

Business intelligence adoption: a case study in the retail chain

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Abstract: Business Intelligence (BI) tools are adopted by more and more companies in the current environment that requires companies to operate as efficiently as possible. The paper investigates a BI adoption in a retail chain. Based on qualitative research methods, it analyses the Business Intelligence life cycle; it evaluates factors impacting the adoption from the Diffusion of Innovations perspective. One of the findings is that requirements engineering is critical, and even small issues have a tendency to cause big problems. This links to the sentiment among managers, often worrying that IT projects will run over-budget and/or over-time. Finally, the presented research identifies benefits that are considered to be the most important by the retail chain managers. An important finding is that managers consider improved decision-making to be the most significant benefit.

Key-Words: Business intelligence, adoption, diffusion of innovations theory, system life cycle, benefits, retail chain, speed of adoption.

1 Introduction

The present need to increase the efficiency of management in retail chains on an ongoing basis and the growing pressure of cost efficiency in this field require the use of different approaches, methods and tools to meet these demands. One opportunity is the use of sophisticated business analytics, such as business intelligence (BI). BI is a wide term that is commonly used for technologies, applications, tools and processes to gather, store, access and analyse data for better decision-making. The literature review on BI has been published by, for example, Foley and Guillemette [1].

According to the Gartner Group surveys [2], BI is implemented in almost 80% of companies in the U.S.A. and in 50% of companies in Europe. Slovak companies have used these systems only in recent years. The next growth of BI is evident, as according to the Gartner group press release [3] from the Gartner Business Intelligence Summit, the BI, analytics and performance management software market was the second-fastest growing sector in the overall worldwide enterprise software market in 2011. As principal analyst at Gartner, Dan Sommer, reported, "The strong growth was driven by two major forces. The first is that IT continues to spend and earmark money to BI, despite constrained budgetary environments... and second, new buying centers are opening and expanding outside of IT, in

line-of-business initiatives, and taking an increasingly large stake of the spending pie. Key drivers for this are self-service data discovery tools, the race among vendors to provide business context through packaged analytics, and CFOs taking a renewed interest in BI and Performance Management."

BI can produce many benefits if it is implemented well. Some literature argues that IT projects, in general, are most often unsuccessful in being on-time, being on-budget and/or delivering the expected benefits [4, 5]. As the Johansson's and Sudzina's [6] research on actual versus planned ERP system implementation costs in European SMEs, including Slovakian companies, shows, although not all companies manage to stay on budget when it comes to ERP system implementation, the situation in the investigated European SMEs is not too critical, probably due to managing to stay on budget and having a prevalent fixed price policy for ERP implementation projects in Europe. It is assumed that this will also apply to BI implementation, and thus being on-time and meeting clients' requirements must be a consideration for successful BI adoption. Chuah and Wong [7] state that according to the EMC Corporation, many BI initiatives have failed not only because tools were not accessible to end users but also because the end users' needs were not met effectively.

This article is the result of a longitudinal study of BI adoption based on in-depth analysis in a sports-fashion multibrand chain of retail stores operating in Slovakia. It presents the successful application of a system life cycle [8] in BI adoption in which the progression of a system is reached through several stages. The results of the examination of benefits of BI adoption are reported, and the factors impacting the rate of adoption [9, 10] of BI in the retail chain are analysed. The findings in the study contribute to the real-life experience of successful BI adoptions.

2 Theoretical background

This section describes the most important basics of BI, including possible BI benefits for the company. The system life cycle and the diffusion of innovations (DOI) theory focused on the factors that impact the speed of adoption of innovations are also presented.

2.1 Business intelligence (BI)

BI, developed primarily as a system to solve analytical tasks, is generally considered to be a way of better decision-making, reducing costs and improving the quality of processes and performance. However, there are different definitions of BI.

IBM researcher, Hans Peter Luhn [11], used the term BI the first time in his article. He defined intelligence as “the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal.” The term BI has become popular thanks to Howard J. Dresner, a Gartner Group analyst. He described the term BI as “a set of concepts and methods to improve business decision making by using fact-based support systems” in 1989, and this usage has become widespread [12]. This concept highlights the importance of data analysis, reports and query tools that provide users with data, and help them to synthesise valuable and useful information.

