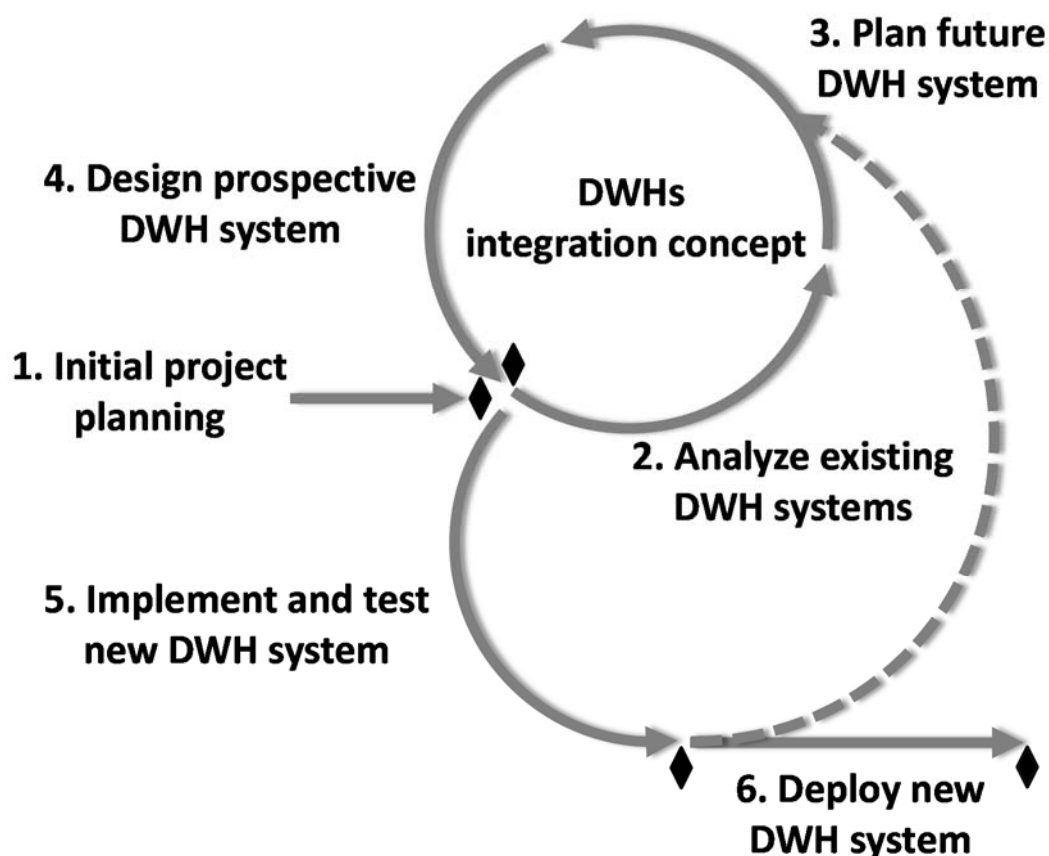# A Process Model to Integrate Data Warehouses and Enable Business Intelligence: An Applicability Check within the Airline Sector

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Abstract

Since the data warehouse allows the extraction of needed information for organizational decision making processes, it has received great attention by many companies. However, companies often face the problem that many heterogeneous data warehouses accumulated over the past. Executives and business users are often unaware of the existence of accurate information. To receive a unique overview and, consequently, having consistent shared data, an integration of independent data warehouses must be realized. This can help to improve decision support, business intelligence, and even knowledge management. Therefore, we constructed and introduce an iterative data warehouses integration process model (DWH-IPM) as a first approach. Our process model is divided in to six main phases including several activities to achieve a successful integration outcome. Within a globally operating flight company, we check to what extent the applicability of the designed research artifact can be assumed.

Keywords

1 Introduction

The topics Business Intelligence (BI) and Data Warehousing (DW) receive great attention by many companies and their business information management. Especially in today's hypercompetitive market, many executives use diverse BI applications to make strategic decisions. For this purpose, companies often implement the Data Warehouse (DWH) as their main BI instrument to analyze a large amount of operational data. More specifically, the DWH allows the extraction of needed information for organizational decision making processes [18]. However, companies often face the problem that many heterogeneous DWHs accumulated over the past. Executives and business users are often unaware of the existence of accurate information, which are necessary to achieve organizational goals. Without a consistent view on the corporate performance, executives have fewer possibilities in making correct decisions.

Furthermore, many DWH systems often lead to data redundancy. These redundant, not integrated analytical systems are often wasteful and may increase the DW costs rapidly. Numerous companies have the main objective to minimize their analytic systems landscape trough a successful integration project. The problem in this context is that integrating the heterogeneous DWH systems is often very complex. Integration projects face two major challenges. The first challenge is to make an efficient decision on the prospective DWH integration strategy, which defines the procedure of restoring and integrating the heterogeneous data into one core database. The second challenge involves cultural and established structures of distributed power. Solution approaches regarding technology competencies and corporation wide measures, structures, and responsibilities must be identified [2]. This leads to the research question:

How can Data Warehouses be integrated to enable Business Intelligence?

