



BUSINESS INTELLIGENCE FROM E -CONNOTATIONS TO TECHNOLOGICAL TRENDS

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Abstract

This article shows most of the E -connotations when approaching the Business Intelligence (BI) field not just as methodology but also as practical implementations meant to serve as a support for organizational decisions. In the last part of the paper the focus is moved to nowadays technological possibilities and trends related to Business Intelligence. Some aspects as the specificity of BI applications, their promises, the problem of real-time response and some other limitations and resolved issues related to their capability to respond to ad-hoc organizational changes by changing their behaviour and feed-back are taken into consideration.

Keywords: Business Intelligence, E -Connotations, Efficiency, Effectiveness, BI Application Interface, Trends, Limitations

JEL classification: O33

1. INTRODUCTION

The main objectives of this paper are to identify the reasons for which BI should be regarded as more than a fancy word and moreover to explain why it should not be limited to the world of business applications.

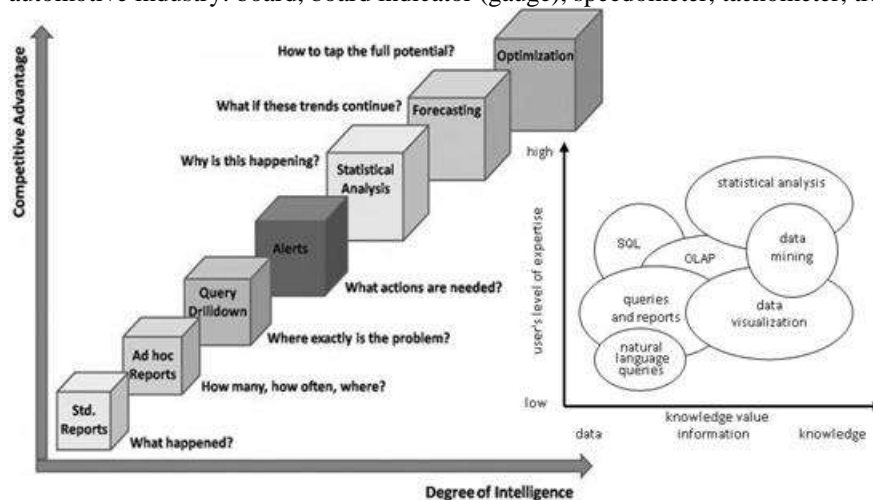
The research methodology was involved when choosing appropriate definitions of various terms related to BI based on a bibliometrical approach (Homocianu, 2009, p. 79-80) and also when testing / quasi-experimenting on the representation possibilities of some on-line tools put together with those of some off-line applications all related to BI and available today (see fig.4). We have used them in cascade: an output of the first one was an input for the other (City Audit, 2013, pp. 27-29, 49-50, 55).

BI is a term (Power, 2005, p. 1) introduced by Howard Dresner (Gartner Group) in 1989 in order to describe a set of concepts and methods meant to improve business decision making by using fact-based support systems. In the '90s, the BI notion was used interchangeably with terms such as: briefing books, reports, query tools and Executive Information Systems (EIS). BI gives to any organisation the ability to extract/report on essential information out of large volumes of data and to use this in order to make effective business decisions. User friendly, scalable, flexible, rapidly deployed and low cost BI reports can be designed the way that they do not hamper operational system efficiency. Those reports can be updated automatically and they are accessible by using any web-browser (Oracle, 2007, p. 4).

Decision Support Systems (DSS) are related to BI. IS researchers and technologists have built and investigated DSS for almost 40 years and they have organized DSS applications into five large categories (Power, 2009): 1) Communications-driven (based essentially on groupware); 2) Data-driven (warehouses, OLAP and query tools); 3) Document-driven (scanned and hypertext documents, images, sound and video); 4) Knowledge-driven (expertise and Artificial Intelligence); 5) Model-driven (financial, quantitative, multi-criteria, optimization and simulation models).