Further, Golfareli and Rizzi [13] underline the decision-making process, as BI provides corporate decision-makers with software solutions that help them identify and understand the key business factors in making the best decisions for the situation at the time. “In general, business intelligence systems are data-driven DSS” [12]. According to Wixom and Watson [14], BI is “a broad category of technologies, applications, and processes for gathering, storing, accessing, and analysing data to help its users make better decisions.” It includes both getting data in (to a data mart or warehouse)

and getting data out (through technologies or applications that meet some kind of business purpose). Wixom and Watson [14] underline the processes as an important part of BI – e.g., processes for extracting, loading and storing data, maintaining metadata for IT and users, and prioritizing BI projects. Some of these processes are the responsibility of the BI staff, while others are the joint responsibility of BI staff and business units. Foley and Guillemette [1] define BI as “a combination of processes, policies, culture, and technologies for gathering, manipulating, storing, and analyzing data collected from internal and external sources, in order to communicate information, create knowledge, and inform decision making. BI helps report business performance, uncover new business opportunities, and make better business decisions regarding competitors, suppliers, customers, financial issues, strategic issues, products and services.”

The BI applications cover analytical and planning functions of most management branches, such as marketing, purchase and sale, financial management, production management, marketing management, controlling, human resource management, etc. The BI is also used in other business fields, such as corporate performance management or customer relationship management. The BI systems enable getting new information and knowledge useful to achieve a competitive advantage for any company with the use of efficient analytical components (reporting, OLAP technologies, and data mining).

There is a general concept of BI solution architecture that contains several layers with subsistent components. Two of the most significant components of BI are data warehouse and data marts. A data warehouse (DW) is a subject oriented, integrated, non-volatile and time-variant collection of data to support management decisions [15]. At the present time, DW is a central component of data storing in a company’s information system. “The data warehouse supports the physical propagation of data by handling the numerous enterprise records for integration, cleansing, aggregation and query tasks. It can also contain the operational data which can be defined as an updateable set of integrated data used for enterprise wide tactical decision-making of a particular subject area” [16]. Data marts can be defined in different ways. According to Inmon [15], a data mart is “a collection of subject areas organized for decision support based on the needs of a given department.”

Analytical components of BI are: reporting, online analytical processing (OLAP) and Data Mining.

Reporting is a broad category, and there are many options and modes of its generation, definition, design, formatting and propagation. A successful reporting platform implementation in a BI environment requires great attention to be paid from the point of view of both the business end users and IT professionals. OLAP is an approach to swiftly answer multi-dimensional analytical queries [17]. As part of the broader area of BI, OLAP embraces both relational reporting and data mining [18]. “OLAP tools enable users to interactively analyse multidimensional data from multiple perspectives. OLAP consists of three analytical operations: consolidation, drill-down, and slicing and dicing” [19].

The third analytical component of BI is data mining. This extraction of hidden predictive information from large data sets is the newest analytical component of BI. It helps companies to centre the attention on the key information in their data warehouses. “Data mining tools can answer business questions that traditionally were too time-consuming to resolve. They scour databases for hidden patterns, finding predictive information that experts may miss because it lies outside their expectations” [20].

2.2 Benefits of business intelligence

A wide range of the benefits for an organization emerges from the basic principles of BI. Hannula and Pirttimäki [21] carried out a study among the large Finnish companies to find out the benefits gained from BI. The most significant benefits provided by BI activities were:

- better quality information acquired for decision-making (95%),
- improved ability to anticipate earlier the possible threats and opportunities (83%),
- growth of knowledge base (76%),
- increase of sharing information (73%),
- improved efficiency (65%),
- easier information acquisition and analysis (57%), and
- faster decision-making (52%).

Time-savings (30%) and cost-savings (14%) were not considered particularly important. The researchers also asked the interviewees to name one factor to describe the most significant benefit of their BI activities. The following benefits were considered to be important:

- harmonizing the way of thinking of company personnel,
- broadening understanding of business in general,

- strengthening strategic planning,
- increasing professionalism in acquisition and analysis of information, and
- understanding the meaning of information [21].

The major benefits of BI, as presented by Thompson [22], on the basis of the results of the survey, are:

- faster, more accurate reporting (81%),
- improved decision making (78%),
- improved customer service (56%),
- increased revenue (49%).

