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Integration of Business Intelligence and Enterprise Resource Planning within Organizations

Muhmmad I. Nofal*, Zawiyah M. Yusof

Strategic Information System, Faculty of Information Science and Tecnology, Universiti Kebangsaan Malaysia, 43600 Bangi Selangor, Malaysia

Abstract

Organizations have invested a considerable amount of resources in the implementation of Enterprise Resource Planning (ERP) and Business Intelligence (BI) systems. In today's competitive environment within the context of complex BI and ERP, these systems have become key strategic tools, which directly impact on the success of any project implementation. But little attention has been given for the integration of Business Intelligence and Enterprise Resource Planning (BIERP). A hand full of studies were carried out in the developed countries while developing countries received much less attention. Despite the effort has been devoted to explain the integration of these systems, the literature is still classified as fragmented and diversified. This paper attempts to review and evaluate articles published between 2000 and 2012 regarding the integration of BI and ERP.

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Keywords: Enterprise resource planning, business intelligence, integration ;

1. Introduction

In today's competitive economy within the context of complex Business Intelligence (BI) and enterprise resource planning (ERP) became a key strategic tool, which has a direct impact on the success of any project. Recently, ERP applications have transformed organizations by improving financial visibility, supply chain operations, and minimized human resource processes and overhead [1]. In today's challenging business environment, BI is a technique and solution that helps managers to understand business situation.

*Corresponding author: Tel.: +60-1-73590049.

E-mail address: mh_nofal@yahoo.com

The most current information technology is to gather together all needed data from the ERP system and then load them into a data warehouse, and then link to BI tools (such as OLAP, data mining, query and reporting).

ERP with the collaboration of BI is expected to be more competitive and flexible in order to share information and data for decision making and control [2]. Therefore, for success in the ERP, the organization must have and shared knowledge on many different manifestations around the process of BI since the importance of BI ERP partners has been commonly recognized [3]. This paper reviews the integrating ERP and BI systems and how they work together to enhance organizational performance. This paper first explores the obstacles facing ERP systems and their needs for integration with BI. The next section provides previous research on BIERP integration. The final conclusion is provided in the last section.

ERP is a software-driven business management system that integrates all facets of the business, including planning, manufacturing, sales, and marketing [1]. [4] mentioned that business Intelligence is a concept of using information technology as a tool for achieving the competitiveness of businesses, the perception of risk that occurs in the environment within the firm, and the possibility of action.

Unfortunately, many executives underestimate the commitment they and their organizations need to make to ensure successful implementation and usage of BIERP [5]. The fact is that most of the project's success or failure is depending on how these businesses do implement the software, not the software vendor or the tool itself.

[6] mentioned that BI is a term introduced by Howard Dresner of Gartner Group in 1989 as a tool that represents a set of concepts and methods originated to enhance decision-making in business through knowledge utilization and systems usages. Business intelligence is a process of leveraging customer information to enhance corporate behaviours and improve relationship with current and target customers for enhanced profitability and competitive advantage. As companies expand their web of customers, they use BI to further mine the customer relationships. BI helps in consolidating, analysing and providing vast amounts of data for business decision-making [7].

Businesses recognize the wealth of information within ERP systems. The challenge lies in the ways of mining these systems. Since ERP systems were not originally designed to provide real-time reports to massive users, the entire system could not facilitate the decision support function [1]. Within the context of ERP, BI is the process of leveraging detailed customer behaviour information to best manage relationships for maximum customer satisfaction, loyalty, retention and profitability [8]. Thus, a key component of this BI strategy is a data management infrastructure that enables companies to recognize in real-time the changes in a customer's behaviour that signal when there is a high probability that the customer will respond positively to an offer [9].

Most businesses have a solid market research capability that helps them understand their customers' needs and expectations. However, knowing customers is not enough. Companies must also know their competitive environment [10]. The market place makes use of application packages which are growing rapidly across all business areas, especially in BI and ERP systems. This growth is occurring not only for application packages that handle business transaction processing, but also for packaged solutions that support business BI and data warehousing [11].