Based on a practical problem of a globally operating airline group, the main objective of this work is to design a process model for DWHs integration. Although, such practical issues often exist, where executives need to obtain a unique overview of their company through an integrated DWH system, the research on this topic has received little attention [18]. The complexity of this task requires a well-structured and systematic approach. As proposed by Gregor and Hevner [9], the structure of this work is as follows: After this introduction, the theoretical foundations and related work are addressed. Afterwards, the research design is presented. Then the designed iterative DWHs integration process model is illustrated and each related phase is explained in further detail. The developed model is evaluated within the airline group. A discussion on the results and observations follows, and the identified limitations and further research are drawn. Finally, the work ends with a conclusion and outlook.

2 Theoretical Foundations and Related Work

2.1 Business Intelligence and Data Warehouse

In the last few years, the term BI became an important topic for many companies. Especially for numerous CIO's, BI has been a top strategic priority in the past decade [27]. Even the latest Gartner [7] research predicts that in 2014 the top investment priority will be in BI and other analysis applications. The origins of BI emerged from decision support systems (DSS), which were first mentioned in the early 1970s, when business managers used computer applications that supported business decisions [27]. In the late 1980s, Gartner has generated the BI term including tools and technologies such as DWHs and reporting queries [29]. Today, there is a variety of BI definitions in the scholarly literature. Yet, in every definition, applications and processes are mentioned that gather, store, access, and analyze organizational data so strategic competitive decisions can be made [27], [29]. BI is more than just a collection of software and visualization tools. The real added value comes from the processes that deliver credible knowledge value to the users, the processes for acting upon that knowledge gain, and the people, which are willing to take action. Most BI tools do not achieve any business value without the right people and processes [14].

The DWH was first mentioned in the early 1990s, when companies used information to achieve effective planning and decision making. The DWH has established itself as one of the most successful

Therefore, we introduce the DWH-IPM as a first approach. In terms of accessibility, this DWH integration project guideline serves for practitioners as an easily understandable approach, which was further supported by practitioners from an airline company.

Several researchers have developed technical solutions to overcome DWHs integration problems. Yet, these technical solutions tend to forget the human being as one of the most important factors. A well-defined integration strategy is inevitable [20]. Further, the user involvement and acceptance influences the success of a DWH project heavily, which also includes commitment and involvement from other important employees such as top level management, project supervisor, and DWH specialists. Most DWHs integration intentions can be technically realized; however, if important stakeholders do not share the integration vision, the project will presumably fail.

A disadvantage of integrating heterogeneous DWHs into one central DWH/EDW can be the overall performance of the core DWH system. According to Gartner, approximately 70% of today's EDWs experience performance issues. These typically arise because of the high workloads, growing integration of BI, and operational applications [6]. Therefore, the first limitation of our model refers to the decision on integrating the DWHs into an EDW. Although, factors such as data quality, cost reduction, etc. are a major advantage, it is necessary to analyze if it is better to implement, for instance, two core DWHs so the performance risks can be diversified.

Further limitations deal with the practical applicability of the DWH-IPM. We presented the model as a first approach, which needs further empirical validation. Although the participants from TUIfly found the process model as a good approach, it is necessary to employ and evaluate the model in other companies.

Based on the presented process model, further research must be conducted and the DWH-IPM can be refined. Especially the above mentioned second limitation concerning the empirical validation should be addressed. If employed in other companies, more empirical evidence and best practice knowledge can be generated. A more precise examination of each phase could be made, where each individual step is described and visualized in more detail. Although, every company has individual characteristics of its environment, culture, and strategies, the process model outlines how to successfully accomplish DWHs integration. Thus, the integration objectives such as the SVOT, cost reductions, flexibility improvements, and so on can be achieved.

7   Conclusion and Outlook

Starting with a review on DWHs integration research within the IS domain, this work focuses on how to integrate heterogeneous DWH. BI and DWH projects must receive attention from organizational, technical and process-oriented levels. Based on CSF for BI and DWH projects and related literature, we presented a practical, iterative DWH integration process model called DWH-IPM. The model describes in further detail the phases and activities that an integration project should follow to successfully integrate DWH systems. The model was constructed and evaluated according to the DSR principles and its practical applicability was then initially checked at the TUIfly airline.

Integrating heterogeneous DWHs requires a great deal of work. Although DWHs integration accomplishes many benefits, companies often face the challenge that these projects require high technical and functional knowledge. Especially long implementation periods and high funding can lead to project failure. Therefore, it is important that an organizational culture and attitude towards the integration purposes is developed. This requires top level management support, commitment of business users on delivering consistent data, and a continual investment of time and budget. Based on this, the DWH-IPM can be used to slim down the organizational DWH landscape.

In today's interconnected world, companies tend to use cloud computing services. Corporate data can be stored in a virtual cloud and can be accessed through the internet. The cloud can save hardware and software costs and it also enables worldwide data access and sharing possibilities. Future research should address the integration of heterogeneous DWHs in a cloud environment.