In general, BI Systems are considered EIS (one "E" connotation) or data-driven DSS (Power, 2007, p. 1). Many solution providers and some theoreticians go further and tend to put the capabilities of the applications (degree of intelligence/knowledge value) in direct relation with the competitive advantage gained due to these traits, respectively with the user's level of expertise (see fig. 1).

The user interface is one of the key components of the BI applications because the insight into or the understanding of a state/dynamics of the organisation depends on that. Most the BI applications available on the market nowadays use representation concepts such as: Dashboard, Scorecard and Key Performance Indicator - related somehow to those in the automotive industry: board, board indicator (gauge), speedometer, tachometer, traffic lights.



Source: [Aurich Consulting, 2013, p. 1]; [Homocianu, 2009, p. 177]

Figure no. 1 BI as a result of the relation between: Degree of Intelligence<->Competitive Advantage and between: Knowledge Value<->User's Level of Expertise

The recent emergence of the ultra-mobile computer technology replacing many functionalities of the traditional desktop/laptop computers and being able to deal with most of the on-line applications designed with advanced assistance features add extra support for the presentation level of the BI applications.

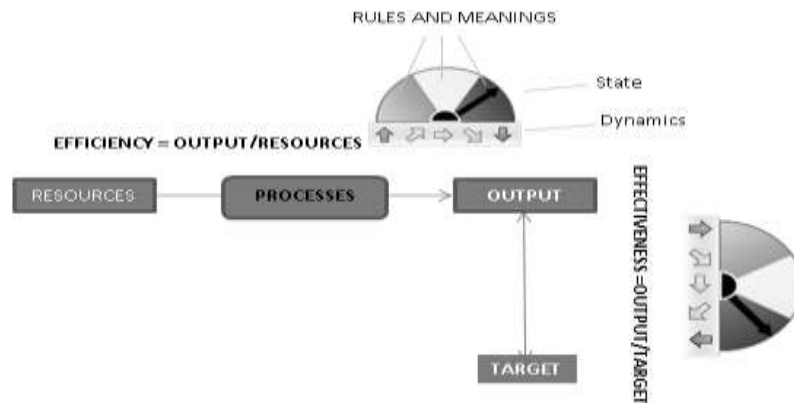
2. TRADITIONAL “E” CONNOTATIONS

It seems that the E-business term was used for the first time in 1997 (Rouse, 2005, p. 1) by the IBM managers – secure, flexible and integrated access in order to run different business by combining processes and systems that execute basic business operations with those that make finding information on the Internet possible. Another term, launched this time by the Hewlett-Packard Company (Centrul de calcul, 2013, p. 1) in 1999, was that of E-service meant to offer complete solutions for E-business consisting in hardware, software and consultancy. An E-business is a company that has an on-line presence. An E-business that has the ability to sell, trade, barter, and transact over the Web can be considered an E-commerce business (Kidd, 2012, p. 1). Other “E” connotations are related to some conditions:

- Adapt to Ever-Evolving market conditions;
- Keep into account the context of the new Information Economy;
- Use intranets, extranets, and business-to-business E-commerce (Electronic Commerce).

3. EFFICIENCY AND EFFECTIVENESS - KEY TERMS IN BI

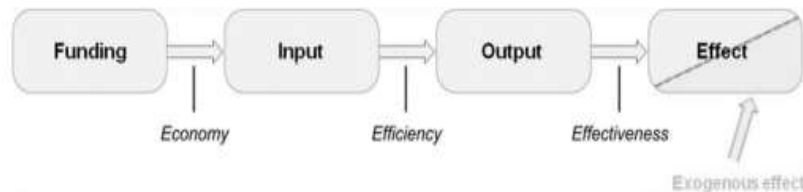
There are many discussions on these two concepts (another two “E” connotations) and their corresponding indicators as well as on how to optimize them both at the same time. Anyway, performance measurement (CBSolution, 2011, p. 1) is the basis of any goal in management. The practice confirms that usually, we cannot manage what is not measured. Effectiveness and efficiency are two broad categories of performance indicators (see fig. 2). Effectiveness indicators measure the extent to which targets were reached. They relate actual values to expected ones. Some examples are: actual vs. expected sales, project overrun, etc. Therefore, effectiveness indicators require a plan in order to reach a target. Efficiency indicators show how well resources (people, money, machines) were used in order to generate output (products, services and profit). They include traditional financial ratios such as profitability, turnover (generic) and more specialised measures such as: work hours per unit, incidents per work-month, etc. In most cases, when we try to be effective, we will surely compromise efficiency. To increase the sales volume, for example, we can develop the campaign investment (increasing cost/sales) or we can lower the unit price and thus profitability. Because of that, the use of a balanced mix of effectiveness and efficiency indicators is usually the best choice.