Many of the benefits of BI are intangible. Wixom and Watson [14] present tangible benefits as well as those that are difficult to measure. For example, companies may eliminate software and hardware licences and fees when they consolidate and retire data marts, or companies may reduce headcount when they replace manual reporting processes. Other benefits, such as the enabling of new ways of doing business, are much more difficult to quantify, but may generate a competitive advantage or open up new markets for the company. A wide range of possible benefits resulting from BI is presented in Figure 1.

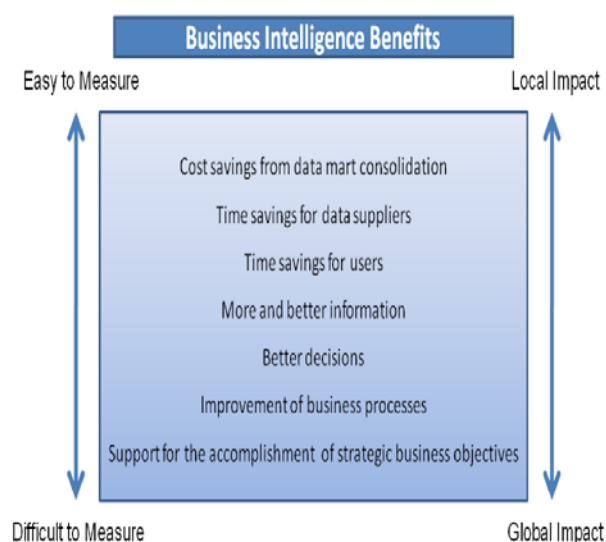


Figure 1: Benefits of business intelligence [14]

The most tangible and easy-to-measure benefits have more of a local impact, typically happening at the departmental level. The more intangible benefits – things such as process improvement and strategic enablement – can have impacts across an organization [14].

2.3 System life cycle

The system life cycle [8] that divides the development of a system into stages is an attempt to establish a structured approach to analysing, designing and building software systems. The stages in a typical system life cycle are as follows:

- problem definition
- feasibility study
- requirements engineering
- design
- implementation
- maintenance

Each of the stages must be completed and agreed upon by the client before progressing to the next stage. These stages are described in greater detail in the results section.

The problem definition provides an initial description of the business problem in a form of a written statement of the client’s current problems and the objectives of the new system. In this stage, the scope and size of the project can also be specified, as well as preliminary ideas and recommended action for the next stage. The investigation whether there is a practical solution to the problem defined, from technical, economic and organizational points of view, is the content of the next stage, the feasibility study. The most crucial part of the life cycle is the requirements engineering, consisting of the discovery and agreement of what the problems are, what the new system should do and how it will be performed. Then, the design is specified and the system is physically built during the implementation stage. The last stage is maintenance, referring not only to finding and correcting errors, but mostly to modification of the system to meet evolving client requirements.

2.4 Diffusion of innovations theory

Rogers’ [23, 9] diffusion of innovation (DOI) theory, consistent with the theory of reasoned action [24], defines five factors that impact the rate of adoption of innovations: relative advantage, compatibility, trialability, observability and complexity. The factors are positively correlated with rate of adoption, except complexity, which is generally negatively correlated with rate of adoption [9]. Moore and Benbasat [10] developed this DOI in IT and generated eight factors with the effect on IT adoption: relative advantage, compatibility, trialability, image, voluntariness, ease of use, visibility and result demonstrability.

Table 1: Comparison of factors in DOI [9] and DOI in information technology [10]

1. relative advantage	=	1. relative advantage
2. compatibility	=	2. compatibility
3. trialability	=	3. trialability
4. observability		4. visibility
		5. result demonstrability
5. complexity	→	6. ease of use
		7. image
		8. voluntariness

A comparison of Rogers’ [23, 9] and Moore and Benbasat’s [10] DOI theories indicates that the first three characteristics of both are similar in meaning. Relative advantage is the degree to which an innovation is better than current technology. Compatibility is the degree of an innovation matching the existing values, needs and experience of potential adopter. Trialability is the degree to which an innovation can be experimented with before using it.

Rogers’ observability, as the degree to which the outcomes of an innovation are visible for others, is substituted by Moore and Benbasat’s visibility and result demonstrability. Visibility means that the degree of the idea of the innovation itself can be visible. Result demonstrability is the “tangibility of using the innovation, including their observability and communicability” [10].

