the sample for the study. Further the values of Bartlett's Test of Sphericity are less than 0.05 and significant for factor analysis. Thereby the data set confirms the validity of the study.

Reliability Test

The most commonly used internal consistency measure is the Cronbach Alpha coefficient. It is viewed as the most appropriate measure of reliability when making use of Likert scales (Whitley, 2002, Robinson, 2009). No absolute rules exist for internal consistencies, however most agree on a minimum internal consistency coefficient of .70 (Whitley, 2002, Robinson, 2009). Accordingly the researcher performed

reliability test and the results presented in following table.

Table 2: Results of Reliability Test

Dimension	Pilot survey		Real survey	
	No of items	Cronbach Alpha Value	No of items	Cronbach Alpha Value
Reliability	3	0.902	3	0.902
ICT Infrastructure	3	0.810	3	0.810
Security	3	0.856	3	0.856
Management Support	3	0.910	3	0.910
Firm Size	3	0.856	3	0.856
Finance Resources	2	0.733	2	0.733
Regulatory Support	3	0.878	3	0.878
Competitive Advantage	3	0.830	3	0.830
Environmental Uncertainty	3	0.964	3	0.964
Readiness for big data analytics	6	0.716	6	0.716

Source: Survey Data, 2019

Table 2 illustrates the Cronbach Alpha value for each dimension recorded at the pilot survey and real survey. For an exploratory or pilot study, it is suggested that reliability should be equal to or above 0.60 (Straub et al., 2004). As the results of the pilot survey meets the required standard, greater than 0.6, the original scales of the pilot survey adopted for the real survey without any modifications. This results reveals that the scales adopted for the study are reliable.

Exploratory Data Analysis

According to Pollard et al(2016) EDA is a fundamental early step after data collection and pre-processing, where the data is simply visualized, plotted, manipulated, without any assumptions, in order to help assessing the quality of the data and building models. There are many ways to categorize the many EDA techniques. Accordingly, the Missing values, Linearity, Outliers, Normality and Multicollinearity of the data set were examined prior to the data analysis and results confirmed the quality of data for the subsequent analysis. The results of

multicollinearity presented in table 4 which verifies the non-existence of multivolliniarity issues.

Univariate Analysis for Dependent Variable

The following Table 3 depicts the descriptive statistics for dependent variable, Readiness to adopt BDA.

Table 3: Descriptive Statistics for Dependent Variable

	N	Mean	Std. Deviation
Readiness to adopt BDA	111	2.70	.553
Valid N (listwise)	111		

Source: Survey Data (2019)

According to above statistics, the overall mean value for Readiness to adopt BDA is 2.70 and the SD is 0.553. Therefore, it can be identify that the private companies in Sri Lanka are having lower level of readiness towards BDA

Multivariate Analysis

Many statistical techniques focus on just one or two variables. Multivariate analysis techniques allow more than two variables to be analyzed at once. The ultimate goal

of these analyses is either explanation or prediction, i.e., more than just establishing an association (Kumar et al,2013).The researcher executed correlation and multiple regression analysis to identify the association and nature of the association between the study variables. Correlation Analysis Correlation, also called as correlation analysis, is a term used to denote the association or relationship between two (or more) quantitative variables.

Similar to the measures of association for binary variables, it measures the —strength‖ or the —extent‖ of an association between the variables and also its direction. The end result of a correlation analysis is a Correlation coefficient whose values range from -1 to +1. A correlation coefficient of +1 indicates that the two variables are perfectly related in a positive [linear] manner, a correlation coefficient of -1 indicates that two variables are perfectly related in a negative [linear] manner, while a correlation coefficient of zero indicates that there is no linear relationship between the two variables being studied (Gogtay and Thatte, 2017). The outcomes of correlation analysis presented in below Table 4.

