

Achieving Business Process Change With Improved Business Intelligence Systems: A Case Of Slovenian Company

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Abstract: - In today's competitive marketplace, companies must focus scarce resources on the strategies most likely to yield success. Business Intelligence Systems (BIS) help them achieve this focus giving the complete vision to learn from the past, monitor and communicate the present, and gain insight into the future. Depending upon the level of BIS maturity companies have different information quality they can base their decision upon. The better the quality of information, the more sound business decisions companies can take and also appropriately carry out business process change for improving their performance. For all these reasons, we try to show throughout a case study, how BIS enhancement contributed to business process improvement in a Slovenian transport company.

Key-Words: - Business Intelligence Systems, Information Quality, Business Process Change, Information Technology

1 Introduction

Over the past decade, companies have faced unprecedented change: globalization and internationalization, rapid advance of information technology, higher value of competition, increased availability, and flexibility of products [5] as well as greater customer demands [17]. Therefore, the need for timely and effective business information for sound business decisions is nowadays recognized as essential not only to succeed, but even to survive [15] on competitive global markets. Information is thus a key resource of the organization and a business issue [18]. Business Intelligence Systems (BIS) present business information in a timely and easily consumed way. Furthermore, they also provide the ability to reason and understand the meaning behind business information through, for example, discovery, analysis, and ad hoc querying [15]. As already observed by Popovic et al. [22], BIS can also act as input for business processes change projects within companies.

The purpose of the paper is, therefore, to show how the introduction of enhanced BIS can enable business process change and thus contribute to improved business performance.

2 Literature review

2.1 Business Intelligence Systems (BIS)

BIS are referred to as an integrated set of tools, technologies and program products that are to collect,

integrate, analyze and make data available [23]. Their main purpose is to hold quality information in well-designed data stores, coupled with business-friendly software tools. These provide knowledge workers timely access, effective analysis and intuitive presentation of the right information, enabling them to take the right actions or make the right decisions [1], [22]. There are several possible application areas of BIS. Some of the most frequent uses include business performance management, outcome analysis, internal reporting as well as reporting to external institutions, support for process and strategic plan execution, support for critical success factors analysis, support for balanced scorecarding, customer relationship management, supply chain management, risk management, product and service profitability analysis etc. [1], [16], [20], [22].

2.2 Information quality (IQ)

Quality of information, defined as characteristic of information that meets functional, technical, cognitive and aesthetic requirements of information [10], is the key element in business process management. Many conceptual frameworks of information quality abound in management-, information-, and communication literature [19], [7]. Their main purpose is to help academics and organizations to find criteria according to which information can be evaluated, to provide frameworks to analyze and solve information quality problems and basis for information quality measurement, as well as to provide the research community with

research map that can be used to structure a variety of approaches [10]. As an example, Lillrank [14] argues that information in order to satisfy producers, administrators, and consumers, must be provided at the right time, with relevant and sound content, in the right format and at reasonable costs. Furthermore, quality information enables results follow-up, on-line process analysis and control, and consecutively dynamic adjustment of organization [10].

Information quality measurement frameworks have also been developed in the past. Forslund [12] established four information quality variables: time, accuracy, access convenience and reliability; which were tested in an industry. The author brought into being that variable in time is the lowest ranked variable, whilst accuracy represents the most important for information to be as qualitative as possible [12]. Another study was done by Eppler [11], who defined information quality framework consisting from 16 criteria divided into four levels, which cover all aspects of information quality. Nevertheless, all levels are important we will explore in this article information quality change from the process level, which covers convenience, timeliness, traceability and interactivity criteria of information (see Figure 2).

2.3 BIS maturity level and IQ improvement

Melville et al. [16] stressed the importance of information quality for proper business decisions. Companies that are interested to improve information quality should orientate towards the development of information technology infrastructure that will represent a holistic approach to business processes [28]. The level of advance of such infrastructure or system can be called maturity of such system. BIS maturity can be defined as ability of BIS to provide quality information and ability of using quality information to improve business processes and ultimately performance (i.e. ability of BIS exploitation). Hence, we can conclude that implementation of new information technology has positive effect on the BIS maturity.

