

# Managing Business Performance using Business Intelligence and Analytics

Nur Hani Zulkifli Abai, Jamaiah Yahaya, and Aziz Deraman

**Abstract**— The importance of Business Intelligence and Analytics (BIA) in being the contributor for growth and development of an organization to remain in an intense environment is undeniable. Consequently, BIA implementation has been a top priority among most organizations, as it seems to be the most suitable partner in managing performance. Most organizations increase their investment in BIA to enhance their technological ability and support in decision making. However, merging complex technology with complex process requires detail study. Literature study is conducted to identify a suitable architecture for using BIA as a supporting technology in managing performance. The study comprises of deep research in business intelligence architecture, business analytics platforms and performance management. It proposes adapting BIA architecture; suitable in managing performance.

**Index Terms**—Business Intelligence, Business Analytics, Performance Management, Strategic Planning, Corporate Performance Management.

## I. INTRODUCTION

In business, pressures to accelerate performance have led many organizations to enhance their performance management practices and adopt Business Intelligence and Analytics technology to improve decision making process. Performance Management (PM) had become a high impact process in assisting organizations to plan and monitor goal achievements[1]. It breaks down organizational objectives into specific benchmarks to ease evaluation processes. The main objective of PM is to manage information towards strategy formulation. In addition, it is also focusing on performance monitoring to ensure management is constantly alert of any instability of achievements. Finally, it is implemented to assist the improvement in existing strategies; to maximize the level of achievement.

However, stack of information generated are beyond the ability of decision makers to perform analysis in order to propose the best action to be implemented [2]. Due to scattered data, the provision of information analysis is time consuming as well as inaccurate [2], [3]. Therefore, suitable technology assistance is required in order to accommodate customer needs

and respond quickly to market changes. Although most organizations have complete performance data, they are still facing problems in linking these data with the actions and management decisions [4].

Consequently, managing business performance with BIA technology is expected to solve the problem. BIA had been an important strategic investment for lots of organizations. According to IBM Tech Trends Report 2010, BIA has become one of the four major technology trends. Furthermore in 2011, Bloomberg Businessweek survey identified 97 percent of organizations with revenues reaching \$ 100 million a year using BIA [5]. According to Gartner, with a top priority of chief information officers and comprises of a \$12.2B market [6]; BIA's ability to collect scattered data, store it in chronological time, analyze and implement effective data mining techniques had contributed to its importance. In addition, it emphasizes the use of analytical elements, to transform data into valuable information. It can identify important components to achieve certain goals, understand business problems and predict the consequences of possible actions to be taken [4], [7], [8]

## II. BUSINESS INTELLIGENCE AND ANALYTICS PERSPECTIVES

Organizations' awareness of the importance of data management in decision-making has led most provisions to focus on Business Intelligence and Analytics (BIA) project. Basically, BIA is a group decision-making technology that aims to allow professional workers such as executives, managers and analysts to make faster decisions[9]. According to [5], BIA consists of techniques, technologies, systems, practices, methodologies and applications that analyze critical business data to help an enterprise understand better its business and market and make timely business decisions. It is a broad category of applications and technologies that include the collection, access and analysis of large datasets [10]. Studies showed that the implementation of BIA could assist organizations achieve business optimization [11], [12]. This is due to, indirectly, BIA turns data into information and then knowledge to assist management in making better decisions [13].

However, BIA could be seen as the combination of two perspectives that are Business Intelligence (BI) and Business Analytics (BA). Even though the term BI, BA and BIA had been used interchangeably in literature, there are still differences that exist between them. To understand the differences, in-depth study of the characteristics and architecture must be implemented.

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Z. A. Nur Hani is with the Northern University of Malaysia, Sintok, 16010 Malaysia (e-mail: nurhani@uum.edu.my).

