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CAGDI: A New Conceptual Model of Early and Late Requirement Engineering for Non Fading Dataware House

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Abstract

Building a data warehouse is a very challenging task. Most of the data ware house project fails to meet the business requirements and business goals because of the improper requirement engineering phase. The chaos all through the development of requirements evolves due to disparity between users and developers resulting in project devastations and terminations. Data warehouse quality depends on the quality of its requirement engineering models. Agent orientation is emerging as a unique paradigm for constructing Data ware house and maintaining the non fading data ware house property. Agent oriented systems are expected to be more powerful, more flexible, and more robust than conventional software systems. In this paper a new conceptual model CAGDI have been proposed which have benefits over the AGDI concept and used in early as well as late requirement elicitation.

Keywords: Data ware house (DWH), Requirement elicitation, agents, Goal decision information model (GDI), AGDI, CAGDI.

1. Introduction

Critical business decisions depend upon the availability of proper strategic information in the enterprise [1] [4] [5]. Data Warehouse (DW) systems are used by decision makers to analyze. DW acknowledged as one of the most complex information system modules and its design and maintenance is characterized by several complexity factors. The solution of the aforesaid problem is data ware house. The data warehouse is

primarily used for the decisional purposes and supports on-line analytical processing. The data in data warehouse is historical in nature available in very huge amount. Because of these basic requirements of a data warehouse system, the development of a data warehouse system is also different from the development of a conventional operational system. Therefore the data warehouse design process has not been supported by a formal requirements analysis method though there are some approaches for requirements gathering. Thus requirements engineering for the data warehouse aims to identifying the information needs of the decision-makers. In recent years, requirements engineering for DW has acquired importance. [3] [6] [16]. A relationship of the Data Warehouse to the organizational context is established at the requirements level. The requirements Engineering task has been divided into two phases: early requirements engineering phase and late requirements engineering phase [7] [19]. The early phase of requirements engineering activities include to consider how the intended system would meet organizational goals, why the system is needed, The emphasis here is on understanding the whys that underlies system requirements, rather than on the precise and detailed specification of what the system should do. The late requirement analysis describes the developing system within its operational environment along with its function and properties. Now this phase specifies what the system will do and how it will be done.

2. Overview of Goal Decision Information Model for DWH Requirement Engineering

Fig. 1: GDI model.

Goal–decision model shown in figure 1 covers both the analysis of initial requirements and the specification of these requirements in terms of a conceptual schema. Goal-oriented requirements analysis starts with a list of stakeholders and their high-level goals, which are refined and interrelated to produce a goal model in which only major stakeholders or decision making users are involved in requirement elicitation process [2] .

Goal-oriented schema design is further divided into two Stages [9]: the modeling of the application domain which describes the necessary understanding of a part of the real world, and facilitates the communication of domain knowledge between developers, end-users and other stakeholders and a conceptual schema, that represents the semantics of the actual data in the proposed database; its design focuses on issues that are specific to the conceptual content and organization of the data.

The GDI [10] [12] [15] model starts with the determination of goal of the organization with the Agent complex agent simple agent External agent Internal agent

contains delegates achieve Goal consists of decision Simple Goal Complex Goal suggest Information provides influence associated requires simple decision complex decision consists of Action and/or help of decision makers by assuming that only decision maker are the stakeholders responsible for decision making activities in the organization. The other stakeholders and their dependencies for achieving the goals of the organization are also important to be modeled. For this GDI model does not have any notion to model stakeholder explicitly