Rogers’ complexity, understood as the relative difficulty to understand and use an innovation, is replaced by Moore and Benbasat’s characteristic ease of use. This refers to the degree to which one perceives that adoption of an innovation would be without physical and mental effort.

There are two new factors that Moore and Benbasat introduce: image and voluntariness. Image is “the degree to which the use of an innovation is perceived to enhance one’s image or status in one’s social system” [10]. Voluntariness concerns the

degree to which the innovation adoption is voluntary or is of free will.

Rogers [9] suggests using Moore and Benbasat instruments and various settings for future research in the diffusion of technology innovations. This is the model that has been used in the paper.

3 Data and methodology

The subject of the case study is a sports-fashion multibrand chain of retail stores of large size, operating in Slovakia since 2003. In 2010, the top managers of a retail chain of stores decided to purchase and implement the software system SAP BusinessObjects and to tailor it to their company needs. According to the press release of the Gartner group in 2012 [3], “SAP remained the No. 1 vendor in combined worldwide BI, analytics and PM software revenue in 2011, accounting for 24% on the market, followed by Oracle, SAS Institute, IBM and Microsoft.”

The study presented here was based on a 5-month analysis conducted during and after the implementation stage of BI. The study was based on document analysis and in-depth interviews. Relevant documents, such as the deliverables of different stages of the life cycle, i.e., business strategy, procedures, reports from requirements engineering, project tasks and schedule, training materials, retail management documents, as well as software developers’ analysis reports, budget and reports from the old system were obtained to understand and analyse the process of BI adoption.

Two semi-structured interviews were conducted after the adoption of BI.

The first included an interview of the president and chief commercial officer in order to understand the main objective and reasons for adopting the new system. The second interview was with the chief information officer to understand and analyse the process and problems with the BI adoption. This interview lasted more than 120 minutes.

A total of nine interviews were conducted with the managers of the retail chain: chief commercial officer, five senior category managers, supply chain manager, marketing manager and e-commerce manager. Each of the interviews lasted approximately 60 – 90 minutes.

The main structure of the interviews was as follows:

A. Stages of system life cycle (problem definition, feasibility study, requirements engineering, design, implementation, maintenance) -

questions were asked and answered in an open-ended manner.

B. Problems and other important facts from the experience with the BI adoption- questions were asked and answered in an open-ended manner.

C. Benefits of BI - the interviewees were probed on particular benefits of BI adoption to achieve unambiguous interpretation of their answers. There was also the possibility of mentioning other benefits, since these were personal interviews. The benefits were taken from the other surveys [21, 22, 14] and from problems definition and the objectives of BI adoption in the retail chain as follows:

- acquiring up-to-date and better quality information for decision-making,
- easier information acquisition and more efficient information analysis,
- improved decision-making (faster, better, based on better quality information),
- improved ability to anticipate earlier changes on the market,
- better planning,
- better pricing,
- increase of shared information among different functional areas,
- stock management – optimization, and
- other aspects specified by the respondent.

As was expected, since interviewees would consider all benefits to be very important, they were asked to name only one factor as the most significant benefit of their BI activities.

D. Factors with the impact on the pace of BI adoption, were structured according to Moore and Benbasat’s [10] theory.

The written records were subsequently approved by interviewees.

4 Results

4.1 The BI life cycle in the retail chain

The analysis of the adoption of BI in the retail chain was based on a sequence of stages, as described in the system life cycle mentioned earlier. Each stage is described in greater detail here.

Problem definition

Analysis of problems preceding the decision on BI adoption in the retail chain was conducted by managers of the retail chain. Typically, managers will look for opportunities to improve the management of business processes in reaction to the pressure on business processes efficiency (mostly

due to increasing importance of e-commerce in comparison to B&M business) and the importance of the permanent need of innovation. The managers, mostly from the commercial department, faced several problems to be solved to achieve better efficiency:

- Share of information and analysis: The information system used in the company was not efficient, the particular systems were not connected (thus a problem in sharing information among departments) and analysis of the data from various aspects was lacking– production, sales, marketing, finance, logistics, and stock. Managers often used extensive Excel files to acquire information and indicators in the required format for defined business purposes, a process that was inefficient and time-consuming.
- Decision-making: Managers' decisions were sometimes delayed or changed due to lack of relevant data and information or other details.
- Planning and pricing: The planning and pricing were not efficient due to imperfections in market change forecasts.
- Stock optimization: There was the need to decrease the costs of stock management.