Y. Jamaiah is with National University of Malaysia, Bangi, 43650 Malaysia. (e-mail: jhy@ftsm.ukm.my).

D. Aziz is with the Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia (e-mail: a.d@umt.edu.my).

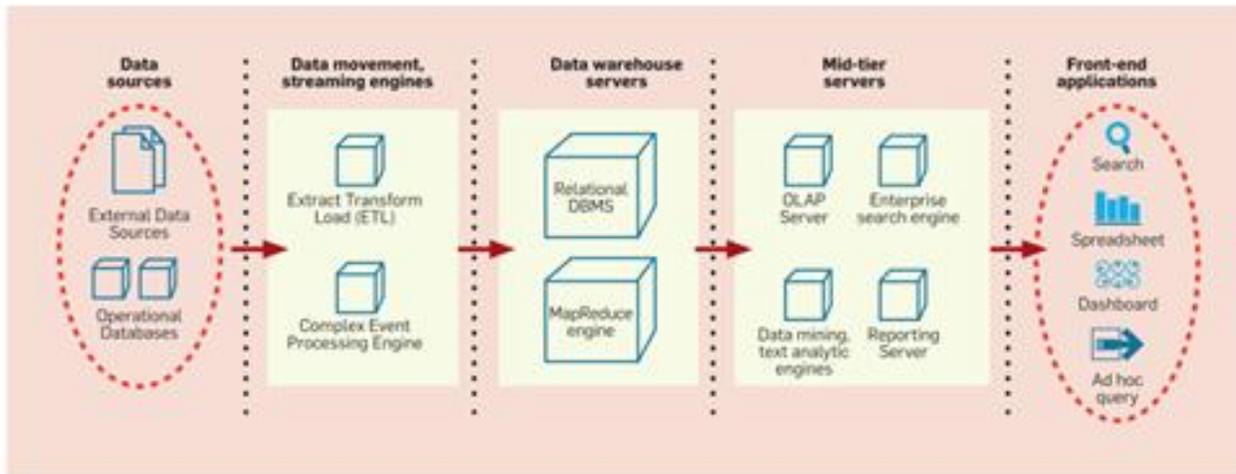


Fig 1: BI Architecture (Adopt from [9])

### A. Business Intelligence Architecture

Business Intelligence (BI) architecture consists of five key components to support its implementation [9], [14], [15]. As shown in Figure 1, the first component involves a data source consisting of multi-platform database operations. Data source could be collected manually and entered into a standardized format that can be inserted into the data warehouse. These data will be extracted through the Extract, Transfer and Load (ETL), the second component. ETL is the process of extracting data from a source consisting of a variety of platforms and formats. It will standardize data through purification process and then upload the data into data warehouse [16]. The third component in BI architecture is the Data Warehouse (DW) that stores subject-oriented and time-based data. The data were integrated at ETL level so that it will be channeled according to classified subjects. The stored data shall not be modified once they are stored in a data warehouse [17].

The next component in the architecture of business intelligence is the analysis engine. It might include on-line process analysis (OLAP) server, data mining engines and reporting server. It will also act as a search engine to access data in data warehouses. Data mining engine allows it to process statistical algorithms for the analytic activities. The final component is the end-user application which includes an interface for searching and analysis activities. It allows users to access data through dashboard, reports and ad hoc queries.

### B. The Rise of Business Analytics

According to [18], analytics is a huge concept that is defined as data-based decision making. Practically, analytics is a process to produce insight of data using data modeling and statistical analysis [19]. Analytic itself could be classified into several domains such as web analytics, customer analytics and financial analytics [20]. However, its application focuses on certain problem and occasion. Business Analytics (BA) requires several domains of analytics in its implementation. From the literature, it could be summarized that BA is a process of using data modeling and statistical analysis to produce insight of data for decision making.

Based on studies conducted by several institutions at present, analytical technology is seen increasingly required by industry practitioners. Number of organizations are using analytics to gain a competitive edge which increased to 57% within one year [12]. Organizational awareness of the importance of data analysis to improve decision-making process also increases. This resulted in most organizations aiming to improve existing BI systems with various analytical tools [21]. Reliably, analytics in the organization will continue to grow and become a high priority in the planning of the organization in the coming years [22]. The main objective in BA implementation is to get insights of data. However, its implementation is very subjective depending on the types of decisions that need to be made. Basically, the implementation of the BA is divided into several stages; started with reviewing business problems. Business problem will be defined, and if necessary, will be broken down into smaller problems that are approachable. Then, analytical activities will be determined, for example, to classify customers or detect unusual activities. Each single analytic activity might consist of several characteristics to be accomplished such as customer background data and customer transaction data. Finally, to determine processing output; for example, customer profile or customer royalty report [23]

