

The UML Model of Business Intelligence System in Increasing Corporate Performance

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Abstract

In the new environment of open economy and high competitiveness on the market of products and services, the operation of companies must be based on information-based structure.

To a large extent, of a company's performance depends on how well its business processes are conceived and coordinated. Business processes can be a source of competitive advantage if they allow the company to be more innovative or to perform the activities better than other competitors. Also, business processes can have negative effects if they are based on the traditional ways of working that impede the company's rapid response and efficiency. From that point, companies must evaluate their information systems: whether they represent a strategic business tool to achieve the main goal of the company, whether they only support or are an integral part of business processes, and so on. Modern-day information systems and information technology automate many steps in business processes and modify the flow of information, allowing parallel execution of multiple activities and efficiency in the decision-making process.

The world has become a "small village" with a highly competitive environment that provides opportunities for rapid growth in profits, but also a quick way to failure. From that point, business intelligence is an important tool to support both functional and business and corporate strategy.

In this article, a system for business intelligence based on UML language will be applied for inventory management process as part of the input logistics value chain in order to optimize corporate performance. UML modelling should allow tracking warehouse inventory, analysis and disclosure of the reasons for their effectiveness or ineffectiveness. In particular, it should enable top management to report on key performance indicators, such as: inventory accuracy, the accuracy of deliveries, the percentage of deliveries made on time, the time of execution of the order, the availability and turnover of stocks and so on. The main purpose of the application of modelling inventory is to adapt to the continuous changes in the environment and improvement and/or innovation of this business process.

Keywords

UML, modelling, business processes, logistics, inventory, performance.

1. A need to introduce business intelligence strategies to companies

Business intelligence is one of the areas of information technology which has been experiencing an explosive growth in recent years. According to AMR Research study, total investments of companies in business intelligence for 2011 amounted

to \$ 57.1 billion, while the market for business intelligence is growing by 4.2% each year. Business intelligence offers a number of opportunities to improve the decision-making process, while more advanced tools enable analysts' greater functionality and, at the same, time become available to an increasing number of users. On the other hand, the IT requirements of companies

grow exponentially, from a few gigabytes of data a few years ago, through data repositories containing terabytes of data, to most data warehouses which are, in some cases, measured in pet bytes. Also, many companies in modern-day operating environment are making their information available to external users such as suppliers and customers, in order to improve business processes.

Current estimates are that a typical company analyzes only 10% of the collected data. By applying the concept of business intelligence, every company can benefit from the remaining data collected from various sources and converting it into high-quality information. The concept of business intelligence provides companies with the opportunity for timely perception of problems, so companies can focus on eliminating the causes rather than the consequences of problem solving. The need for the introduction and use of business intelligence systems is imposed by the stronger competition, developed channels of distribution, and supply of products and services that significantly exceeds demand (30% according to some sources). Also, in many industries, there is a trend of introducing substitute entry of new companies in the market, increasing demands as consumers and suppliers at the same time. Precondition for the successful introduction of business intelligence system in a company is a well-defined strategy of the company including the development strategy of the company's overall information system.

There are a number of key factors required to define an effective strategy for introducing a system of business intelligence in a company such as (Elliot, 2003):

- ongoing compliance with the overall business objectives and strategy of the company,
- functional integration of business intelligence applications in the company's key business processes,
- consultation with those who cannot tell what is good and what is not in the current business intelligence applications to be used by the company that end users and technical staff that supports these end users,
- establishing the best technical architecture for gaining competitive advantage,
- implement an effective process for implementation of the strategy for the introduction of the company's business intelligence system.

Information needs of companies are constantly changing in accordance with their goals. Alignment strategy for the introduction of business intelligence with the company's business strategy can produce a number of benefits. The concept of business intelligence is part of the answer, through information technology to meet exactly these identified needs. It is a simple concept that can greatly contribute to the success and stability of the company, i.e. the sustainability of the global market. Business intelligence enables companies to choose key parameters for the definition of corporate priorities.

2. Models in business intelligence

In order to maintain their competitiveness, companies must assess the quality of their products and the efficiency of their services. In doing so, they have to assess their environment: their competitors, their subcontractors, their suppliers, legal and other regulations, and, above all, their customers. They must also objectively analyze their own business, searching for an answer to the following questions: Can I improve my product or service in any way? Can production be realized in a more efficient manner? Is it possible to expand the portfolio of my products / services to new markets and customers? This list of questions is by no means complete. The answer to all of them can be given by means of business modelling and business environment.

The Business model is an abstraction of business functions, whose goal is to provide a simplified view of the business structure, which will be the basis for communication, improvements or innovations and defining the information requirements necessary to support the business users. The Business model is the focal point for conducting business or to enhance certain business operations. It is the basis for the introduction of new opportunities to improve the business.