2. Key terms definitions

2.1. Business Intelligence

BI defined as systems which collect, transform, and present structured data from multiple sources [12]. BI systems are accounted for the potential to shorten the time to obtain relevant information and enable efficient utilization [13].

2.2. Enterprise Resource Planning

ERP system defined as an enterprise-wide set of management tools that balances demand and supply, containing the ability to link customers and suppliers into a complete supply chain, employing proven business processes for decision making and providing high degrees of cross-functional integration among sales, marketing, manufacturing, operations, logistics, purchasing, finance, new product development and human resources, thereby enabling people

to run their business with high levels of customer service and productivity and simultaneously lower costs and inventories; and providing the foundation for effective e-commerce. [14].

3. ERPBI values, benefits and considerations

3.1. ERPBI value

An ERPBI system usually integrates of modules such as production scheduling, sales management, customer relationship management, accounts receivable, accounts payable, project management, material requirements planning, inventory control, reports, general ledger and so on. Many of the roles and responsibilities of business and IT need to define in order to make ERPBI efforts successful. For the technical personnel, it is recommended that the following roles be performed full-time by dedicated personnel as much as possible and that each person is responsible to receive specific training [15].

The value of the right ERPBI system comes from the integration between the modules and the ability to achieve the sought targets, including reductions in paperwork; improved productivity; lower costs; and more reliable performance; cost reduction that distribution and spent on information achieved with an ERPBI as well as ability to handle time Initially, For example, when getting the full cooperation of suppliers and ERPBI system makes it possible for decision-making and implement the purchasing operations in a timely manner. This can reduce the inventory costs dramatically and development free capital otherwise invested in inventory.

Another value that is very important but not as easy to translate into money is the value of the process seamless and reliable. ERPBI users are more successful on the ability to maintain agreements with customers with respect to the full delivery and in a timely manner, and can communicate more effectively on the progress of the project or a specific production order [16]. Also other value but equal in importance, achieve improved productivity because, when properly applied, the ERPBI system reduces waste of time and material. Built-in intelligence and bases can be applied, for example, so that similar production orders are combined to make more efficient use of the workforce, machines and materials.

ERPBI reduces IT infrastructure costs by integrating information and eliminating redundant data extraction processes and duplicate data housed in the enterprise independent data marts across [17]. ERPBI also saves time for data suppliers and users because of more efficient data delivery [18].

3.2. Benefits of integrating BI and ERP

BI performs various operations such as facilitating the means of creating, modifying and distributing standard reports, exploring the data, data relationships, and trends through relevant methodologies to draw conclusions, and this process can drive revenue growth and improve operational efficiency within the organization [19]. While ERP systems robust for processing and storage transaction data from different internal and external sources, it is not the most efficient data distribution system in existence. The system of ERP and BI integrated can enhance and improve the ability of companies to decision-making by leveraging the ability to manage data from the ERP system and the analytical capabilities of the BI system. This integration leads to optimal use of both ERP and BI systems. More specifically, this integration obtained the following benefits [20]:

- Allowing to control the recognition of corporate cash flow in real time
- Facilitating a company to implement cooperation between departments
- Reducing the time required to generate regular reports
- Improving profitability by transaction data analysis and forecasting business trends
- Enabling finance staff to create financial revenue reports / expenses quickly
- Improving accounts payable and vendor relationship management
- Enable the management of the sales force
- Providing online access to the data, which saving access time

- Improving relations with customers through sales of in-depth data mining
- Sharing information with the sales department, and this allows to make better decisions based on a macro view of the business

3.3. *Considerations to ERPBI integration*

Although the integration of BI and ERP systems gives many benefits, there are some considerations must be strict implementation and use of such integrated systems [1]., and these concerns are technological innovation, size, reliability and availability, efficiency, and system flexibility

Technological innovation is one of these considerations for the customer's needs are changing constantly. Consequently, BI solutions should constantly adhere to the changing requirements and provide information infrastructures that well suits them instead of sticking with the same old technologies that do not satisfy the user community. Another one more consideration is related to reliability and availability. As a BI system scales up with the changing needs of the business, it should guarantee a continuous service with reliable performance. While the ERP system supports the enterprise-wide transactions, an integrated BI system becomes critical on its scale efficiency. It has been mentioned that since an enterprise grows and continue to grow, it must provide proven infrastructure to manage, schedule, and deliver information to the right destination at the right time. The last view is that ERP systems are, mostly, inflexible. Thus, it is the responsibility of BI systems to support all major web standards and integrate smoothly with existing applications and provided infrastructure without much complexity [1, 21].