### C. Whither Business Intelligence and Analytics

The implementation of Business Intelligence (BI) and Business Analytic (BA) should be aligned. Previous research [24] had found that sophisticated BI tools are required to increase the success of BA implementation. Although analytic has been practiced in BI indirectly, at present its implementation needs more attention and emphasis. BI implementation in the last decade emphasized more on the method of data integration and standardization of formats to enable comprehensive reporting and analysis can be performed. Now, interests and aptitudes of both academics and industry practitioners converge deeper towards applying analytics to assist in the decision making process [2]. Therefore, the term Business Intelligence and Analytics (BIA) can be concluded as a technology that uses statistical and analytical techniques with support from BI architecture to get insights from data for decision making.

In the coming years, the information transparency of BIA

implementation will move from internal visibility and compliance to shared information with customers. While decisiveness of BIA will shift from decision support on tactical and strategic level, to analytics that support transactional business processes [25], it is also predicted that by 2015, majority of BI vendors will make data discovery their prime BI platform offering, shifting BI emphasis from reporting-centric to analysis-centric. Analysis process of BIA previously focused on descriptive and predictive analytic will turn to prescriptive analytic that will provide actionable insight for decision making. Hence, organizations will analyze big data as an extension from current transactional and operational data to include environmental factors for a more critical perspective in decision-making.

### III. PERFORMANCE MANAGEMENT SYSTEMS OVERVIEW

Research regarding Performance Management System (PMS) started in early 1990's when the use of Balanced Scorecard was introduced by Kaplan and Norton in 1992 [26]. It refers to a process of defining objectives, developing vision and mission and then structuring strategies and tactical operations such that action can be taken to improve performance or services of the organization to become more systematic [27]–[29]. Most researchers agreed that performance management is important to ensure the achievements of organizational objectives [2], [30]. Subsequently, improving organizational performance requires the right information, at the right time for the right decision maker [31]. A number of past research were investigated to propose appropriate framework and method in managing performance [32]–[36].

According to [1], PMS is a method, process, information systems and personal skills that focus on decision making for strategies implementation. It includes several tasks of collecting, sorting, storing, processing and presenting analytical and critical information. It shall also define, control and manage organization's performance [30]. PMS is a continuous or repeated process [27], [29] to ensure goal achievement. It includes targets for the overall organization, management groups or individuals. Thus, it can be concluded that the Performance Management System is a process of strategies implementation to develop, define, monitor and control the performance outcome and continually improve strategies for an optimized organizational success.

The main objective of implementing PMS is to help organizations improve and optimize their operations in all aspects. In addition, it aims to monitor performance of the organization so that management is highly alerted on any changes or abnormal situation. Finally, it can be a tool that could assist decision makers in making informed decisions to improve their existing strategies to maximize success.

Past research had identified several important phases in the PMS which include (1) the determination of the vision, mission and objectives of the organization, (2) the determination of the strategy and action plan, (3) determining the level of performance to be achieved, (4) the remuneration to be given if organizations, units or individuals achieve their goals and finally (5) feedback needed to be understood by the

organization to environmental changes in order to improve the strategy and action plan for future [37]. Even though research of performance management has matured, present environmental condition requires technology support in order to strengthen PMS implementation and accelerate decision making process.

### IV. BIA FOR PERFORMANCE MANAGEMENT

Integrating BIA in performance management process is crucial due to several aspects. One of the reason is it involves expensive costs in setting up BIA technology. Therefore, it creates pressure in the expectation of Return of Investment towards this project. Another important factor is towards the importance of performance management in organization. It is a critical management field to determine successfulness of an organization. Intense competition among organizations does not allow any fault in decision making.

Each BIA components need to be fully utilized. BIA will serve as a support system to process data that will allow organizational performance measurement. In addition, BIA will also analyze data to ensure each objective is aligned with organizational goals. Analytic elements are required to improve the effectiveness of PMS process in terms of developing strategy and action plan. It is also able to generate suggestions for more effective action for strategy improvement from time to time.

Figure 2 shows the proposed architecture for the implementation of BIA in managing performance. The architecture starts with the BIA component as discussed in Section II which is data sources. It contains data from transactional application. It might also contain data that had been manually collected and transformed into a structured form. Important data from data sources will be identified and extracted using ETL tools. Since data at this stage is scattered and not standardized, it is important to purify the data using data extraction rules. Then data can be loaded into Data Warehouse according to subjects that had been classified. Data in the data warehouse extract is being updated regularly and kept in time series.