Business modelling can be used to create new models in order to perform experiments as fit new business concepts in the current model. The models are used to determine whether the current organization, resources, and information systems are adapted to the new process. Models should serve as the basis for creating and modelling appropriate information all in one company. Models are also useful in terms of assessing the value of a business intelligence system and the justification of its investment. From that point of view, they serve as a basis for such a comparison maturity models. They determine the level at which such systems

are implemented and their effectiveness, manageability and measurability. Maturity models show where the organization is situated on the scales maturity of business intelligence. It is shown in the following picture:

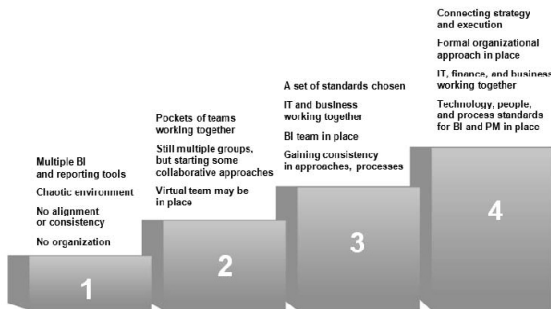


Figure 1 BI maturity levels

Source: Boyer, Frank, Green, Harris, & De Vanter, 2010

Maturity Models are the basis for revising the strategy of business intelligence. This article looks into developments of the TDWI maturity model (the data warehouse institute business intelligence maturity model) and Gartner's maturity model (Gartner's Maturity Model for Business Intelligence and Performance Management).

TDWI maturity model was originally developed by Wayne Eckerson in 2004. TDWI model focuses on the main aspect the Technological assessment of maturity. Maturity assessment is conducted through eight key areas-scope (scope), sponsorship, funding, value, architecture, data, development, and delivery. Each of these eight aspects was assessed on the following scale with five levels: infant, child, teenager, adult and the elderly (Rajteric, 2010).

Besides the assessment of the maturity of business intelligence, the value of this model is in helping people to realize that their efforts are not isolated, but that they share the same challenges and obstacles with the other employees in the company. Groups working on business intelligence often begin their work with great enthusiasm, which will over time subside when they face cultural, organizational and technical challenges.

In Gartner's maturity model, the evaluation of the model consists of three key areas: people, processes, metrics and technology. This model defines five levels of maturity: unknown, tactical, focused, strategic and widespread (omnipresent, piercing) level.

Applying these models of business intelligence provides a combination of business strategy and technology company structure in order to focus on

achieving goals and achieving higher corporate performance.

3. Modelling a business intelligence system for inventory optimization in companies

To achieve competitive advantage, companies need more and complex analyses in the area of inventory management. By applying systems of business intelligence, companies are able to increase barriers for its competitors, as well as to maximize income through appropriate responses to new market opportunities and establish stronger relations with suppliers. The main purpose of the company's strategy should be better management of operating costs because research shows that reducing general and administrative expenses by one monetary unit has the same effect as an increase in sales of 13 money units, i.e. reduction of these costs by 1% will increase the company's revenue by 2.3%.

The purpose of the analysis of data relevant for the process of inventory management is to identify trends and patterns, to predict likely future outcomes by formulating a series of scenarios, and to discover the potential opportunities and risks in the company's operations. Considering the amount of money that is spent on inadequate inventory management process, it becomes clear why companies need a business intelligence system for consolidation, optimization and transparency of this process. Effects that can be achieved with the application of business intelligence in the inventory management system are numerous (Luetic & Seric, 2011):

- reduction in the cost of supply of certain products,
- acceleration of the duration of the supply cycle,
- reduce and eliminate unauthorized supplies,
- increasing of inventory turnover ratio,
- full control over the supply chain,
- qualitative coordination and synchronization of activities,
- proactive management that results in fast business decision with high quality, etc.

In this way business intelligence system is a useful tool that enables detecting risks and opportunities, enables prediction of future trends, gives manoeuvring space for management and ensures the company's survival and competitiveness. The

application of the concept of business intelligence enables the company to concentrate and ensure free flow of necessary data and information in one place—in the data warehouse, in order to improve decision-making on the one hand, and minimize the cost and time required for execution of certain processes, in other hand. How this concept can serve as support in managing inventories is illustrated by data published in an issue of *Business Week* from 2010 which states that companies that have business intelligence system showed a 20% faster growth than companies that do not own a business intelligence system.

The figure below shows the place of the business intelligence system within the process of inventory management.

