

Requirement Elicitation For Data Warehouse Using GDI Diagram And Tropos Methodology

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Abstract. Data Ware House-(DW) must start from goals and works its way to the decisional information needed to take the decision that fulfills these goals. Naveen Prakesh and Anjana Gosain [1] proposed GDI diagram. Through GDI Diagram they proposed two associations 1) goal-decision association 2) decision-information association to represent this. Our paper concerns with goal-decision association and objective is to use tropos methodology for requirement elicitation by exploring GDI diagram for DW

I INTRODUCTION

Several surveys indicate that a significant percentage of data warehouses (DW) fail to meet business objectives or are outright failures. One of the reasons for this is that requirement analysis is typically overlooked in real projects, mainly since[7] :

- a. • Warehousing projects are long-term ones, and most requirements cannot be stated from the beginning.
- b. • Information requirements for DW applications are difficult to specify since decision processes are flexibly structured, poorly shared across large organizations,
- c. jealously guarded by managers, and unstable in time to keep pace with evolving business processes.
- d. • Requirements for decision making often refer to information that does not exist in the required form, and must be derived from data sources.
- e. In this paper, we look at requirement elicitation process for arriving at the GDI diagram [1]. Through GDI Diagram they proposed two associations 1) goal-decision association 2) decision-information association. The total process is a two-part one. In the first part, the goal-decision coupling is elicited. That is, the set of decisions that can fulfill the goals of an organization are elicited from goals. Thereafter, in the second part, from elicited decisions, the decision-information coupling can yield decisional information [1]. Here, we deal with the first part of this process.

My paper concerns with goal-decision association and objective is to use tropos methodology for requirement elicitation by exploring GDI diagram for DW.

II. The GDI DIAGRAM

The Goal-Decision-information (GDI) model[1] is shown in Fig.1. Goal can be viewed as an aim or objective that is to be met. Goal is a passive concept and unlike an activity/process/event it cannot perform or cause any action to be performed. A goal is set, and once so defined it needs an active component to realize it. Decision is the active component . Further appropriate information is required. to fulfill the decisions

A decision is a specification of an active component that causes goal fulfillment. It is not the active component itself: when a decision is selected for implementation then one or more actions may be performed

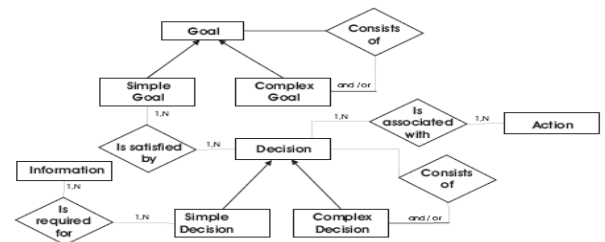


Figure 1. GDI diagram[1]

to give effect to it. In other words, a decision is the intention to perform the actions that cause its implementation. Decision-making is an activity that results in the selection of the decision to be implemented. It is while performing this activity that information to select the right decision is needed. Fig.1 shows that there is an association 'is satisfied by' between goals and decisions. This association identifies the decisions which when taken can lead to goal satisfaction.. Fig.1 shows that there is an association 'is required for' between decisions and decisional information. This association identifies the decisional information required to take a decision.

The dynamics of the interaction between goals, decisions and information is shown in Fig. 2. A goal suggests a set of decisions that lead to its satisfaction. A decision can be taken after consulting the information relevant to it and available in

the decisional system. In the reverse direction, information helps in selecting a decision, which in turn satisfies a goal.

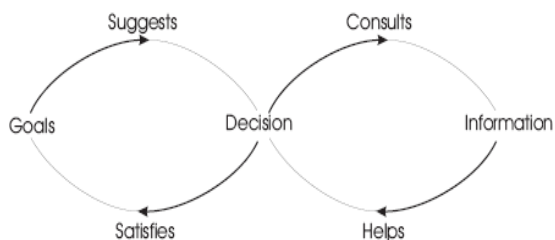


Fig.2. The Interaction cycle[2]

III. TROPOS METHODOLOGY

The Tropos methodology[3] is intended to support all analysis and design activities in the software development process, from application domain analysis down to the system implementation. In particular, Tropos rests on the idea of building a model of the system-to-be and its environment that is incrementally refined and extended, providing a common interface to various software development activities, as well as a basis for documentation and evolution of the software. In the following, we introduce the five main development phases of the Tropos methodology: Early Requirements, Late Requirements, Architectural Design, Detailed Design and Implementation. The last four phases are well-established in the Software Engineering literature and are supported by various methodologies and tools. The first one (early requirements analysis) is well accepted in the Requirements Engineering research community, but not widely practiced.

A. Development phases

The ultimate objective of requirement analysis in Tropos is to provide a set of functional and non-functional requirements for the system-to-be. Requirements analysis in Tropos is split in two main phases: Early Requirements and Late Requirements analysis. Both share the same conceptual and methodological approach. Thus most of the ideas introduced for early requirements analysis are used for late requirements as well. More precisely, during the first phase, the requirements engineer identifies the domain stakeholders and models them as social actors, who depend on one another for goals to be achieved, plans to be performed, and resources to be furnished. By clearly defining these dependencies, it is then possible to state the why, beside the what and how, of the system functionalities and, as a last result, to verify how the final implementation matches initial needs.

In the Late Requirements analysis, the conceptual model is extended including a new actor, which represents the system, and a number of dependencies with other actors of the environment. These dependencies define all the functional and non-functional requirements of the system-to-be.

