Competitive Advantage through Business Intelligence for E-Commerce

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Abstract—In today's competitive business world it is certain that there is lot of data to be processed. It is essential for the business organization to analyze and comprehend the generated data for the performance of the organization. In this paper we review a framework that allows Small and Medium Enterprises (SME) to take advantage of the information available and to adopt a set of measures supported by Business Intelligence (BI). The adoption of BI in SMEs can create the need for organizations to adapt the processes that support systems for decision support, and may have to adapt their systems to the level of databases and applications. This would provide an additional perspective of information, enabling more consistent analysis of the data in order to support the process for prudent and agile decision making.

Keywords— Competitive advantage, Business intelligence, Business Intelligence, Decision support, SMEs

I. INTRODUCTION

Business Intelligence is a progressive method for extracting, transforming, managing and analyzing large data through a mathematical model which gains information and knowledge to help and make decisions in a complex situation.

The term *business intelligence system* is a common umbrella concept that groups multitude of like architected information systems, derived from business and information fields. These systems are used to transform data, keen on information into decisions, and decisions into successful actions. The term *business intelligence system* lacks generally accepted definition. The lack of clarity in the understanding and use of the term can lead to difficulty when studying the field of business. Intelligence systems; in fact one research team proclaims that business information systems are neither a single product nor single system. In reality, business intelligence systems are enhanced described as a grouping of products and systems.

Elements of Business Intelligence are Data Warehouse, Data Mining and Decision Support System. The major origin of business strategy for creating a competitive advantage is to understand the data of the firm generated through its own business. Information processing has increasingly become the foundation for achieving competitive advantage. The organization has to believe that they encompass the right information at the right time which is available to the right people [4].

Companies use Business intelligence to make optimal decisions so as to cut costs and to categorize new business opportunities. BI is surplus to just corporate reporting and more than a set of tools to coax data out of enterprise systems. Business Intelligence is used to identify inefficient business processes that are ripe for re-engineering. The target audience of suppliers of business intelligence solutions confines to the large companies, due to their greater receptiveness to host projects and financial ability. Some authors argue that BI cannot be applied to SMEs, and that BI is a managing process of the exclusive domain of large companies [3][1]. However, SMEs are subject to the same circumstances that motivate large organizations to systematize BI.

The selection of the relevant information is not always consensus and may be different for each organization and in each of its areas. Hence, it is advantageous that each area of the organization has a list of needs, in terms of analysis and management, and once selected the necessary information, it shall be made available timely in order to facilitate \ assist the process of decision making, either for choosing the best solution, either for the implementation of actions for solving problems at the appropriate time.

With today's BI tools, business organizations can jump in and start analyzing data, to a certain extent than wait for IT to run complex reports.

This democratization of information access helps users back up with hard numbers business decisions that would otherwise be based only on gut feelings and anecdotes. Although Business Intelligence holds great promise, practicality can be dogged by technical and cultural defiance's. Executives have to ensure that the data feeding to Business Intelligence applications is clean and consistent so that users trust it. For a considerable time, large companies have realized the importance of the existing data in their information systems and began to invest in systems with great analytical skills, particularly in BI. Only recently some SMEs began gathering requirements to receive BI solutions.

Systems and Business Intelligence tools have a key role in the process of decision making in organizations. They collect, store, access and analyze organizational

data in order to support and facilitate decision making [6].