Source: [CBSolution, 2011, p. 1]

Figure no. 2 Effectiveness and efficiency

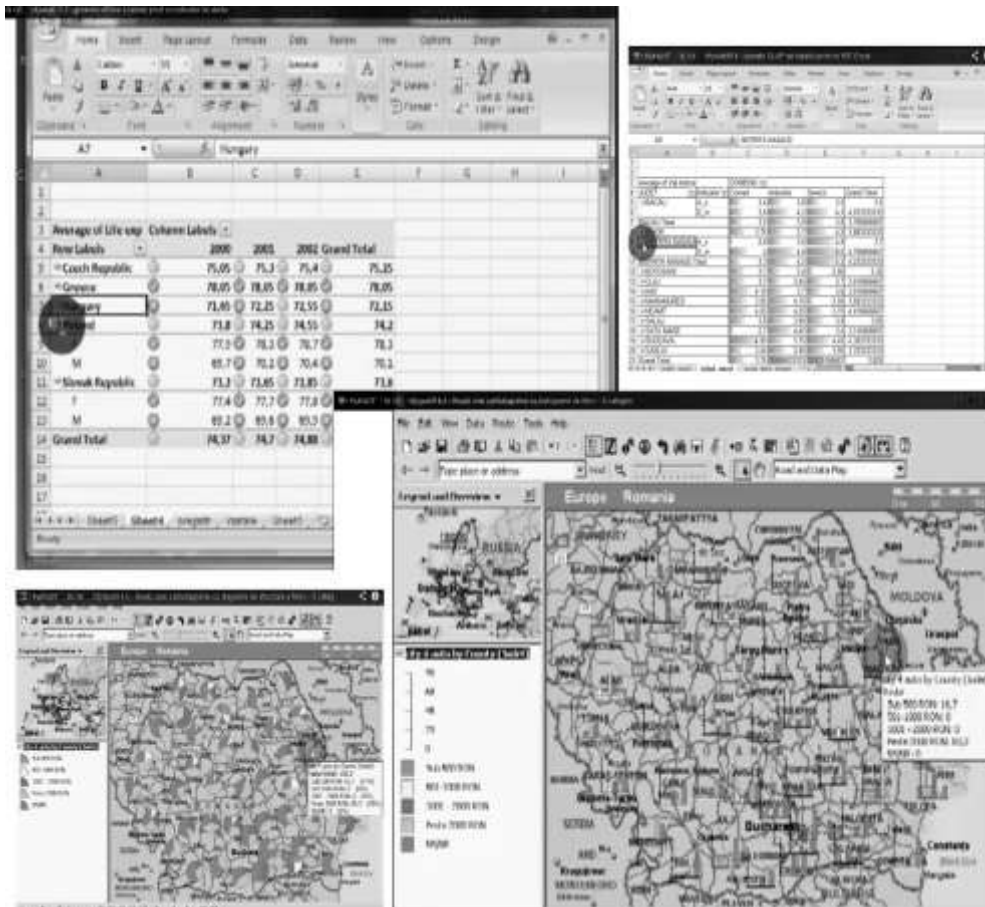
The value-for-money analysis proposes four stages referring to a certain type of asset (see fig. 3). Gradually, the asset is transformed from one type of value into another.



