

Business Intelligence: Concepts, Issues and Current Systems

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Abstract—During the last decade, the interest in Business Intelligence (BI) has been highly increased as a result of its widely used concept. Generally, the concept of BI is confusing, yet, it can be defined as the acquisition and utilization of fact-based knowledge to improve a business strategic and tactical advantage in marketplace. Based on this understanding, a lot of organizations have implemented BI systems within their firm and many others on the way to implement it as well. However, there are some challenges and drawbacks face organizations and prevent them from obtaining the optimal benefits from BI systems; perhaps the most obvious reason is organizations' readiness toward BI systems. This paper, discusses the term BI from different views, presents the concepts and ideas behind its applications and systems, and it gives more enlightening about the pros and cones of BI with a high focus on implementation challenges.

Keywords-Business Intelligence; review; challenges; decision making;

I. INTRODUCTION

The world has witnessed a major change in many aspects in our life, especially in the last decade. This is clearly reflected on the managerial activities, in the presence of the vast development in IT realm. Due to that, organizations needed to follow-up the advanced development and the sophisticated decisions, go beyond the country that the organization belongs to. One of the offered solutions is the Business Intelligence (BI) concept, which allows organizations to take decisions more efficiently and accurately. The term "Business Intelligence" was firstly noted in [1] where it was a very recent and unfamiliar term that time. However, it is widely accepted that the term BI is transferred and popularized in recent years by Howard Dresner [2][3][4]. Since then BI, as a concept, has been defined in many ways in the literature, most of which are related to its business side, though it can be also looked at from the technical side. In this regard, BI is defined as a product of analyzing business data using BI tools [5]. However, BI was broadly looked at and defined as an umbrella term that covers the processes involved in extracting valuable business information from the mass of data that exists within a typical enterprise [6]. Some other

researchers defined BI concept approximately in a similar scenario, and can be referred to in [7][8][9]. Apart from that, some recent authors preferred to give more in-depth definitions, where Chang defined BI as the accurate, timely, critical data, information and knowledge that supports strategic and operational decision making and risk assessment in uncertain and dynamic business environment [10]. While BI was defined by Sabherwal and Becerra-Fernandez as providing decision makers with valuable information and knowledge by leveraging a variety of sources of data as well as structured and unstructured information [11].

This paper is organized as follows: Section II discusses the concept of BI system and its components, implementation, tools and support systems. Section III presents the pros and cones of BI systems. Section IV discusses the challenges and future plans for BI systems. The paper concludes in the last section, Section V, the final remarks.

II. THE CONCEPT OF BI SYSTEMS

In the introduction, the paper presented a brief summary about BI definitions, which are important for further understanding of BI system. As any other system, BI system has its own concept, components and principals. Basically, governing a cumbersome task, such as decision making, is a challenging and complicated matter. Thinking about a system that copes with BI, which offers the right information for the right person at the right time, leads us to imagine how interested such system to be discussed.

A. BI System Components

BI is a very wide field includes various technologies to composite what is called the BI System (BIS). This is system aims to serve organization in offering more accurate and crucial decisions when they are needed. BIS system in their general structure should have the following basic elements:

- 1- Data Sources: Data sources are represented by any means used for the organization to obtain the data from. These sources may vary from large data bases to the Internet or market research companies and they can be relational databases or any other data structure that supports the line of business applications [12]. On the other hand, data source can be resided in many other forms of information, such

as tables or spreadsheets, or unstructured information, such as plaintext files or pictures and other multimedia information [12].

- 2- Extraction-Transformation-Load (ETL): ETL is a generic term presents the tools that are responsible for data transfer operational system to the data warehouse. As the name indicates, ETL works in three stages, namely reading the data from data warehouse, data mart or database to extract the required set. Then, transforming the acquired data to the desired state using lookup tables or any other converting function. Finally, some loading function is used to write the resulting information in the desired format.
- 3- Data Warehouse (DW): DW is one of the main components in the BIS. It represents a huge data storage for the organization. DW allows the physical propagation of data by handling the numerous records for integration, cleansing, aggregation and query tasks [12]. The DW here works as a large database connected gathers fixed and updatable from stock markets, market research, scientific news and even the Internet. Generally, the data in the DW should be kept alive with minimal historical records [12].
- 4- Operational Data Store (ODS): ODS is an off-line copy of one or more source systems, namely, data model that represent the data, model of the source system, an added functionality of storing historical versions of the data, and an integration between the source system models of different applications. In any case the ODS is not built to support strategic decision making, but rather support operational reporting, related to a the functional scope of a specific application [15].
- 5- On-line Analytical Processing (OLAP): OLAP a category of software technology or tools that enables analysts to gain insight into data through fast, consistent and interactive access to the data stored in the DW [13][14]. OLAP tools enable users to analyze different dimensions of multidimensional data by allowing the navigation of dimensions such as time. Generally, OLAP is designed to work with DWs or large databases for supporting decision making process. In this regard, OLAP is implemented in multi-user client/server mode and presents consistently rapid response to queries, regardless of database size and complexity. The scenario that OLAP is designed to work in is “what-if” which helps users in discovering the optimal solution based on the available data. However, this is generally achieved via server, namely the OLAP server [14].
- 6- Data Mining: Data mining is an automated process of discovering previously unknown useful patterns in structured data [14]. Usually, the naked eye does not recognize more than three dimensions through sorting or filtering. Thus, data mining process helps in obtaining many useful relationships, normally