The general categories of business intelligence tools are:

1) Spreadsheets
2) Reporting and querying software: tools that extract, sort, summarize, and present selected data
3) OLAP: Online analytical processing
4) Digital dashboards
5) Data mining
6) Data warehousing
7) Decision engineering
8) Process mining
9) Business performance management
10) Local information systems

Open source free products

1) Eclipse BIRT Project
2) RapidMiner
3) SpagoBI
4) R
5) KNIME
6) TACTIC

Open source commercial products

1) Jaspersoft: Reporting, Dashboards, Data Analysis, and Data Integration
2) Palo (OLAP database): OLAP Server, Worksheet Server and ETL Server
3) Pentaho: Reporting, analysis, dashboard, data mining and workflow capabilities
4) TACTIC: Reporting, analysis, dashboard, data mining and integration, workflow capabilities

Proprietary free products

1) Birst
2) InetSoft
3) MicroStrategy
4) QlikTech
5) Tableau Software

Proprietary products

1) SADIG Business Intelligence tool
2) ActiveReports & ActiveReports Server
3) Actuate Corporation
4) Advanced Business Solutions
5) ApeSoft
6) BOARD

7) Business Analyze
8) Cloud9 Analytics
9) Connexica CXAIR   etc.

II. BACKGROUND AND LITERATURE REVIEW

Business Intelligence not just a technology or a methodology. It's a powerful new management approach that would convey knowledge, efficiency, optimal decisions and profit to organization that uses it [7]. The current complex business environment requires companies to be agile and proactive in relation to decision-making processes, it is necessary to understand the information to track the history of sustainable future events, such factors leads many organizations to adopt BI systems in its business processes[8].

BI tools have a number of advantages for businesses, with following highlights [9]:

- The reduction of the dispersion of information;
- Greater scope for interaction between users;
- Ease of access to information;
- The information is available in real time;
- Versatility and flexibility in adapting to the reality of the company;
- Useful in the process of decision making.

Globally companies intend to obtain and maximize profit through the sale of goods and services. With BI, organizations can understand systematic sales information and guide trade policies to the specific needs of customers, while still attracting new customers and retain old customers with value-added products [9].

According to Guarda, BI bridges between different systems and users wishing to access information, providing an environment that facilitates access to information needed for day to day activities and analyzing the business performance.

With BI, organizations can integrate powerful tools, analyze, standardized reporting, monitoring system with various metrics, data integration, along with other features, within a service-oriented architecture, essential for a good business management to guide managers in strategic direction for quality information, with the establishment of standards and procedures to ensure compliance with the objectives

The techniques of analysis and visualization can detect evolutionary data previously ignored. Finally, the strategic measures could provide an alignment with tactical initiatives, by setting strict goals and objectives to be achieved in each moment, allowing control over the same simplified and more efficient correction of deviations.

The effortlessness of the historical analysis is facilitated if the organization has a repository of historical data, both internal and external source, enabling exploratory analyses using BI techniques.

The permutation of historical data with BI tools allow SMEs to take strategic decisions relevant

through exploratory techniques of large volumes of data potentiating analyses of unknown patterns, which is an important advantage in understanding the business processes[3].

Organizations should adopt a strategic and active behavior, exploring a more competitive pricing model, eventually replacing the current market for new markets, and becoming more competitive compared to its competitors[2].

Generally organizations look for information regarding the analysis of less favorable situations, this analysis is a reactive action to a negative or adverse situation. In a proactive management perspective, if the results are positive, organizations must continue to develop actions to leverage and optimize the obtained results. Reactive organizations, wears all its energy and all the resources in the inversion of negative results, eventually this costs the improvisation of their skills and exploration of numerous opportunities. Without these skills and approaches to business, organizations fail to evaluate the course of business [7].

The organization must decide whether to have a reactive behavior or pro-active behavior. A proactive organization is focused on meet the opportunities and prepared to foresee possible failures [5].

As the business environment constantly change, it can be verified that the requirements at the level of information technologies, market challenges in addition to business pressures faced by SMEs are not much different than those faced by large companies. Large companies have harvested over time the benefits of BI systems, since they can implement and maintain BI solutions.

At present, the volume of data the companies create and store is increasing. The few data sources: customers, suppliers, business partners, market research and others. The management of large volumes of data and transforming it into useful information is the challenge posed to SMEs. A viable alternative for SMEs could be choose the solutions Software-as-a-Service (SaaS). This enables the companies to strengthen with systems and information technologies. And would improve the quality of their information systems, giving a competitive advantage to the company.