The main objectives of the new system in the retail chain are to ensure that data are on time, accurate and appear in the required format, that the links of data from different functional areas are ensured and that shared information for better cooperation of departments is available. This should result in improved forecasts of customer demands, planning, pricing, stock optimization, clear operatives, as well as strategic decision-making. Fulfilment of these objectives is to facilitate business processes in order to ensure future expansion of the business.

The project encompassed mostly areas of commerce and retail: e-commerce being the main processes, but also involving supporting areas of the business, marketing, distribution centre, logistics, finance and human resources. The project team in the retail chain consisted of the following: president, chief commercial officer, two senior category managers and supply chain manager for the business processes; chief information officer for the coordination; and representatives from an external company (SAP) and its cooperating company providing the design and implementation of BI. The final BI system was used by all top managers, category and store managers, marketing manager, supply chain manager and e-commerce manager - in total 40 people.

Preliminary ideas included an adoption of BI to improve decision-making procedures of top

managers and category managers, store managers and supply chain manager, as well as to share information in the company. Next, the project team prepared recommended actions, not only investigating and producing recommendations for the introduction of the system for the highlighted areas of the business, but also researching the costs and benefits of each proposed system, in comparison with old system (ERP and the system based on Microsoft Excel platform). The stage of problem definition lasted three months, as planned.

Feasibility study

The feasibility study examined the technical, economic and organizational feasibility of the project. It resulted in the decision that the company would adopt a new system, and, after cost analysis, decisions regarding the budget were made. The feasibility study was prepared according to the time plan: a month. The SAP BusinessObjects was chosen which had been expected to fit in with existing business procedures.

Requirements engineering

All interviewees concurred that the stage of discovering and agreeing on exactly what the problems were and what the new system would do was the most demanding stage of BI adoption.

The managers worked out a detailed list of key performance indicators (KPIs), including their definitions, calculation, input data and the influence of each KPI on company performance. Comprehensive analysis of requirements was finished by the list of reports demanded by managers, containing the selected KPIs, periodicity of reports and definition of end users of the reports. The period of requirements engineering lasted five months, while only four months had been scheduled. Nevertheless, after the implementation of the new system, new requirements evolved, and thus more maintenance was needed.

Design

The technical solutions of BI adoption (OLAP cubes and reports) and the data warehouse (DW) administration were realised in this stage. The subjects of BI development were: the analysis, database design, ETL and reporting. After implementation of BI, administration of BI was needed: administration and maintenance of data warehouse, administration of ETL, database servers, reports and administration of complete BI solution.

The solution analysis focused mainly on the definition of data sources, inputs and outputs of DW and various functional areas, that are the basis for

the functionality definitions included in a business object universe. Presentation database of DW was a direct source of the data for the implemented SAP BO tools.

The data flow from determined data sources to the implemented SAP BO tools is illustrated in Figure 2.