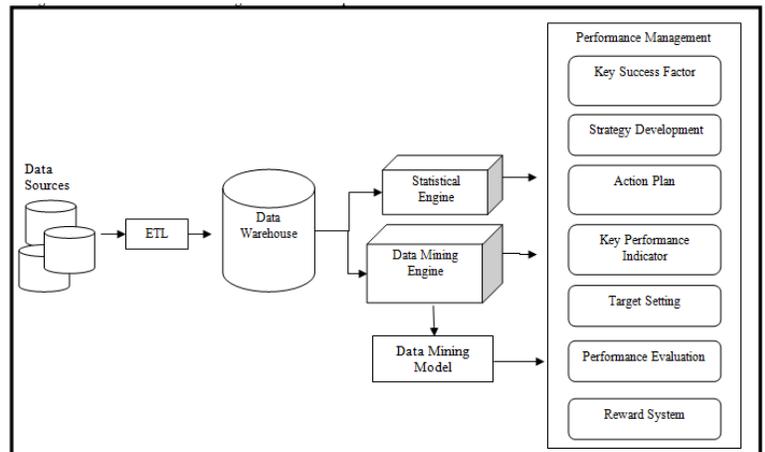


Fig 2 Integrated BIA and PMS Architecture

Next is the analytic engine that consists of statistical and data mining engines. Both engines have their specific functions. Statistical engine is developed to assist descriptive analysis of

data. It is important to summarize data to give user insight of data. Normally, statistical engine is used when using Online Analytical Process (OLAP), dashboard and reports. However, data mining engines are used to perform predictive and prescriptive analysis. It consists of various data mining methods and techniques that can be chosen to get insights of data. Data mining activities will develop a data mining model that is suitable with the organization.

BIA could support several performance management processes. One of the processes is to identify Key Success Factors. Besides, analysis could be done to guide strategy development. Prediction model on what might happen on execution of certain strategies could give the top management awareness of the possible benefits and risks. In addition, certain analysis could be done in identifying high impact action plan that will boost strategy implementation. Also, analysis could be done to identify appropriate Key Performance Indicator (KPI) that will measure performance achievement. Setting target on each KPI is also complex. Analysis in minimum and maximum capability of achievements could give decision makers guidance in setting appropriate target. Next, BIA could support performance evaluation processes by easily summarizing and drilling down information so that business problems could be easily identified. Finally, analysis could be done to identify appropriate rewards that could boost staff motivation.

## V. CONCLUSIONS

This paper has presented the issues in managing performance. Currently, managing performance had become a great challenge with enormous stack of data. Integrating Business Intelligence and Analytics (BIA) closely with performance management processes could bring performance management into a different level. Theoretical research has been done to determine the important elements that should be considered in the architecture of implementing BIA in managing performance. However, empirical study is required to ensure the suitability of architecture before its implementation in the industry.

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**Prof Dr. Aziz Deraman**, is the Dean of the School of Informatics and Applied Mathematics, University Malaysia Terengganu. He received his masters from Glasgow University in 1984 and PhD from the University of Manchester Institute of Science and Technology (UMIST) in 1992. He is presently a senior professor of Software Engineering specializing in software process, management and certification



**Nur Hani Zulkifli Abai** was born on 20<sup>th</sup> August 1979 at Penang, Malaysia. She obtained her masters degree in Information Technology from Northern University of Malaysia (UUM), Sintok, Kedah in 2010. She is currently pursuing her PhD in Information Technology at The National University of Malaysia (UKM), Bangi, Selangor. Her major field of study is Business Intelligence and Analytics.

She currently work as Senior Information Technology Officer at Northern University of Malaysia (UUM). Her research interests are business intelligence, business analytics, requirements engineering, data warehousing and cloud computing.



**Dr. Jamaiah H. Yahaya** is Associate Professor at the National University of Malaysia (UKM). She received her masters from University of Leeds, UK (1998), and PhD from The National University of Malaysia (UKM) (2007). Her research interests are software certification, software quality, software maintenance, and software ageing/anti-ageing.