Table 4: Results of Correlation Analysis

		Readiness to adopt BDA
Reliability	Pearson Correlation	.073
	Sig. (2-tailed)	.450
IT Infrastructure	Pearson Correlation	.376**
	Sig. (2-tailed)	.000
Security	Pearson Correlation	.225*
	Sig. (2-tailed)	.019
Management Support	Pearson Correlation	.376**
	Sig. (2-tailed)	.000
Firm Size	Pearson Correlation	.225*
	Sig. (2-tailed)	.019
Finance Resources	Pearson Correlation	-.121
	Sig. (2-tailed)	.211
Regulatory Support	Pearson Correlation	-.183
	Sig. (2-tailed)	.057
Competitive Advantage	Pearson Correlation	.204*
	Sig. (2-tailed)	.033
Environmental Uncertainty	Pearson Correlation	-.152
	Sig. (2-tailed)	.114

Source: Survey Data ,2019

According to the statistical decision, there is a positive correlation between IT Infrastructure, Security, Management Support, Firm Size and Competitive Advantage and Readiness to adopt BDA. IT Infrastructure ($p=.000$) and Management Support ($p=.000$) found to be significant at 99% confidence level. Security ($p=.019$), Firm Size

($p=.019$) and Competitive Advantage(.033) recorded as significant at 95% confidence level. The results revealed a statistically significant relationship between IT Infrastructure, Security, Management Support, Firm Size and Competitive Advantage with Readiness to adopt BDA. Hence, test statics support the

link assumed in the model by hypothesis H2, H3, H4, H5 and H8. Further Reliability, Financial Resources, Regulatory Support and Environmental Uncertainty found to be insignificant and therefore the hypothesis H1, H6, H7 and H9 were rejected.

Multiple Regression Analysis

According to Kumar et al(2016), in multiple linear regressions, several independent variables are used to predict with a least square approach one direct variable. While correlation

analysis helps in identifying associations or relationships between two variables, the regression technique or regression analysis is used to —modell this relationship so as to be able to predict what will happen in a real-world setting. Multiple linear regression on the other hand can be used when we have one continuous dependent variable and two or more independent variables (Thatte et al, 2017). The results of multiple regression analysis of the study illustrated in following tables.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.473 ^a	.224	.170	.504

a. Predictors: (Constant), Reliability, Infrastructure, Security, Management, Size, Finance, Regulatory, Advantage, Uncertainty
 Source: Survey Results (2019)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.388	7	1.055	4.160	.00
	Residual	25.621	101	.254		
	Total	33.009	108			

a. Dependent Variable: Readiness to adopt BDA
 b. Predictors: (Constant), Reliability, Infrastructure, Security, Management, Size, Finance, Regulatory, Advantage, Uncertainty
 Source: Survey Results (2019)

Table 7: Results of Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
	(Constant)	-.780	1.033		
Reliability	.080	.066	.110	1.213	.228
Infrastructure	.448	.102	.384	4.409	.000
Security	.275	.101	.237	2.728	.007
Management	.466	.112	.399	4.174	.000
Size	.324	.110	.280	2.951	.004
Finance	.053	.097	.060	.549	.584
Regulatory	-.105	.095	-.139	-1.103	.272
Advantage	.098	.100	.014	.083	.034
Uncertainty	.077	.091	.118	.836	.405

Source: Survey Results (2019)

According to the results of multiple regression analysis, the adjusted R^2 value recorded as 0.224 which indicates 22.4% of the variation in the Readiness to adopt BDA can be explained by study predictors. The p-value is significant (0.000) which indicates fitness of the model for the study. Among the study predictors, IT Infrastructure, Management Support, Firm Size and Security gave the highest contribution towards Readiness to adopt BDA. According to the findings the highest beta coefficient is recorded by IT Infrastructure that is 0.448 then Management Support, Firm Size and

Security recorded as 0.466, 0.324 and 0.275 respectively. The lowest contribution is recorded from regulatory support (- 0.105) and financial resources (0.053).