4. ERP and BI pitfalls

An ERPBI system can be a very useful tool for every enterprise in which core procedures can be supported by the software. There are significant benefits to implementing an ERPBI but also many pitfalls that can fall into. If possessed the ability to avoid the common pitfalls, the implementation of ERPBI system and subsequent usage are much more likely to be successful.

4.1. *ERP pitfalls*

Wrong motive for ERP: A commonly made mistake, especially when ERP-like systems first appeared, is the choice for ERP with the wrong motive. There have been many companies who have opted for ERP in order to clean up their messy way of operation. This will almost always end up in a disaster. The old maxim: 'rubbish in – rubbish out' still counts. To avoid this pitfall, make sure you first improve your procedures to a reasonable standard before thinking of an ERP. It is clear that the underestimation of the required efforts of implementing ERP will probably increase the complexity of such systems regarding the users' procedures. In addition, preparation of the implementation takes much time. Consequently, sometimes an ERP supplier gives an offer that looks clear, but it may contain open ended issues that can cause considerable conflicts with the supplier later on. Always make sure you've considered all cost components and how particular scenarios may affect your contract. Another related point is the all-too-common failure to conduct a robust cost/benefit analysis before selection and implementation. This pitfall can cost an enterprise dearly when it later appears that the costs of an ERP system (lease, licence, maintenance, costs of implementation) outweigh the financial benefits. One of the biggest pitfalls of small and medium companies is choosing an inappropriate ERP system that mismatches their needs [16].

4.2. *BI pitfalls*

Many changes are expected in the requirements of a BI project. The most crucial point is that when trying the customization vendor application. It was seen that too much customization rarely increases usability. One more thing is that since training is important factor or critical success factors (CSF) in BI implementation, the top seniors should make sure that the target groups to be trained are those employees with a need to know rather than to go all through the training sessions. It is also very crucial to involve executive as executive's commitment and support are

the most CSF for BI success. This form of support is especially critical for business intelligence projects that require collaboration between different organizational groups. Another pitfall can come from the lack of communication to consultants. Consequently, specific deliverables are to be assigned to each person on the project, as well as their time frames. Lastly, it is important to understand how the BI application meets the business user's workflow and requirements before announcing that the project is already completed. The BI project may not truly end for several months, perhaps even years, after it has been organized [22].

5. Differences in perspective between ERPBI in developed and developing countries

It is asserted from the literature of systems such as CRM, BI and ERP is a concept that has been developed in a western environment [23]. Interestingly, there has only been limited to relevant research conducted on some developing countries such as Brazil and India, whereas there were few studies for BI and ERP implementation in Arab countries. Hence, the problem of the high failure rate in BI and ERP project is expected to exist in developing countries as well. For instance, it is argued that 65% of managers believe ERP project failure will damage a firm [24]. Comparing the availability and richness of literature on BI and ERP implementation in developed countries to the availability of such literature in developing countries, there is a gap in favour of developed countries. Nevertheless, there is also a lack of literature on ERP implementation globally and the impact of cross-cultural on ERP implementation. [25, 26].

The evaluation of IT and information systems is a complex task [27,28]. There are many methods and frameworks that measure the applicability and benefits of ERPBI projects and an IT projects investment. For instance, [29] argued that BI is one area of IT in which traditional evaluation techniques may perform poorly, as many of the benefits are strategic, and consequently not easily quantifiable. These Estimating the value of BI and ERP require answers what the cost of implementation and what the benefit from incurring these costs. These benefits can categorize into measurable, none measurable, indirectly quantifiable and unpredictable [28].