The ability of development of BIS depends on various factors, including (but not limited to) [1], [20]:

- Industry. For information intensive industries (e.g. retail, telecommunications, banking, and insurance) BIS have greater potential.
- Competitive business environment. In more competitive environments organizations need more flexibility and exploitation of possibilities provided by IT.
- Readiness for business process change. Process-oriented organizations, where business process change readiness is greater, will convert possibilities offered by BIS into actions sooner (because of promptly

available information) and easier (due to comprehensiveness of information).

- Business orientation of business intelligence environment development. When development of BIS is technology rather than business driven and when as such does not derive from organization's strategic goals there is high probability that even a first-class BIS will fail to contribute to business performance and will remain unexploited.

Recent studies have also noticed that a higher level of BIS maturity enables the company to exploit improved information quality [8]. For example, IT deployment enables the seller/supplier to process information faster, more accurately and reliably to the customer [13]. Electronic Data Interchange systems have been recognized as an enabler of direct implementation benefits, such as, reduced transaction costs and higher information quality [31]. For these (but not limited to) reasons we can state that higher BIS maturity level achieved with implementation of information technology enhances information quality.

2.4 BIS enabling Business Process Change

As already explained before, implementation of information technology facilitates a higher BIS maturity level. For that reason improved IT processes such as gathering data only once, integrating cross-functional systems or increasing information speed to customers, enable radical business process change [3]. Business value of BIS does not hide in better information quality but in improved business processes as a result of improved information quality (Figure 1) [22].

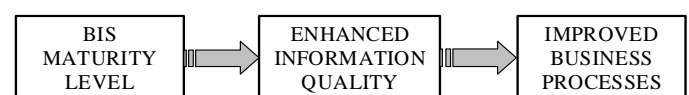


Fig. 1. From BIS maturity to improved business processes [22].

There are several options for the company to exploit better information quality and improve business processes. These can be recognized as improved information processes (shorter delivery times), business performance management (including business process change and optimization), supply chain optimization, changes in retail processes (customer segmentation, campaign management), cross selling and changes in management processes (planning, decision taking, human resource management). Another important option is that information workers can take business decisions at different stages of business processes. Moreover, Tracey et al. [26] argue that companies with high level of manufacturing technology, good decision support

system, and strategy interaction achieve higher level of competitive capabilities (price offered, quality of products, product line breadth, order fill rate, order cycle time, order/shipment information and frequency of delivery). Based on these factors, positive connection between improved information quality and changed business processes can be established.

Based on previous described theoretical and practical knowledge, we will in the following case study describe how implementation of information technology (GPS) changes the BIS maturity level, which consequently improves IQ. Quality information enhancement is therefore the one of the key factors that affects business process change as final outcome.

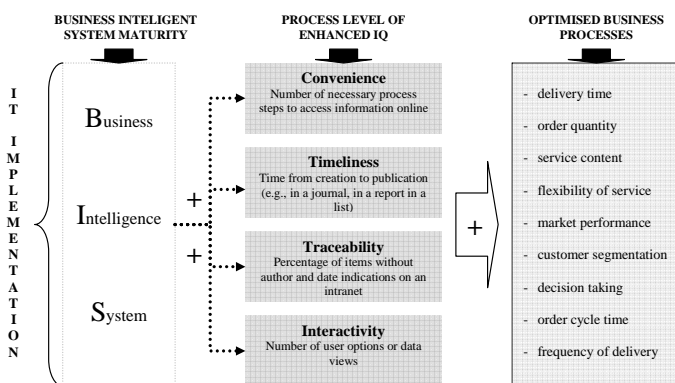


Fig. 2. Connection between BIS maturity, enhanced IQ and improved business processes.

3 Research Methodology

To achieve the main objectives of this research, an exploratory case study method was adopted. Generally, case study is a research method which focuses on understanding the dynamics present within single settings [9]. According to Yin [30] exploratory case study can answer exploratory, descriptive or analytic research questions. Therefore, it can explain, describe, illustrate, explore or evaluate the studied social phenomenon without prior definition of research questions and hypotheses.

We consider this study to be exploratory for three reasons. First, exploratory research methodology is used when not much is known about the situation at hand [4]. Second, exploratory research is useful in clarifying issues surrounding a phenomenon, to gain an understanding, to help in analyzing and in problem definition [32]. Third, exploratory research is appropriate in a topic which has no established theoretical base or methodology [6].

