Aligning Data Warehouse Requirements with Business Goals

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Abstract. According to the Gartner Group, over 70% of Business Intelligence (BI) projects fail. Among the reasons are the different languages employed by IT and business people and the necessity of a long-term BI plan describing the goals of the organization. In current practice, when building the data warehouse (DW), strategic plans are rarely considered. In this paper, we propose a method to align the business plan with DW requirements analysis. By aligning the DW, we (i) validate the correctness of each decision makers' goals, (ii) ensure that their decisions and the DW contribute towards organization goals, and (iii) provide a long-term unified BI strategy. We instantiate this alignment by combining i* for DWs with strategic business models.

Keywords: Business Intelligence, business plan, data warehouses, alignment, BIM

1 Introduction

Data Warehouses (DW) integrate numerous heterogeneous data sources in multidimensional structures in support of the decision-making process. In order to be successful, recent DW development approaches, such as [5], include a requirement analysis step based on goal models. During this step, the requirements of individual decision makers, who are the users of the Business Intelligence (BI) system, are gathered by means of questionnaires and interviews.

The main drawback of the techniques used during the requirements step is that they obtain only a partial view of the problem from each decision maker. Moreover, these partial views may not always be aligned with the business plan, which, together with the gap between IT and business people, makes it difficult to validate the goal models. In turn, the lack of alignment between individual decision makers and the business plan is translated into a lack of long term enterprise BI strategy, which is one of the key factors to successfully apply BI. This problem arises whenever business goals are not considered during the requirements analysis step. For example, a fictitious car dealer company EURent

pursues the goal of "Be positioned within the top 10 car dealers". EURent Sales Manager is considering how to improve the "Car Sales" process by "Increasing the margin of benefit per sale". While this particular goal improves the results of the sales process, it does not contribute to the increasing number of cars sold.

In this paper, we propose to tackle this problem by aligning the business strategy with current BI and DW goal models. Therefore, we ensure that our BI-enabled decision making is consistent with the business strategy. First, we elaborate a strategic goal model from the business plan to formalize business goals and trace business indicators. Then, we align and relate decision makers' goals with business goals. Therefore, we ensure that all the decision makers are contributing towards the overall goals of the enterprise, and identify business goals that are being overlooked by decision makers.

The remainder of this paper is structured as follows: Section 2 presents the related work in DW requirements. Section 3 describes the alignment process and the main contributions of our work. Section 4 presents the conclusions. Section 5 describes the ongoing and future work in this area.

2 Related Work

Until now, most of the attention in DW requirements analysis has been focused on requirements elicitation. Current techniques [2, 5–7] are focused on gathering requirements by means of interviews and questionnaires. However, although it has been stated that DW requirements can rarely be gathered correctly and comprehensively from individual decision makers [7], only in [2] do the authors consider organizational modeling in the requirements step. Unfortunately, the focus of organizational modeling in [2] is to identify the information stored in business processes, rather than obtaining business goals. Therefore, these approaches do not ensure that decisions being taken are aiming to provide a benefit for the organization according to the business plan, nor they do ensure that all the organization's goals have been considered in the decision making process.

3 Scientific Contributions & Tool

In this section we present the main contributions of our work, as well as the current tool support for our approach. Our contributions are described in the following order: (i) a method to perform the alignment between DW requirements and business goals, (ii) a set of mappings to instantiate the alignment method, by using i* for DWs [5] for modeling decision makers' goals, and the Business Intelligence Model (BIM) [1] for modeling the business strategy, and (iii) show how these mappings and models can be implemented in a tool.

First, the alignment method is shown in Figure 1. The alignment process starts by modeling decision makers' goals by means of techniques used in current DW approaches. As a result, an i* for DWs model is created for each decision maker. In parallel, or after DW requirements have been obtained, the business

strategy model is created by using the information from the business plan. Business plans include information regarding business goals, the objectives associated with each goal, and may also include information regarding business processes. Once both models have been obtained, we proceed to the alignment step. First, we align the concepts used to model decision makers' goals with those used to model business goals, in order to ensure that we correctly relate individual goals with business goals. Then, in collaboration with a domain expert, we align each concrete decision maker goal to a specific business goal. Finally, we analyze the alignment and perform changes as necessary.