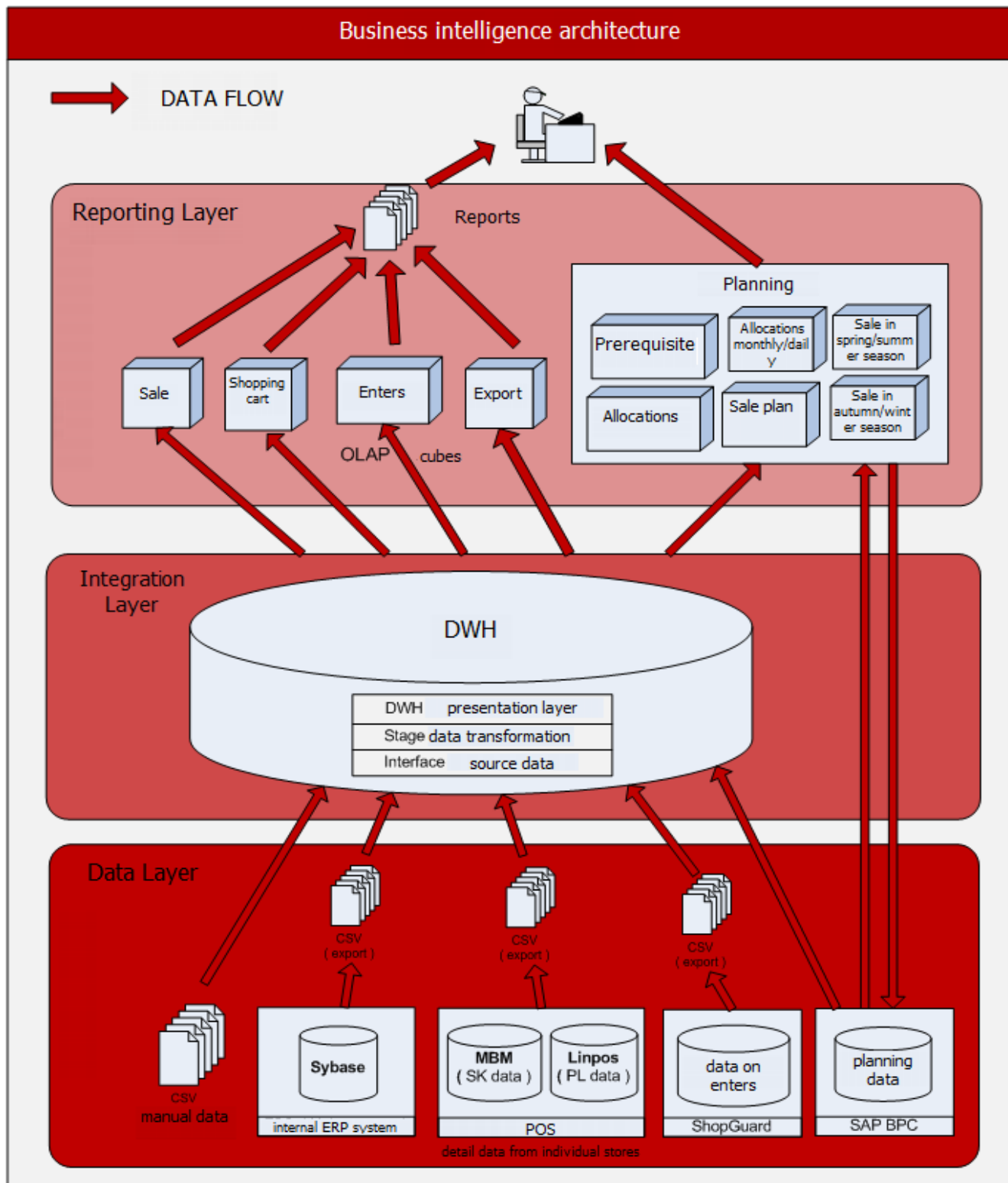


Figure 2: Technical architecture of the BI solution.
Source: Internal company's materials

1. Data layer

Overview of the data sources: The following data sources were identified for the DW needs:

- internal ERP system,
- POS (detail data from individual stores),
- ShopGuard system – data on customer turnover,
- planning data gathered from the planning of the BI project, and
- manual CSV files.

Some of the data were acquired through third party applications used in the company. All data from the source systems were entered into the DW through the defined input text files (CSV files). It was thus necessary to specify the path to the specimen file, destination directory and the frequency of data import.

2. Integration layer

The most important parts of the integration layer were:

- DW in the integration layer, consisting of three databases:
 - DW (presentation layer) – historical and aggregated data in the form for reporting. The data are imported by an incremental approach in granularity and periodicity defined in the analysis by managers.
 - Stage (data transformation) – data are divided into dimension and fact tables. The data are changed and transformed for reporting. The tables on this layer contain original ID from source systems, as well as so-called “surrogate” keys.
 - Interface (source data) – between DW and source data.
- Ad-hoc ETL processes, which run three main tasks: importing the processing of the source data that can be imported in irregular time periods, plan actualisation and maintenance of the data warehouse.
- Database jobs which divided into three groups:
 1. Regular job – regular daily process triggered in time set.
 2. Ad-hoc jobs – are used for the purposes of operative reporting.
 - a) Import of “irregular” or often changing text files (e. g., plans, monthly data, etc.).
 - b) Actualisation of specific functional or data areas. These jobs can be started at any time, but it is not possible to run the same job in parallel.
 - c) Actualisation of OLAP cubes.