Source: [Capgemini, 2010, p. 31]

Figure no. 3 Effectiveness and efficiency - the value-for-money analysis

The value creation starts with funding - financial means needed to set up and execute the value creation process. The Funding can be raised based on a budget assignment by the organization or based on revenues from earlier activities. The value creation continues with the input asset comprising the production means (buildings, machines, tools, staff and intermediate products) needed to create products (output). The output can either be finished products which are delivered to the organization or other products as parts of the output (intermediate) and used as new input means to improve productivity. The effect occurs at the end of the value creation process when products will have an effect on the organization. This effect will change the capabilities of the organization and will enable them to create added value. The transition from one type of value towards another type of value is an important driving factor for the amount of value which is created by the process. Well organized and optimized transitions will enhance the added value for the organization (more value-for-money). The Economy transition turns financial means into production ones, a good transition implying lower financial costs. The Efficiency transition turns production means into (intermediate) products and is about planning and assigning the right resource to a specific task in a smart manner. The Effectiveness is the transition from products to the actual effect within the organization.



Source: [City Audit, 2013, pp. 30,54,58,59) (nesstar-demo.nsd.uib.no/webview/;
www.cityaudit.ro - Studies section]

Figure no. 4 Microsoft BI reports (MS Excel and MapPoint) with advanced representation rules generated starting from web-based OLAP environments

In relation with both concepts, the tabular representation format of data (since early '50s) gave the possibility to compute their corresponding indicators. The suggestive colourful representations that followed – as conditional formatting with additional types of rules, alerts with meaningful metaphors (see fig.4) were possible from the very beginning and their absence was not due to apparently continuous lack of inspiration/imagination but was conditioned by the computing power of the time (they were implemented after at least half a century).

Combined with pivot table and OLAP functions which offer the possibility to drill and synthesize in a multidimensional way (see fig.4) and being part of many on-line and off-line applications available today, this kind of representations can give a lot of insight on business processes and their cause-effect relation as snapshot and dynamics.

Moreover, at the moment, there are tools and technologies that claim (Oracle, 2012, p. 1) to: (1) enable organizations to define strategic goals and objectives that can be cascaded

to every enterprise level; (2) ensure that individuals are tracking the right metrics in their reports in order to achieve better business performance; (3) include proven, leading BI and data warehousing technology that delivers a full range of analyses and reporting capabilities; (4) combine both rules and predictive analytics to power solutions for real-time enterprise decision management; (5) enable the delivery of effective management and financial analytic reporting to a broad user community by facilitating the real-time or on-demand transfer of financial information; (6) provide enterprise data discovery platforms for advanced, intuitive exploration and analysis of complex and varied data.

4. DASHBOARDS & SCORECARDS AS PART OF BI APPLICATION INTERFACE

The Balanced Scorecards provide a means to link the strategies of various economic subfields in an overall corporate vision. The term and the methodology were introduced in 1992 by David Norton and Robert Kaplan - Harvard Business School, which found that the regular financial reports from most companies did not provide sufficient information or the right information (Kaplan *et. al.*, 2006), suggesting that they were not focused on the key performance indicators - KPIs (Rasmussen, *et. al.*, 2002). Together with other techniques, KPIs are also used to synthesize more information and provide significant support for managers in their daily activities. Some KPI examples (Morrison, 2007, p. 1) are: average number of responses for open job positions, average time to recruit (Human Resources), number of safety inspections for the month, number of fatalities/hours worked (Health and Safety), water used per volume of manufactured goods, energy costs per unit of production (Environmental). The most modern BI systems currently have many facilities required in order to load and input all necessary data to create a scorecard. They also provide possibilities for automatic generation of reports, analytical and graphical features. A BI dashboard, as claimed by Stephen Few (Few, 2004, p. 3) in the article Dashboard Confusion, is a visual display of the most important information needed to achieve one or more objectives, consolidated and arranged in a single screen, so that information can be monitored at a glance. While the dashboard in the automotive industry is a compact form of control panel near the windscreen car containing indicators and dials such as tachometer, speedometer, odometer and fuel gauge, a BI dashboard provides all critical information needed to run a business. Basically, it is used in many cases when it is necessary to make strategic decisions for a large corporation or to accomplish the daily operations of a team or individual. Therefore, the essence is a display on a screen and the purpose to efficiently stay in touch / maintain contact with the information needed for carrying out different tasks.