3.1 Case study description

3.1.1 Background of the company

This study is based on successful Slovenian transport company that has been operational on European markets for more than 25 years. After Slovenia became a member of European Union the company faced strong international competitive pressure. This has weakened its market position, and, in order to fulfill customers' diverse demands, the company reorganized internal processes with adoption of internal information system. For that reason, this company is a good example of winning survival on global markets by orientation towards use of information technology. The company is in private family ownership and operates with 33 vehicles (road trains and mega trailers) that are their main business assets. According to limited market capabilities, high degree of competition and global orientation, executive board decided to improve internal information processes by implementation of Global Position System (GPS). GPS allows the company to monitor position of its vehicle at any time; it records average driving speed of the vehicle, stop positions; and enables simple communication of the driver with the transport office. Thus, transport organizers, who deal with various customer demands, are able to give up to date information of the location and predicted collection or delivery time. The investment soon showed positive effects through increased efficiency, shortened delivery times, and better flexibility of the company for customers' demands.

3.1.2 Data sources

Research was carried out with use of qualitative methods from multiple sources [9]. To assure well grounded and solid findings [2] data were collected by three different sources: (1) semi-structured interview with logistics manager, (2) archival materials from company's archive; especially all available records about global position system as well as documents about quality system and (3) observation. Summarized illustration of all data sources used is presented in Table 1.

Source 1	Source 2	Source 3
Semi-structured interview: - Logistics manager	Company's archival materials: - Annual financial reports - Customer satisfaction surveys - Annual review reports - GPS booklets - Transport reports	Office and field observations: - Office observation - Full explanation of system function - Participation in actual transport organization - Study of the system in the vehicle

Table 1. Data sources used in case study.

4 Problem Solution

This case study looks at BIS maturity level and business process change after adoption of GPS technology. Internal and external drivers triggered formerly described transport company an implementation of GPS, with main intention to offer a support in managing transport process. After the implementation quality of information has noticeably changed which consequently affected decision making strategies and thus initiated rigorous business process changes.

The understanding of business process change is based on enhanced IQ from the process level [10] described through the following factors (see also Figure 2):

- Convenience – Does the information provision correspond to the user's needs and habits?
- Timeliness – Is the information processed and delivered rapidly without delays?
- Traceability – Is the background of the information visible (author, date etc.)?
- Interactivity – Can the information process be adapted by the information consumer?

Information quality is extremely important especially due to vast customer needs and demands (location of the goods, time of delivery...) that need to be fulfilled by the company. Therefore transport organizers have to assure on time and right information as well as transparency and ability to trace the background data of information. All these process level factors of information quality are key enablers of further BPC. For all these reasons, we describe in the subsequent paragraphs the change of BIS and IQ after adoption of GPS and its impact on business process change.

4.1.1 The situation before implementation

In the time before the implementation of GPS transport process was not carried out with support of any core information technology application where the data would have been stored or prepared for further use. Monitoring of vehicles was done by regular calls of the drives that did not even have always available mobile phone. Thus, driving speed and working hours of the driver as well as other important information, that are important in this process were not properly monitored. Moreover, for storing all the data only paper forms were used, that were hardly ever looked at for further analysis. Hence, company was not always able to assure qualitative, accurate and up to date information about the location of the vehicle, predicted delivery and pick up dates as well as times. The most frequent information quality difficulties from the process level are explained furthermore in Table 2.

Information quality before the implementation was very poor, not only because of lack of information but also because of inability to make further analysis, reports and ad-hoc queering. As a result management in many situations accepted mistaken decisions that had consequently weakened company's competitive position. For these reasons we can identify companies' BIS on the level of "Child" which reflects system equipped with spreadsheets with poor control over the content and display of information [24]. In this stage information is primarily exploited by user and used for answering different types of questions and analyzing only historical trends [24].

Convenience	Timeliness	Traceability	Interactivity
- not right information	- not at right time	- date was not visible	- information is available to
- not whole information	- not fast enough as required	- author was not visible	- only one person
- very poor convenience	- delivered with delays	- person responsible was not visible	- information is not representative
	- to long to process the information		- no transparency

Table 2. Information quality difficulties.