3. Administrative jobs – are used for the needs of the DW maintenance – creation (and recovery) of DW.

Processing of DW installation was also defined. It consisted of several steps, from server installation through arrangement of other standard administration precaution, e. g., maintenance plans preparations. Regular production DW backup was reserved by main ETL process. Errors and conflict management was also the part of the BI design.

Technical suggestions were made, mostly defining the servers for the project purposes:

- Two database servers – serving as data marts for DW and at the same time as performance part for ETL processes (with MS SQL server installed).
- Application server – used as the performance part of the solution (with SAP business object tools installed).

3. Reporting layer

The reporting layer was the most substantial part, as seen from the managerial perspective. The data areas had specific functions and also report values.

The functional areas were:

- sales,
- shopping cart,
- customer turnover and
- export.

The facts were defined for functional areas and dimensions, including the hierarchy defined, for the purposes of reporting.

The DW was built by using data sources. The DW integrates and unifies the data from these sources. The presentation layer of DW contained related dimension and fact tables in the structure of “star schema” that provided integrated and clean data for a specific functional area.

Meta-data models for OLAP cubes - business object universe

Each functional area was represented by an OLAP cube and defined reports. OLAP cubes are basic data sources for defined reports. The structure of every OLAP cube in SAP BO tools is defined by “universe.” The BO universe is a business representation of a company’s data that helps end users access data autonomously using common business terms; it also isolates business users from the technical details of the databases where source data are stored. Universes are made up of objects and classes that are mapped to the source data in the database, and accessed through queries and reports [25]. The SAP BO applications do not allow creating OLAP cube with real data, and that is

why each universe is identical with the OLAP cube. In use, in any query of the OLAP cube, a join between the OLAP cube and relevant universe is created in order to transform the data from DW in real time and in a defined way (defined in this universe).

Reports were made in relation to OLAP cubes. Granularity and periodicity were defined for each report by managers of the project team. It was also necessary to map the reports for all dimensions and measures. The creation of a data dictionary was essential in the preparation of BI adoption. It contained the definition and description of all business terms and measures used in the business processes by end users.

Implementation

The adoption of BI, when the system was physically built by external company, lasted six months, two months longer than planned due to corrections after testing the system by the managers of the retail chain. A six-member team from the retail chain (chief commercial officer, two senior category managers, supply chain manager, chief information officer and IT assistant) and developers from external company were responsible for the system implementation.

A parallel conversion strategy was used, where the users had to operate both the old and the new systems. Deliverables from this stage of the life cycle included program listings, test plans and supporting documentation, details of the hardware on which the system would run, as well as manuals.

Insights from the interviews provided not only the need of dealing with the new knowledge requirements for the end-users of the BI (see also [26]), but also the need of training and formal system of coaching in the beginning of using the new system. In addition, there was frustration until the time of full exploitation of the BI system occurred, and thus the top management support helped end users. Finally, the new tasks for the managerial positions were defined, those needed during the implementation stage and after the BI adoption [27].

Maintenance

After the BI adoption, maintenance of the system was still needed to find and correct errors, taking about two months. Also, new requirements evolved into further maintenance in order to react to the strategic decision of closing the stores in foreign country, taking about one month. This was not as demanding, since just a few parameters were

excluded from the system. Further, development of dashboards was the object of the maintenance of the BI system, something which could be dealt with earlier in the requirements of managers. This required additional maintenance time, approximately three months from requirement engineering until implementation, as well as incurring additional costs.