4. DISCUSSION

Out of the research objectives, the first and foremost objective was to identify the level of readiness to adopt BDA. According to the results of descriptive statistics, the overall mean value for Readiness to adopt BDA is 2.70 and the SD is 0.553. It reveals that Sri Lankan private companies are showing low tendency towards BD readiness. Thereby the

researchers achieved the first objective by identifying the level of BD readiness in private sector organizations. The second objective was to identify the technological, organizational and environmental factors relating on readiness to adopt BD analytics in private companies, Sri Lanka. Accordingly, the researchers performed correlation analysis and the results indicated that five studied variables are having significant relationship with BD readiness. Thereby IT infrastructure, security, management support, firm size and competitive advantage could to adopt BDA. These research findings are in line with those of other prominent researches in the area of BD technology; Dasananyaka et al(2018), Kalema & Mokgadi(2016), Cooper & Robert(1990), Tsai et al(2010), Agrawal (2015), Cohen & Levinthal(1990), Almoqren & Altayar(2016).

5. CONCLUSION

This study sought to investigate organizations readiness for adopt BD analytics. Organizational readiness is a critical scenario, as it governs optimal implementation of technology (Venkatesh et al., 2003; Rafferty et al., 2013). Results of this study have indicated that there is low level readiness towards BDA by private sector 65 companies in Sri Lanka. IT infrastructure, security, management support, firm size and competitive advantage of the organization plays a good role in its preparedness for BDA. Optimal

be deemed as important in preparing for BDA. The factors reliability, financial resources, regulatory support and environmental uncertainty depicted insignificant relationship with readiness to adopt BD. Thereby the researchers were able to achieve the second research objective. The third objective was to investigate effect of identified variables on readiness to adopt BDA. Multiple regression analysis was executed and IT infrastructure, security, management support, and firm size were found to be significant predictors of Readiness implementation of a technological innovation is paramount for its success. Results of this study further indicated that for optimal implementation, organizations have to play their parts diligently and get involved in the changing process. Hence, readiness should embrace communication between the stake holders of an organization so that they work in a holistic manner. This is essential especially for organizations in developing countries that operate with limited resources. More still, due to heterogeneous challenges, it is rare to find smooth, linear and longitudinal technology shifts in organizations of developing countries like Sri Lanka. Hence, readiness assessment for any technological innovation should examine all relevant factors ranging from individual to organization to global.

The findings of this study indicated that organizations need to pay

attention to many factors and go through organizational, technological, and environmental changes if they are to be ready and feverishly explore ways of benefitting from BD analytics. It is only by doing so that they will be able to gain capability of creating strong competitive advantages. BD are often portrayed as a potential opportunity for organizations regardless of their nature. Many organizations, especially big firms in developed countries, are already benefitting from BD analytics (Kalema & Motau, 2016). However, literature indicates that traditional technologies are struggling to match up the velocity, variety and volume at which BD are generated. Leveraging the findings of this study, organizations will be in position to know what to do, when to do it and how when they are faced with situations of BDA. Hence, this study contributes to the scanty academic literature of BDA, as its findings will be used by management to make informed decisions regarding BDA.

This study provides relevant academic insights as it incorporates the TOE Model to explain the readiness to adopt BDA. The theoretical implications stem from the fact that conceptual model tested in this study will be added to the existing body of knowledge on readiness for BDA. And it can be used by future researchers for their research studies in different contexts. This will contribute to the information technology body of

knowledge where there are limited literature in the arena of BDA. The study reviewed the literature and identified factors that could influence organizations to make sound technological decisions before adopting BD Analytics innovations. This implies that this study makes a significant contribution to practice and management of the assessment of BD Analytics readiness. The practical contributions are considered, the research model used in this study will have managerial implications for practitioners in formulating better strategies for BDA readiness. Using the research model of this study could assist top level managers in enhancing their understanding of pre-conditions needed to consider for the successful preparation of BDA. Furthermore, results from this study could be applied not only to assessment of BD Analytics but generally to any new technology in an organization. Future researchers are encouraged to increase sample size and widen the representativeness in sectors to make a more generalize conclusion. Further, researchers are encouraged to consider the other related factors which may affect the BDA readiness through a thorough review of literature. They may also consider other possible and relevant mediating, moderating and controlled variables as well. Studies of readiness should involve several rigorous methods of data collection and future studies should leverage the use of other approaches like qualitative approach or mixed method.

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