All these aspects triggered the company to implement GPS, recognized as an effective tool for measuring various types of traffic data [29], which was installed inside of the truck and connected through software application to transport office. Transport organizers were able to monitor transport process fully, which thus reflected in rigorous business process change.

4.1.2 The situation after implementation

Company has first decided not to implement GPS in all trucks concurrently. This has therefore soon brought positive effects, whilst the comparison of information support when conducting transport before and after adoption of GPS was possible. The most important changes are explained below:

- driving speed and working hours are monitored the entire time,
- driver has full communication with the transport office,
- information is completely up to date,
- information is entirely stored and available in electronic shape,
- information is prepared for further analysis and reporting,
- transparency of information is very enhanced, while it is available to more users alongside,
- date and author of created information is visible,

- paper forms are no longer needed, while software application enables to make instant queries.

GPS adoption enabled the company to enhance monitoring, analyzing and using information available. Hence, users equipped with this powerful BI tool created new views, analyses and reports more quickly than ever. This has, thus led BIS maturity to higher level called “Teenager” [24] which severely improved quality of information. Information has consequently become not only available when required with no faults but also transparent with all other background data visible (see also Table 3).

This has led the company to experience severe business process change, which reflected mostly on transport process. Improved information quality enabled company’s management and other important members in the process to improve times of delivery; order quantity plans as well as flexibility of a service. Order cycle time has shortened, which has, therefore, increased frequency of delivery. Electronic stored and analyzed information grounded first attempts of a customer and supplier segmentation. Simplification of report preparation as well as transparency of information facilitated qualitative foundations for decision taking. This has consequently soon reflected as improved competitive position and overall market performance.

Convenience	Timeliness	Traceability	Interactivity
- information reflects users needs	- up to date information	- date is visible	- information is available to more than one person
- complete information	- available when required	- author is responsible is visible	- information is completely representative
- trustiness in information is very high	- no delays in delivery	- all other characteristics are visible	- high level of transparency

Table 3. Information quality improvement.

4 Conclusion

In the paper we showed how enhanced BIS maturity positively affects information quality upon which companies can base their decisions and how this can be applied towards business process change.

After implementing the GPS system into Slovenian transport company, presented in the case, BIS moved from “Child” to “Teenager” level of maturity. This shift brought out enhanced IQ on the process level, specifically improved convenience, timeliness, traceability, and interactivity (see Figure 3) of the information. Among the four process level criteria most improvements were noticed by complete information availability to information users (convenience) and up-

to-date information, delivered with no delays (timeliness).

To exploit the enhanced IQ at its best, companies have to be ready for business process change. Process oriented companies, where business process change readiness is greater, will convert possibilities offered by BIS into actions sooner and easier. However, for enhancing IQ companies need to move to a higher level of BIS maturity. The fact is that some transitions between certain maturity stages of BIS are more exacting than others and that is why companies come to the question of when it is reasonable to invest into BIS and thus move to a higher level of its maturity [22].

Based on our findings we would like to emphasize the following critical factors for successful introduction of BI systems:

- BIS introduction and development has to be based on decision support strategy of the company as a whole.
- Since business value of BIS derives from improved business processes based on better information quality [22] it is mandatory for its achievement a proper culture for business process change.

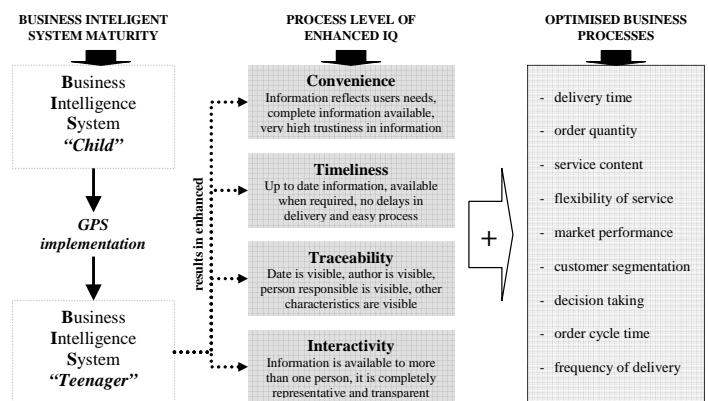


Fig. 3. Connection between BIS maturity, enhanced IQ and improved business processes.

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