In practice and theory there are many models and frameworks for evaluating IT investment in both developed and developing countries. Financial method is one of the classical methods in evaluating such type of investment, ROI. [30] mentioned that the difficulty of this method is that the evaluation of the system is based on the value of information which very complex job. Some practitioners use case study, strategic and subjective analyses. Cost-benefit analysis has long been used for evaluating a wide range of projects. It is the widest aspect of economic investment even with some variation in results can be found [31]. Comparing developed and developing countries, measuring these benefits in developing countries are more clear than in developing ones.

6. Review of past related works on BI and ERP integration

ERP systems are transacted-based, that is, ERP applications are designed to process large volumes of business transactions within sub-second response times [1]. Due to its ability to generate friendly reporting, BI allows dynamic enterprise data search, retrieval, analysis, and explanation of the needs of managerial decisions.

[32] argued that the integration of BI and ERP gives the possibility of integrating two capabilities. This integration will probably strengthen corporate by combining decision-making capability through utilizing the analytical capability of BI system and data management capability of ERP system.

In their study, [1] concentrate on the benefits of integrating BI and ERP. There are concerns for effective implementation and utilization of such integrated systems. These concerns are technological innovation, reliability and availability, scale efficiency, and system flexibility. This article concludes that ERP and BI can greatly improve the IT performance and decision-making capability inside the organization. But, the debate is that is it necessary to talk merely about IT performance rather than overall organizational performance. One of the limitations is that the article is more conceptual rather than empirical. Unlike the previous study, [32] examined the impact of integrating enterprise resource planning systems with business intelligence systems on decision-making performance. But the investigation is for on a single industry. The advantage of this study is that it is the only article from the fewest that reflects the status of developing countries.

Table 1. Studies on BI and ERP Integration

Author	Objective	Methodology	Integration	Findings
[1]	Seeks to propose a business intelligence (BI) and enterprise resource planning (ERP) integrated framework that adds value to enterprise systems	A conceptual approach	BI and ERP	ERP systems integrate all facets of the business and make data available in real time. BI tools are capable of accessing data directly from ERP modules
[21]		Survey	ERPBI usage	ERPBI system usage in organizations is positively related to DMP. Secondly, Organizations using ERPBI systems achieve higher levels of decision-making performance compared to organizations which only use ERP systems.
[33]	To evaluate the main reasons that drive companies to implement and upgrade ERP and BIS, in light of potential relationships among them.	Comparative case study	ERP/BIS	The results of this research show two different approaches to the implementation and upgrading of ERP and BIS
[34]	To integrate data and processes from all areas of the organization and unify it, to provide ease of access and an efficient workflow	-	ERP and business intelligence	There is a need for some form and shape of data warehouse in virtually every environment

In [33], two approaches were conducted to show the implementation and upgrading ERP and BIS. The conclusion from this paper an effective approach to BI, must pay attention to the structure of the data, because they are the basis of all the decision support systems. The main limitation of this study is the usage of depth case study in which generalization of findings is not simple [34].

As can be seen from this table, different studies used different constructs. The majority of the studies was conducted in developed countries. These studies also used different respondents, different target population, different cultural settings, and numerous combinations of variables. There is no study that considers the critical success factors that affect BIERP usage, and in turn how this integration affects organizational performance in one model. This represents a gap of this current study. In the context of developing countries, it has been documented that there are insufficient researches in ERP and BI among business organization [35].

7. Recommendation and conclusion

The ERP system has been mentioned as a strategic tool in the literature for handling corporate resource planning. BI software has also gained acceptability of its decision support capability and unique reporting nature at all levels of the organization. While the role of ERPBI as a source of improved performance (decision making performance) has received a great deal of interest from information system researchers, most of the work has been done either descriptive or conceptual. A few empirical studies have mentioned the importance and impact of ERPBI adoption (see table 1).

Over the years, the phenomena of ERP and BI have received some attention among consumer behaviour, IT acceptance and usage, ERP and business solutions researchers. The majority of the research focused on investigating ERP and BI but only a few attempts to integrate them. The first implication of our findings is the need for rigorous empirical research in ERPBI integration. Second inference and suggestion is needed to connect to the existing ERPBI evaluation methods and frameworks. A model that examines the integration between ERPBI is to be proposed for future research.

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