Generally deprecated software applications used by SMEs will prove to be an enabler for essential change, since SMEs are increasingly pressured due to evolving markets and technologies. Thus, BI systems seem to be the right choice for organizations, allowing usage of advances in Information Technologies, deploy software applications in business processes. This positive change is in accordance with integration of software, allowing the integration of information flows from clients and suppliers, and redesign and formalize business processes.

It is not guaranteed that a BI system will generate a return on investment because not every business has been successful with BI solutions. But an adequate

and integrated BI, can create the competitive advantage necessary for SMEs be successful.

It is integral to understand and implement what type of BI solution should adopt an SME to meet its business needs.

Once the identification of protocol is done the business processes must be identified and the stakeholders roles should be defined along with the functional requirements such as information reporting, analysis, and presentation delivery.

SMEs that have taken into consideration of the BI system quickly realized that they can compete more effectively in the marketplace, with additional information about their customers, patterns and more efficient financial management.

A systematic search of online databases and research indices provide a large body of literature detailing business intelligence systems and the impact they have on business decision-making. The first and foremost four common components of a business intelligence system are Data Warehousing, ETL tools, OLAP techniques, and Data Mining. The second examines how each of the four most common components relates to the managerial decision making actions as described. Actions reacquiring/gathering information, searching information, analyzing information, and reporting information as shown in figure 1. The third aspect examines how business intelligence systems can be employed at each of the three levels of management: operational, tactical and strategic.

III. SIGNIFICANT ROLE OF BI

The role of business intelligence is to extract the information deemed essential to the business. It presents or manipulate that data into information that is useful for the managerial decision support through the use of business intelligence systems as shown in figure 1.

Understanding business intelligence systems enables any organization to implement an analytical approach that transforms data into information, information into knowledge. Then knowledge into decisions and Factors such as an ever increasing number of very diverse internal and external data sources, the sheer volume of data generated. This include everyday businesses, complexity of business processes as well as various compliance, privacy and other data related issues, have made cross-organizational data integration and analysis more.

The utility of business intelligence systems has become popular in recent years as an approach to gather and analyse data. The business house believe that this is because business intelligence systems can deliver meaningful data at the right time to the right location and also uses right reporting tool that

supports the decision. By utilizing business intelligence systems organizations are collecting, treating and diffusing information with the objective of reducing uncertainty in the making of decisions. These decisions are often made under pressure, almost always at critical times in which businesses need real time data.
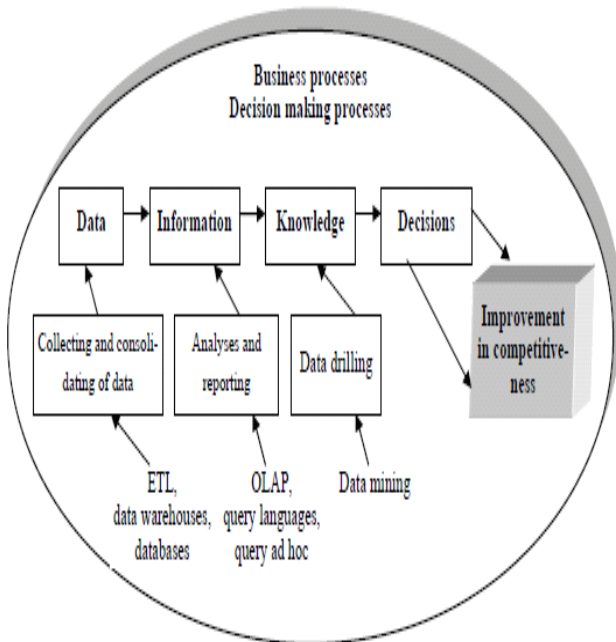

Fig. 1 The Role of BI in decision making

A business intelligence system allows managers to make decisions using real time data by monitoring competition, carrying out constant analysis of numerous data. Considering different variants of organization performance, data is extracted from operational databases, customer databases, and from data collected pertaining to the competition. The business intelligence system extracts this data from these various data sources, transforms it into specified formats. Then BI loads the newly formatted data into specially designated data warehouses that are available to all three levels of decision making within the organization: operational, strategic, and tactical as shown in figure 1.