The form of dashboard for executives (Executive/Manager Dashboard/Cockpit) is the continuation of what back in the '80s was referred to as EIS. These systems, as their web-based successors, had the same goal of providing critical information to decision makers and to improve organizational performance.

Table no. 1 Dashboards vs. Scorecards

	DASHBOARD	SCORECARD
SHORT DEFINITION	Performance Monitoring System	Performance Management System
MAIN PURPOSE	To measure the performance	To chart the progress
DECISIONAL LEVEL	Tactical - short term decisions	Strategic - long-term decisions
USERS	Managers, stuff	Executives, managers
BUSINESS REPRESENTATION	Snapshot of business performance	Changes/Trends in business activity
FOCUS ON	Tactical/Operational goals	Strategic plans
DATA	Events	Summaries
UPDATES	Real-time	Periodic
TOP-LEVEL DISPLAY	Charts and tables	Tables, symbols and icons
TECHNICAL COMPOSITION	Collection of reports/modules	Collection of KPIs/metrics

Source: [Bradley, 2010]; (Anastasakis, 2012); [Microsoft, 2013]

Although some authors (Popp, 2008, p. 1) use both terms (dashboard and scorecard) alternatively to designate various types of analytical software used for performance measurement, there are some significant differences (see table 1) between these two categories mainly determined by: purpose, users, update mechanism, source data and visual displays.

5. BUSINESS INTELLIGENCE TRENDS AND LIMITATIONS

There are voices who claim that the future of BI lies in predictive analytics (Stackpole, 2010, p. 1). But that surely means a more profound relation with Data Mining, Artificial Intelligence, Web, Portals and also with their corresponding applications. Intensely used in simulations, the head-up displays also represent the future for BI applications. There are already some which turn a few mobile devices into real projectors on the reflection principle. The evolution of the augmented reality techniques and also of the manner in which information could be presented when mixing a panoramic scenery with the complex pellucid presentation of various types of information (id, news, business, weather, location, traffic, functionality parameters) turns the head-up displays into a competitive real-time interface not only for business but for any science with an exploration nature such as medicine, marine, astronautics, etc. Most of the current business software applications do not benefit from advanced graphical user interfaces with more than two axes of representation and flexibility in customizing and refreshing the output. When speaking of BI applications, the user interface is more advanced mostly due to the solved need for alerts. But they still lack in advanced features and data analysis possibilities available in the entertainment and forensic fields (e.g. 3d simulators). These are rather conceptual limits than impossible to overpass.

But the big problem in BI applications is still the one related to the waiting periods needed to process large volumes of current or historical data for analysis in order to refresh the executive's screen that must contain valuable predictions. Unfortunately, this can be resolved just partially (physically) either by improving the storage speed - eventually by storing in circuits (in-memory technologies) or by supplementing the processing power with additional units - the multi-core technique solving the short-circuit barrier of the nowadays binary processing units.

6. CONCLUSIONS

With a solid relation to many fields of science and technology, BI rapidly evolves in order to make everything more ergonomic and more useful to the omnipresent and omniscient human being.

Beyond our general arguments and connotations about BI stands the fact that any technology adoption takes time and a user will be satisfied with such a technology as long as it is useful but, more importantly, not disruptive. As its words suggest, the BI value is in fact given by the value of the insight produced by images, graphics and visual tools for interpreting data. And those must be supported with any kind of devices and technologies available.

The contribution of the authors mainly consists in examples of representations tested with on-line data samples, parallel analysis of key terms and various explanations on BI expectations, advantages, limits and trends, all intended to sustain the purpose of motivating why BI is of such a great interest today.

Acknowledgment

This work was supported by CNCISIS-UEFISCSU, project number PN II-RU code 188/2010.

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