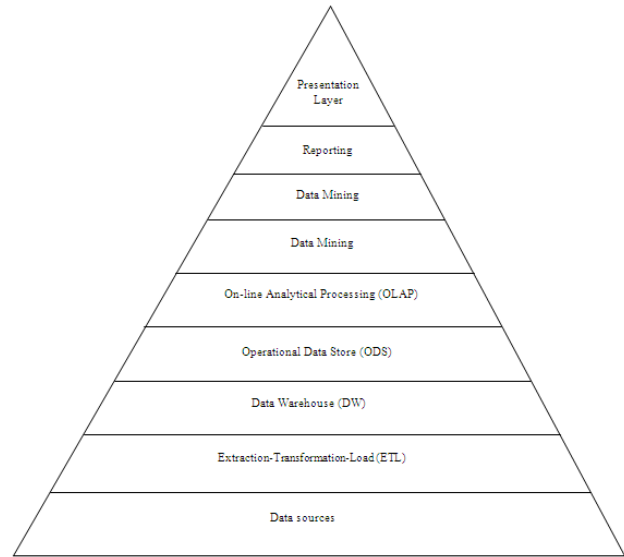


Figure 1. Hierarchical representation of BIS components

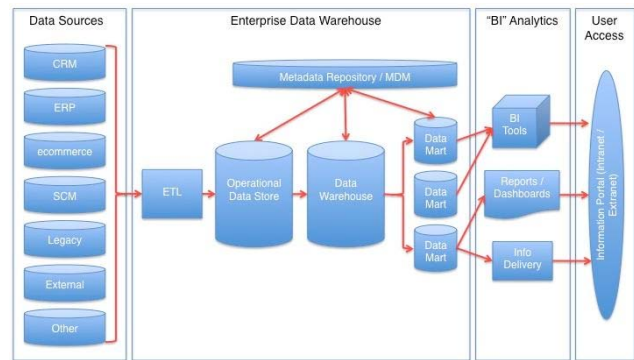


Figure 2. Business Intelligence System architecture [16]

hidden, in an automated fashion for supporting more complicated decision making process in higher accuracy.

- 7- Reporting: Reporting is the stage before the final which creates and utilizes different synthetic reports using ad hoc inquiry tools.
- 8- Presentation Layer: The final stage or layer which has the graphical interfaces and multimedia options for BIS users.

As discussed above, there are many components attached to the BIS in a hierarchal order in order for this system to run properly. This hierarchal order is presented in Fig. 1. However, it may be best to illustrate the complete architecture of BIS to clarify further any hidden fact. Fig. 2 illustrates BIS architecture.

III. BUSINESS INTELLIGENCE BENEFITS AND ISSUES

BIS has come to the existence as a result of an accumulated development process combined between IT and business experts. BI Bases the key-points on data and data

availability for obtaining the optimal decision, which in turns offers a great enhancement in decision taking process. However, there are a number of advantages provided by BIS, which can be summarized in the following:

- Providing a large database for intra-organizational data which facilitates analyzing data and creating reports about the organization. Also, this database allows the users, organization’s employees, to share any desired information at any time.
- Fixing the error if it exists and resolve any mistakes may be within the data in the DW, in order to present correct and precise reports based on accurate data analysis. This for sure increases the accuracy of data.
- Providing a fast data retrieve and friendly user-interface for viewing.
- Increasing the efficiency by eliminating the need for any repetitive data entry process. This means reducing data storage, entry and retrieval processes [16].
- Enhancing the process of report creating for sophisticated data without the need for advanced analytical technologies. In addition, providing remote access to any desired data via a laptop or a smart phone.
- Improving information security by accessing data on need-to-know basis [16].