The Architectural Design and the Detailed Design phases focus on the system

specification, according to the requirements resulting from the above phases.

Architectural Design defines the system's global architecture in terms of sub-systems, interconnected through data and control flows..

The Detailed Design phase aims at specifying agent capabilities and interactions. At this point, usually, the implementation platform has already been chosen and this can be taken into account in order to perform a detailed design that will map directly to the code.

The Implementation activity follows step by step, in a natural way, the detailed design specification on the basis of the established mapping between the implementation platform constructs and the detailed design notions.

B. Early requirements analysis phase

Early requirements analysis phase consists of identifying and analyzing the stakeholders and their intentions. Stakeholders are modeled as social actors who depend on one another for goals to be achieved, plans to be performed, and resources to be furnished. Intentions are modeled as goals which, through a goal-oriented analysis, are decomposed into finer goals, that eventually can support evaluation of alternatives.

Once the stakeholders have been identified, along with their goals and social dependencies, the analysis proceeds in order to enrich the model with further details.

In particular, the rationale of each goal relative to the stakeholder who is responsible for its fulfillment has to be analyzed. Basically, this is done through means-end analysis and goal/plan decomposition. It is important to stress that what goals are associated with each actor is a decision of the corresponding stakeholder, not the design team.

C. Late requirements analysis phase

Late requirement analysis phase focuses on the system-to-be within its operating environment, along with relevant functions and qualities. The system-to-be is represented as one actor which has a number of dependencies with the other actors of the organization. These dependencies define the system's functional and non-functional requirements.

IV TROPOS IN THE DW CONTEXT :

For using Tropos in the DW context requires some new concepts to be introduced:

- a. • **Facts.** In organizational modeling, a fact models a set of events that happen when a goal is achieved. In decisional modeling, a fact is more properly meant as a possible focus of analysis related to an analysis goal. Graphically, facts are represented as rectangles connected to a goal
- b. • **Attributes.** They are fields whose value is provided when a fact is recorded to fulfill a goal. They are denoted as small diamonds connected to goals.
- c. • **Dimensions.** A dimension is a fact property that describes a possible coordinate of analysis, i.e. a

2) Fact Analysis

Like for organization modeling, rationale diagrams are extended by identifying facts and associating them to the goals of decision makers. Facts are possible objects of analysis, and correspond to business events that dynamically happen within the enterprise. Facts are normally imported from the extended rationale diagrams produced during organization modeling. For instance, in Figure 6 the analyst associates fact transaction, identified during organizational modeling, to the goal analyze transactions (the figure also includes dimensions and measures, that we introduce later).

3) Dimension Analysis

In this phase, each fact is related to the dimensions that decision makers consider necessary in order to satisfy their decisional goals. Dimensions are connected to the goals associated to the fact as shown in Figure 6, where dimensions account number and month are associated to goal analyze total amount.

4) Measure Analysis

Finally, the analyst associates a set of measures to each fact previously identified. For example, two measures are identified for goal analyze total amount in Figure 5: total amount and average amount.

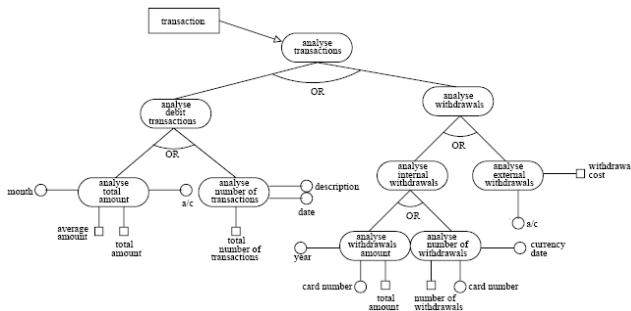


Figure 6: Extended rationale diagram for the Financial Promoter decision maker from the decisional perspective[6]

V FROM GOALS TO DECISIONS

The goals of the GDI diagram can be obtained from the organizational modeling and these are same as the early requirement of the data ware house defined by the Tropos methodology. Similarly the decision in the goal decision association of the GDI diagram can be obtained from the decisional modeling which corresponds to the late requirement in the TROPOS methodology.

The organizational modeling represents the main goals on which the organization operation is based. It provides a model to analyze the organizational setting in which the data warehouse will operate and the decisional model provides us the areas on which a decision maker can make the decision. These decisions are required to fulfill the organizational goal.

For example: From the figure we can identify the main goals of the BANK as an enterprise. These goals are:

- a. Manage permanent payment
- b. Manage withdrawal
- c. Manage Bank Transfer
- d. Manage external ATM Withdrawal
- e. Manage internal ATM Withdrawal
- f. Manage Credit

Some of the goals are further decomposed into the sub-goals.

From the decisional perspective we can see the areas on which a financial promoter can make the decision. These areas of decisions are:

- a. Analyze Debit Transaction
- b. Analyze Total Amount
- c. Analyze Number of Transaction
- d. Analyze Withdrawals
- e. Analyze Internal Withdrawals
- f. Analyze External Withdrawals

VI. CONCLUSIONS

The goals of the GDI diagram can be obtained from the organizational modeling and these are same as the early requirement of the data ware house defined by the Tropos methodology. Similarly the decision in the goal decision association of the GDI diagram can be obtained from the decisional modeling which corresponds to the late requirement in the TROPOS methodology. The area of decision can be identified from goals using GDI and Tropos methodology.

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