Each level of the organization utilizes different OLAP techniques and data mining process to analyze data and report information that is most relevant to them. The information generated from the business intelligence system will be used in all decision-making processes. At the strategic level, decisions set objectives and push the decision to the tactical level of the organization. At the tactical level the information is mined from the business intelligence system and develop tactics to realize the strategic objectives. These results are in-turn, will push a decision down to the operational level of the organization. Both the tactical and operational levels of management are reactive to the strategic decisions of the organization.

Data and decisions flow in an organization: Organizational decision flow with a shared objective and different levels of the organization will utilize information for different purposes. At strategic and tactical levels, information provides input to senior managers, operational levels, and also provides input to lower level managers.
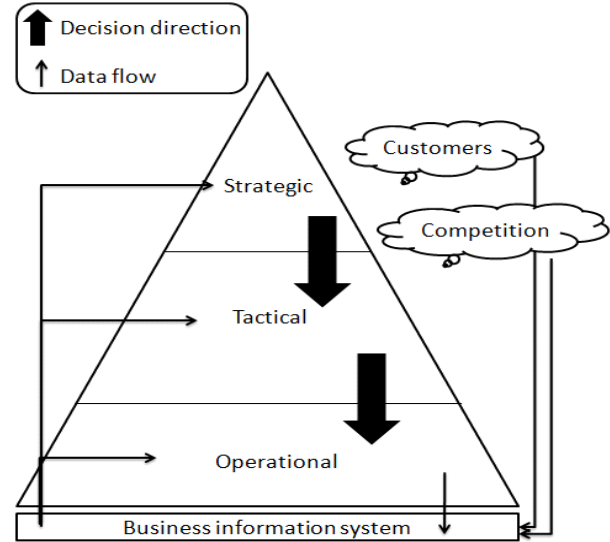

Fig. 2.. Organizational decision flow overview

A. Operational level decisions

At the operational level, decisions affect or are related to the ongoing operations of an organization as shown in figure 2. These decisions are generally based on up-to-date financial data, sales in addition to co-operation with suppliers and customers. Data are the life of daily operations in an organization and business intelligence takes that data to presents decision makers the required form of information otherwise difficult by manual and verbal means. Business intelligence systems provide information used at the operational level of an organization to address the following specific actions :

1. Categorize problems and deadlock.
2. Provide analysis of "best" and "worst"
3. Provide analysis of products
4. Provide analysis of employees
5. Provide analysis of metrics such as sales, costs or quantifiable results.
6. Perform ad-hoc analysis and answer questions related to departments' ongoing operations, up to date financial standing and sales.

Operational level decisions are noted as being the decisions that allow an organization to run its routine activities .The information provided by the business intelligence system is at a summary level and the data feed into the business intelligence system from the

operational level of an organization is analysed and combined with other external information to create direction and allow for strategic planning to emerge.

B. Tactical level decisions

Decisions made at the tactical level are related to planning and rely on real-time data and forecasting to direct the future actions of marketing, sales, finance and capital management. Tactical decisions are often used to support strategic decisions. The literature details these related tactical decision-making activities as being supported by business intelligence systems:

1. Analyses of deviations from the realization of plans for particular organizational units, individuals or indicators.

2. Decisions pertaining to the direction of marketing, sales, finance and capital management

3. Forecasting of demand for a product or service the information derived through these activities allows for optimizing future actions and for modifying organizational priorities time to tiem.

C. Strategic level decisions

Strategic level decisions set objectives as well as ensure that those objectives are realized. Business intelligence systems provide information in support of strategic decision related to the development of future results based on historical results. The profitability of offers and the effectiveness of distribution channels focus on strategic decisions in using business information systems to create forecasts based on historical data from the past. Combining all the above aspects to study the current performance and then to estimate how conditions will play out in the future. Based on the literature, information provided by BI systems inform these kinds of decisions made at the strategic level.