Since currently there is no standard for modeling decision makers' goals nor business strategies, they can be instantiated according to different frameworks, thus leading to different results. Therefore, in order to instantiate the method, it is necessary to perform an ontological mapping between the concepts of the specific frameworks being used. In our case, we make use of i* for DWs in order to model decision makers' goals, and BIM for modeling the business strategy. Thus, we analyze the definitions and characteristics of each concept included in these metamodels and align them to ensure their correct use. Due to space constraints, we provide only a brief overview of the metamodels, and focus specifically on aligned elements.

First, i* for DWs [5] is an extension of i* that includes several types of actor goals to describe the decision making process rationale: Strategic Goals, Decision Goals, and Information Goals. Strategic Goals are goals with the highest level of abstraction, such as "Attract new customers", while Decision and Information Goals are included to describe the steps required in the decision process to achieve the Strategic Goals. We formally describe a Strategic Goal as follows: A strategic goal S_i describes a change from a current situation into a better one, as seen by *one* decision maker DM_j. The change described by S_i must be related to an objective O_k of *one* Business Process BP_m, e.g. "Sales". Therefore, it is said that S_i *improves* BP_m. If S_i is achieved, it causes an immediate benefit B_p for the organization, that may or may not be measurable. Finally, i* for DWs also includes lower level abstraction elements that realize Information Goals and define the structure of the DW: Contexts and Measures. Contexts describe

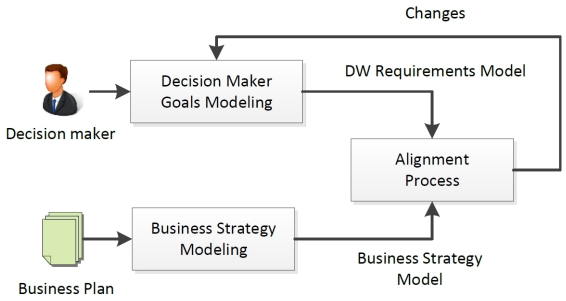

Fig. 1. Steps involved in the alignment method

concepts involved in BP_m, such as "Customers", while Measures are quantitative values v that evaluate the performance of BP_m, such as "Quantity Sold".

Second, in order to create the business strategy model, we use BIM [1, 4]. BIM includes four core concepts that allow us to formalize the elements within the business plan: Intentions (business goals), Situations, Indicators, and Processes (see [4]). An Intention defines a desired situation for the enterprise, as defined by one or more persons of authority $A = \{A_i, ..., A_n\}$ in the business plan, where A usually is a subset of the decision makers. Intentions can be classified as Strategic (long term), Management (medium term), and Operational (short term), and are realized by one or more Processes, $BP_i, ..., BPn$. An example of a Strategic Intention of the organization EURent is "To be a Premium Brand car rental company". Next, Situations describe internal or external factors, such as "Economic Crisis", that may affect Intentions or Processes, while Indicators measure the performance of a Process or Intention. Indicators include a target value t to be achieved, a threshold th that separates average from bad performance, and a worst value w that describes the worst performance. Finally, Processes represent Business Processes, such as "Sales" or "Rentals".

According to the descriptions provided in the i* for DWs and BIM proposals, Decision and Information Goals, and Contexts from i* for DWs cannot be aligned with any element in BIM. The main reason is that BIM focuses on representing the business strategy and does not consider elements specific to the individual decision making process, such information requirements or actors.

Next, Business Processes and Measures from i* for DWs can be easily aligned with BIM elements. First, Business Processes refer to the same concept as Processes. Second, Measures provide a value v_i that measures the performance of a business process. These values are one of the basic elements used to calculate Indicators that monitor elements in the business strategy. A Measure can be related or transformed into an Indicator I_j if (i) v_i is used in the calculus of I_j and (ii) the rest of the values t_j, th_j, and w_j are defined.