3. Agent Goal Decision Information Model

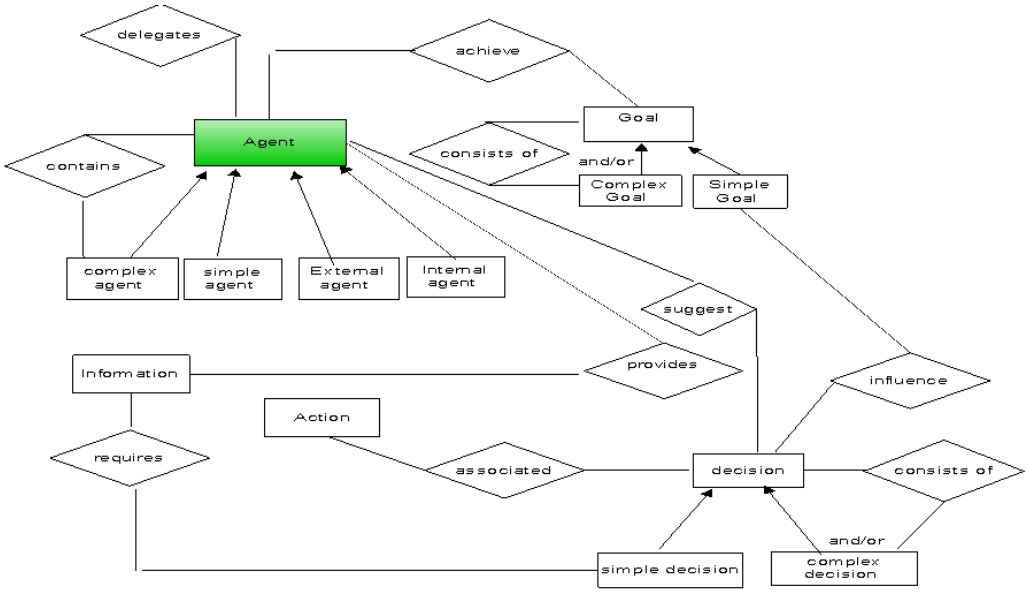

Fig. 2: Snap short of Agent Goal Information model.

The notion agent represents each and every user of the system. They can be stock holders, decision makers, information providers etc. The organizational goals can be achieved by combining the individuals goals of each stakeholders which can be in turn depends on each other. The Agent may depend on another agent for goals to be achieved, decisions to be suggested & information to be provided. These dependencies among agents are called goal, decision & information dependencies respectively. The extended GDI model is called an AGDI model [3] [8] [13] [17] [18]. AGDI model is used to support organization modeling and goal modeling activities. The Papers [19], [20] explores other domains of AGDI applications and proves its applicability in various domains with reduce the risk of failure and have the non fading property. AGDI uses the following concepts for requirement modeling

Agents- position of an agent can be considered as actors of use case diagram. It represents the various users, stakeholders, decision makers and users of the organization. [11], [12] Defines various different types of roles that termed as actors.

The agent can be internal, external depending upon the working of the agents' w.r.t. to system. Agents can be either simple agents or complex agents.

Agents & goals - Goal are the objectives of agents to be achieve by the organization. These goals are the prime driving force in requirement elicitation for the developing DWH. Goals can be simple or complex that can be subdivided into simple goals. These goals may have two or more actors' dependencies to achieving a particular goal.

Agent, decision & Information – once the goals have been decided it needs a decision and information on which decision has to be made to achieve the goals. These decisions for achievement of goals will be suggested by to agents thought repeated interactions. The DWH itself as an agent provide information to support these decisions.

In AGDI the early phase requirement analysis can achieve by Organization model which provides agents with their goal dependencies and Goal model which provides the relevant decisions to achieve the previously defined goals whereas late requirement analysis is achieved by Decision model that provide quality information to support the decisions made earlier.

To provide these set of information there is a need of an agent which can manage this kind of historical information in an effective way. In this case data ware house is a viable solution, which will work as decisional system for the organization. Similarly to support all suggested decisions the required information may be indentified though set of interactions among agents. This set of information will be kept in DWH. The set of models produced during the early and late requirement analysis will kept in DWH.

4. New Conceptual Model - Clustered Agent Goal Oriented Decision Information Model

The above foresaid model is emphasis on including more and more agents in the requirement elicitation process to reduce the risk of failure and make the developing data ware house as per user requirement but in the process of including maximum agents in the requirement elicitation process our system is diluting, therefore followings are the shot comes of including maximum agents in the requirement elicitation process:

i. Taking more storage space to maintain the status, information and requirements from each user.
ii. As the numbers of agents are numerous It takes more time to build the system.
iii. By increasing the space and time complexity of the developing system the overall cost of the system will be increased.
iv. There are no security measurements for the agents in AGDI model. Providing security layer mechanism for each user is difficult. So security threats can be arises.

To overcome the above mentioned issues there should be a mechanism to limit the number of participating agents with the same time maintaining the quality of the developing system so that the developing system is useful for its all user and having its

non fading property as it holds previously. Therefore we proposed a new conceptual model CAGDI. In this model we are categories the users and make clusters of the users who are having same functionality or have same traits and user requirements for the developing system. This clustering is based upon the use case methodology.