IV. FRAMEWORK OF BUSINESS INTELLIGENCE

The framework can be an efficient method to validate the requirements of a project, as a way to detect any faults and discrepancies against the requirements of the project. In the case of BI, the framework allows evaluating the capabilities of this technology through data access and analysis that can assist in organizations decision making [6].

We intended to develop a framework that exemplify and simplify the applicability of the BI as a driving force for SMEs to bridge the gap between theoretical knowledge and practical use of a tool for decision support. The exploration of the historical data of customers with BI tools will facilitate decision-making and planning strategies through the use of techniques for extraction. T h e processing

and visualization of data and exploitation mechanisms of large volumes of data, enhances the analysis of unknown patterns, which constitutes an important advantage in understanding the business processes [8].

The BI Stack: The Framework endeavor to encapsulate and promote the newest trends and tools in Business Intelligence that include:

- Integration with "real-time" operational systems via message-based architectures or Enterprise Service Bus for improved operational visibility and automation.
- Closed loop integration - Analytics trigger automatic processes.
- More pervasive presentation and usage across the organization, using web 2.0 capabilities.
- Architecting for elevated performance analytics, critical for explosive data growth. This includes addressing and optimizing the entire end-to-end BI stack; and use of specialist streaming analytic appliances where ever appropriate.

The vendor-independent methodology for BI implementation is an accumulation of experience, preeminent practice and existing methodologies. It includes the following structured project phases with an iterative approach to validate results and ensure early business feedback and buy in.

The framework is structured as shown in Figure 3. Currently, the providers of BI tools have some BI tools priced within the reach of SMEs, some of these being available online. The next phase, intelligence, must be taken into consideration that one of the most important aspects of a BI project is determining what needs to be evaluated, and how to be assessed. Thus, one should define the critical success factors of the business, and are determined for each of these metrics appropriate for measuring assess what is running and creating the appropriate alerts. These metrics will support the architecture of the BI solution. SMEs have the advantage in defining the metrics, since they have a comprehensive and detailed knowledge of the business.At last , the dissemination should in principle be the simplest process, unless the previous phases have not been successfully performed. At this stage it is essential that users of the system known to interpret the test results obtained. Figure 3 depicts the layered approach of BI with layers such as presentation, performance management , Analytics, Data Integration and infrastructure with a logic of feedback approach.
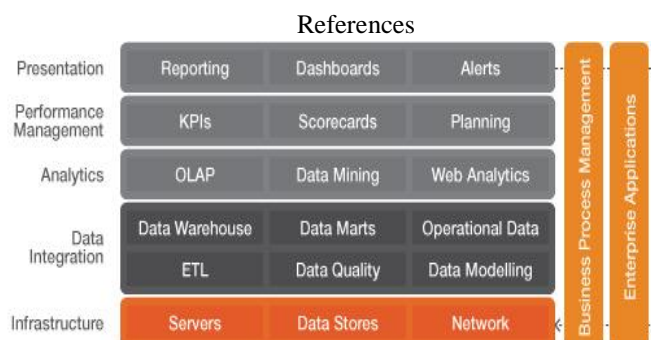
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Fig. 3. Framework for BI implementation.

V. CONCLUSIONS

The Due to the increased volume of data in the organization, the BI has become vital aspect for any company, whatever its size, and is essential for decision making.

For SMEs it is essential to line up its strategy for growth supported on the appropriate management tools. The use of software applications outdated by companies could be the booster for radical change that SMEs need to face the changing markets and technologies. Due to the size and specific characteristics, negotiation power of SMEs is limited. The choice of a suitable BI system is strategic, allowing companies to take advantage of advances in technology. This paper focus on how BI would be able to resolve difficult decision making exercise in enterprises.

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