4.2 Pace of the BI adoption in the retail chain

The impact of eight factors on the relative speed with which the BI adoption was adopted by end-users was dealt with in the interviews:

- Relative advantage: All the interviewees answered that BI enabled them to accomplish tasks more quickly, improved the quality of their work and made it easier to do their job. Using the BI improved the job performance, was advantageous in the job, and increased the productivity. The adoption of the BI was impacted by good perception of BI if compared to their previous systems.
- Compatibility: According to all six commercial managers, BI was completely compatible with their current situation. Other managers were not sure about the compatibility with all aspects of their work.
- Trialability: Only members of the project team (chief commercial officer, one senior category manager and supply chain manager) agreed that they had a great deal of opportunity to try other BI systems and test various applications. The others could not experiment with other BI systems, but did not think this was crucial for their later use of the new system.
- Image: The interviewees did not perceive great importance of BI for improvement of their image or status in the company. Six of the managers saw the advantage of the use of BI and the experience for their image outside of the company (suppliers – to present the company as company using modern technologies and systems, labour market – as professional experience with the BI or the involvement in the BI adoption).
- Voluntariness: The use of the BI was not voluntary; its use was inevitable due to the formal instruction in the company.
- Ease of use: The interviewees, from the position of view as the end users of the BI system, found it cumbersome to use BI at the beginning. The members of the project team became familiar with the BI much earlier than the others did, and thus those who were feeling

frustrated by using a new system at the beginning needed coaching.

- Visibility: The use of BI was visible for all. The interviewees could also see the use of BI outside the company.
- Result demonstrability: The results of using the BI were apparent to the managers.

4.3 Benefits of BI for the retail chain

Interviewees named only one factor from all offered to them, as follows:

- chief commercial officer: acquiring up-to-date and better quality information for decision-making,
- senior category manager 1: improved decision-making (faster, better, based on better quality information),
- senior category manager 2: acquiring up-to-date and better quality information for decision-making,
- senior category manager 3: improved decision-making (faster, better, based on better quality information),
- senior category manager 4: improved decision-making (faster, better, based on better quality information),
- senior category manager 5: improved decision-making (faster, better, based on better quality information),
- supply chain manager: stock management – optimization,
- marketing manager: improved ability to anticipate earlier changes on the market and
- e-commerce manager: better pricing.

One category manager and chief commercial officer named information for decision-making as being the most important benefit. Four category managers agreed that improved decision-making was the most significant benefit of the new system. The chief commercial officer ended the interview with the final statement that all category managers, senior as well as junior, got the right data on a daily basis, with no need to filter and export the data from the ERP. They also had the data in one system. The managers of other functional areas indicated other benefits that were related to their job position.

5 Discussion and conclusion

This section provides a short discussion and conclusion to the system life cycle of the BI adoption, as well as factors impacting the speed of

the BI as the innovation in the retail chain. The customisation of the BI system, according to the requirements of the managers, is the most important factor of successful adoption of BI. From this point of view, the importance of all the stages of the system life cycle can be emphasized for the successful BI adoption in general, with the focus on precise requirement engineering as the most crucial stage of the life cycle, and the use of more flexible life cycle models suitable for project of large size and budget, e. g., spiral model [28] or modified waterfall with risk reduction [29] or the others.

The case study can be useful not only for companies and BI vendors to improve the process of BI implementation to be on-time, on-budget and to meet requirements on the system, but also for researchers to study the adoption process with the focus on models and methods of requirements engineering and their verification. The requirements defined insufficiently can prolong the BI adoption and cause additional costs for the maintenance of the system. Also, the end-users who were not involved in the process of requirement engineering found the new system not easy to use, and thus there is a question about their involvement and the extent of their involvement in the process. The MUST method [30] could be used to ensure end-users participation in requirements gathering. Unfortunately, the MUST method was not used prior to the implementation in the analysed case. In future research, the critical success factors of the BI implementation could be examined as well [31].

The study confirmed that the generated factors [10] with the effect on the speed of the diffusion of the BI in the social-system were important in the speed of the adoption of the new system: relative advantage, visibility, result demonstrability and trialability. Compatibility should be explained to the end-users more in greater detail, and together with ease of use, should be studied in relation to involvement of the end-users in requirements engineering. The voluntariness is difficult to discuss because the use of the new system was mandatory. A real difference from Moore and Benbasat [10] occurred in understanding of the factor image. The certitude of adoption of innovation was apparent among all interviewees, may be thanks to the innovation oriented company culture. People took it for granted that all would use the new system and have benefits from its use. Thus, the image outside of the social-system was emphasized by managers and could be studied by researchers.

The successful adoption of BI in the company enhances the value of management in the company and helps to improve business processes.

Throughout the case study, the main benefit of BI in the retail chain processes was determined as improved decision-making (faster, better, based on better quality information), along with further advantages of using the new system.

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