Finally, Strategic Goals can be aligned with Intentions as follows: according to our formalization, achieving a particular decision maker strategic goal

Table 1. Elements aligned between i* for DWs and BIM and their characteristics

i* for DWs	BIM	Details i* for DWs	Details BIM
Business Process	Business Process	Not detailed, Strategic Goals improve its results	May be detailed, Realizes goals
Strategic Goal	Strategic Intention	Future, Focused, Long-term, Qualitative or Quantitative, Improves business process	Future, Focused, Long-term Qualitative, Measured by KPI
Measure	Indicator	Measures the performance of a Business Process without target values	Future, Time-Targeted, Long or Short-term, Measures Goal and Process performance

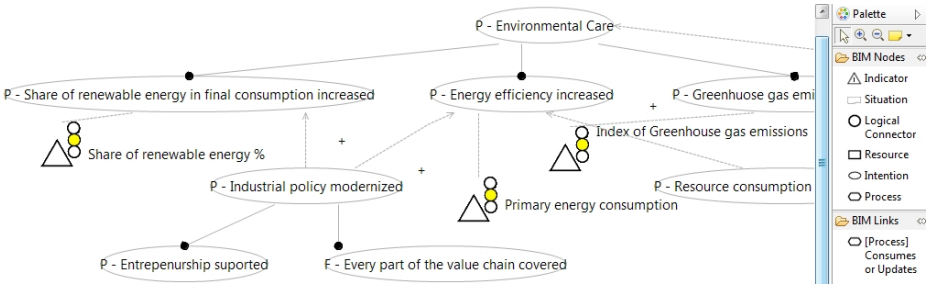

Fig. 2. Business strategy editing using the Lucentia BI Tool

S_i *improves* a process BP_m. Thus, this improvement helps the organization to achieve a business intention I_j, realized by BP_m. There are, however, two limitations to automate this alignment. First, S_i may improve a specific objective O_k that does not have an impact on I_j. For example, improving the "Car Sales" process by "Increasing the margin of benefit" does not have an impact on "Be positioned within the top 10 Car Dealers". Second, in practice, not every business plan or strategy provides references to the business processes that realize each intention. Thus, it is necessary to collaborate with a domain expert in order to identify if the particular goals are aligned with the business intentions or not.

The alignment is summarized in in Table 1, along with the informal descriptions provided by the frameworks for each element.

After aligning the concepts, the last step is aligning the elements within the goal models obtained from decision makers with the business strategy, thus obtaining a combined model that covers both individual as well as organizational views. We have successfully tested our approach in an experimental case study, creating a business strategy from a business plan and interviewing experts in information analysis to obtain decision makers' goals. However, due to space constraints, the case study will be described in a future extended version.

Our approach is supported by our tool, the Lucentia BI suite, which allows us to model (i) user requirements by means of i* for DWs, (ii) business strategies by means of a particular implementation of BIM, and (iii) a trace metamodel, described in [3], that allows us to materialize the alignment between user requirements and the business strategy. The tool is based on Eclipse and includes a set of modules, each designed to support an specific task. An screenshot of the tool can be seen in Figure 2.

4 Conclusions

In this paper we have presented an alignment between the business strategy, modeled using BIM, and DW requirements, represented by i* for DWs. Our process results in an alignment that allows us to (i) validate DW requirements according to the business strategy and identify non-aligned goals, (ii) provide a

long-term BI strategy to be pursued, including what information is being used by the organization to support each goal, (iii) identify the different decision makers participating in a business goal, thus providing awareness, and (iv) evaluate if decision makers are being successful by analyzing the values of indicators related to business goals.

While extending i* to consider all the elements within the business strategy would overcomplicate the model, our initial applications have shown that it can be combined with other models in order to capture both the particular viewpoint of each decision maker as well as the overall strategy of the organization.

5 Ongoing and Future work

The current ongoing work is focused on making it easier for businesses to apply our proposal. In order to achieve this, we plan to semi-automate the process of obtaining an strategic model directly from the business plan. Therefore, we are analyzing the viability of defining a series of pattern-based transformations in order to save time and costs.

In the medium-term we plan to apply our approach to a real case study and evaluate the results. Since then structure of business plans may vary from one organization to another, we plan to minimize the impact of this variability by using the standard Business Motivation Model, proposed by the Object Management Group group.

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