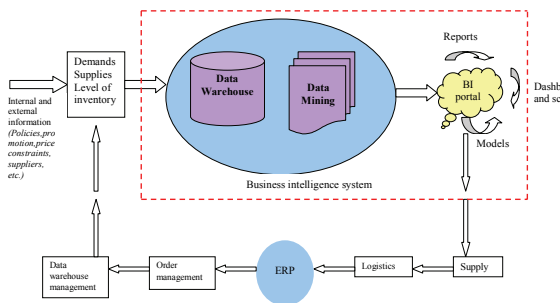


Figure 2 Business intelligence system as part of inventory management
Source: Zdravski, 2013, p. 87

As shown in the figure, business intelligence system would consist of three key elements, Data Warehouse, applications or tools for analyzing data (Data Mining) and interface by which users would receive data in form that they want. The data repository will contain its own data markets that will address specific areas of operation, orders, suppliers, products, payments, etc., which would be integrated into the central data warehouse.

Microsoft Access as will be used a database management system for the design and development of the data warehouse. A big advantage of Access is that it can work with large databases, and as a Microsoft product it is compatible with other Microsoft Office applications. In order to facilitate the work of end users, they can have a dynamic overview of the data in any application known to them, such as Excel, Word, PowerPoint using ODBC (Open database connectivity) driver, etc. It is a standard method for access to database from any application, no matter what database management system (DBMS) is used. ODBC allows access to the data at the middle layer, be-

tween the application and the database management system, called a database driver. The purpose of this layer is to enable transformation of questionnaires created with user application in appropriate commands that will be understandable to the warehouse management system (database) data. For all this to be possible, the application that is used must be compatible with the ODBC driver, but the database management system should also be compatible, so that it can receive commands from the ODBC driver. In addition, access to the data in the Data Warehouse through these drivers will be read-only, or users will have authorized access to the data they need, without being able thing to change in their structure. In this way, ODBC driver allows the application to access the different databases, using the same set of commands.

4. The UML model of business intelligence system

This article presents a model of business intelligence system, created using the UML, but because of limited size, it will include only those phases which are crucial to get the basic framework for the functioning of the system. In addition software application StarUML will be used for UML modelling, which supports all diagrams that is necessary for creating UML models. UML is a unified modelling language, and using it allows object-oriented development of the information system. Object oriented development of an information system is an iterative process and consists of the following four processes with several sub-phase of each of these processes: Defining requirements, Object Oriented Analysis, Object oriented design, and Implementation.

The most important diagrams in the design of a logical model of the system are context diagram and decomposition diagram. Contexts diagram represents the highest level of abstraction, but decomposition diagram translates the contexts diagram into a low level of abstraction. Decomposition diagram is shown in Figure 3.

Implementation process uses object oriented programming, or programming languages like C++, Java, Visual Basic and others for designing components. This process will be used as a platform, i.e. environment for creating the database, making the application, as well as the introduction and testing. This process needs a selected data base management system and an adequate programming language based application that will be realized.

Conclusion

Business intelligence is becoming a necessary concept in company management, which is primarily the result of strategic thinking and the main tool that enables Faculty of Economics Prilep management to achieve accurate, objective and timely recognition of the opportunities and threats.

Business intelligence is the spanning area between the IT (providing information) and business users (who need the information to perform their work). Besides enabling connectivity goals, metric and people within the company, business intelligence helps companies in the management and optimization of information flows. It is therefore necessary to build an appropriate strategy for the application of business intelligence that will be aligned with the strategy of information systems, as well as with the company's corporate strategy. The basis for reviewing the implementation of the strategy of business intelligence constitutes maturity models as the basis for creating and modelling appropriate information system in a company.

A model for business intelligence system as part of the inventory management system by using the unified modelling language UML is created in this paper. In fact, companies spend huge financial resources because of inadequate inventory management process, so a business intelligence system would greatly contribute to the consolidation, optimization and transparency of inventory management process. This model will have enough general characteristics than can be applied

in most of the companies, inventory represent one of the most important categories because in every company.

The modelling of business intelligence system includes processes that are critical in getting the basic framework for the functioning of the business intelligence system, as part of the process of inventory management. In that way modelled business intelligence system would be a useful tool that will enable the detection of risks and opportunities, to predict future trends, and providing not only survival but also growth and development of the company.

By modelling system for business intelligence in the company which refers to inventory, the resulting knowledge that arises from the analysis of the data can be used for effective measurement, control, forecasting and inventory management aimed at cost minimisation. Application of the business intelligence system enables the management to make timely decisions and maintain the optimum level of inventory, and thus the company's continuous service. The concept of business intelligence enables such an evolution of the supply process, supports the process of feature operation in its growth into a powerful mechanism to achieve competitiveness and increasing the effectiveness and efficiency of the company. **SM**

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