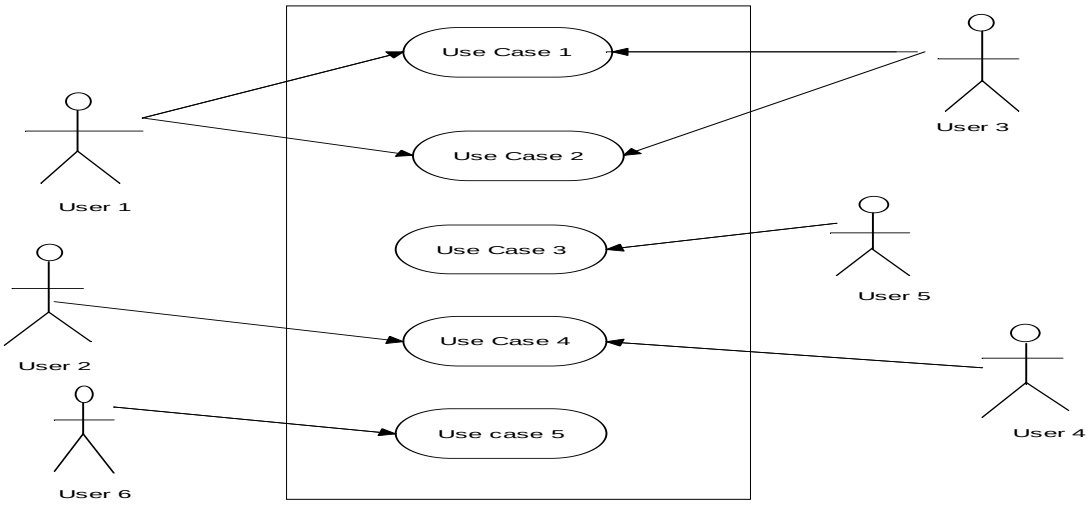

Fig. 4: Use case approach with clustered technique.

As shown in the figure 4 here we involve all the possible agents of the developing system. Based upon their use cases interactions we can identify the functionality of each user. It is fact that user requirements are based upon their uses and the functionality with the system that is what the agent expect from the system. Based on the above said point and the use case interactions of each user we can categorize the agents and make clusters of them. As shown in figure 4, user 1 and user 3 are interacting only with same use cases 1, 2 so we can make cluster c1 having two agents. From this cluster c1 having 2 agents with same requirements from developing system we can generalize and opt any one agent randomly for the requirement elicitation. This agent covers the requirements of all other users present in the same cluster but the whole cluster c1 is delegated to achieve the sub goal and objectives of the system. Similarly agent 2, 4 are interacting with use case 4, so they can combine to make second cluster c2. Again any one agent can be used for requirement elicitation process but whole cluster is delegated for achieving the goals.

In view of above context following are the proposed guidelines for categorizing users and for framing clusters:-

- Clusters are of variable sizes.
- Single member that is singleton set can be cluster.
- Clusters once made can be modified later on while developing the data ware house.
- A password can be assign for each cluster to add security mechanism in CAGDI model.

These are the just the suggestions in building the clusters. In practice clusters making process of the actual developing ware house is depending either based on above guidelines or adding some other rules. The discovery of new rules after the intensive research is in progress and in continuation. The set of decision models produced during decision modeling activities captures the late requirement for a DWH whereas organization and goal models produced captures the early requirements. DWH is itself act as an agent that provide the information support needed for the decisions made at goal modeling. Keeping this fact the requirement elicitation and analysis for the developing DWH is closer to the practical aspect. As it's ultimately the user who will use and get benefits by the DWH therefore requirement elicitation by using this approach by involving each agent of DWH is more suitable than other conventional requirement elicitation techniques.

5. Conclusion

By applying the fore said model we can overcome the short comes of AGDI as mentioned above and reduce the risk of failure for the developing project, while getting the longer useful life span. Thus achieves the non fading property. We can also be able to get extra benefits from the features of clustering technique which can be useful in the projects.

5.1 Future Work

In the coming future work the proposed model will be implemented with the working example or case study. To support CAGDI model more options will be explored by focusing on the different system agents, various goals of the system and proposing more development guidelines. CAGDI model can be applicable in other fields such as medical, university system and other domains.

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