In contrast to the above pros, BIS suffers from some drawbacks as well. These drawbacks can be summarized in the following:

- BI requires additional work inputting data as well as additional training to get to know the system.
- Depending on dehumanization of processes that should be personal may cause various errors.
- The need for continuous maintenance, information updating, system upgrading and etc.
- Integrating BIS with other Management Information Systems (MIS) is an uneasy task.
- Increases the cost of MIS implementation.
- Organization’s readiness toward BI systems, which considers as a major drawback and in currently a hot research issue.

The last drawback is a cumbersome challenge for many organizations. There have been many researches about organizations’ readiness issue [18][19]. This is due to the huge amount paid for implementing BIS expecting a reasonable Return-Of-Investment (ROI). Therefore, this paper presents a brief preview of the readiness problem as key-point.

IV. ORGANIZATIONS’ READINESS TOWARD BIS

Organizations’ readiness toward BIS is whether or not a given enterprise is truly prepared to make the changes that are necessary to capture the full business value of BI [20]. This is generally can be resolved via business and technical aspects. What is more important here is the business aspect, which is hot research area [20][21]. It is needed challenging

to ensure driving BIS to deliver the expected outcomes by users, vendors and customers. To do such a task, some researchers proposed an assessment method for detecting or evaluating the degree of readiness at organization for implementing BIS [22][23][24].

Generally, the solution that was proposed by these researchers is conducting a survey to get enlightened on “what do you think makes BIS successful at your organization?” and “how do you think BIS should be improved in certain aspects?” and the list goes on with relatively long questionnaires [25][26][27]. These studies could identify important factors affecting organizations’ readiness toward BIS. The identified factors are called Success Factors (SF) or Critical Success Factors (CSF) [27]. The researches attempted to build up a model based on these CSFs to assess organizations’ readiness toward BIS. The obtained CSFs were set as parameters for a model built to assess organizations’ readiness toward BIS. This model with its obtained CSFs is illustrated in Fig. 3. However, most of the developed methods/models suffer from the lack of confirming all CSFs due to more expanded and extensive qualitative and quantitative surveys. Moreover, regarding the context of Malaysia, so far, we have not found any previous study or research copes with the readiness issue. Therefore,

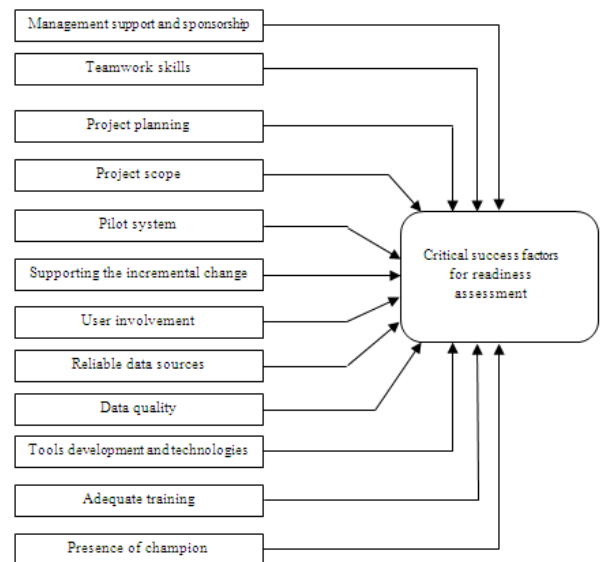


Figure 3. CSFs for the implementation of BIS [26]

the next part of this research will present a methodology for assessing organizations’ readiness toward BIS in accordance the context of Malaysia.

V. CONCLUSION

This paper presented the most common definitions of BI found in the literature, and most related to the context of our current study. In addition, the paper further explored the concept of systematic basis of BI which lays within having certain components ranging from DW and data repositories to the final displaying and interfacing stages. Throughout the

discussion of this paper, some points were highlighted, namely, the advantages and disadvantages of BIS, as well as some of the challenges that maybe faced during the implementation of BI S. Finally, the paper presented the most contemporary issue related to BIS, which is organizations readiness toward BIS implementation. Although there are some researches discussed the readiness problem and identified some key CSFs for assuring the successfulness of BIS, but more extensive and focused research should be done. One of the good candidates for such a research is the Malaysian context, as Malaysia is witnessing a major change in MIS and traditional methods used for coping decision making, and yet to be considered and enhanced.

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