Modelling of Requirement Elicitation for the Complete Banking System Using Agent Goal Decision Information Approach

[1]**Sandeep Mathur,** [2]**Girish Sharma,** [3]**A K Soni**

[1]Amity University, Noida, UP, India
[2]BPIBS Shakarpur Delhi, India
[3]Dept. of IT, Sharda University, Greater Noida, UP, India

Abstract

Most of the data ware house project fails to meet the business requirements and business goals. One of the reasons for this is that requirement analysis is typically not done with keeping the actual working conditions and situations. This leads 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. Building a data warehouse is a very challenging task. 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. Agent oriented systems are expected to be more powerful, more flexible, and more robust than conventional software systems. Here presenting the detail discussion of agent oriented methodology based model AGDI used in early as well as late requirement elicitation. This approach is illustrated through a case study of the general banking system in [24] for which Data Ware house is to be built to support decisional goals. In this paper the complete solution for banking system is explored

Keywords

Data Ware House (DWH), Requirement Elicitation, Agents, Goal Decision Information Model (GDI), AGDI

I. Introduction

Critical business decisions depend upon the availability of proper strategic information in the enterprise [1, 5] and [7]. 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. [7, 13, 17]. 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 [4, 23]. 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.
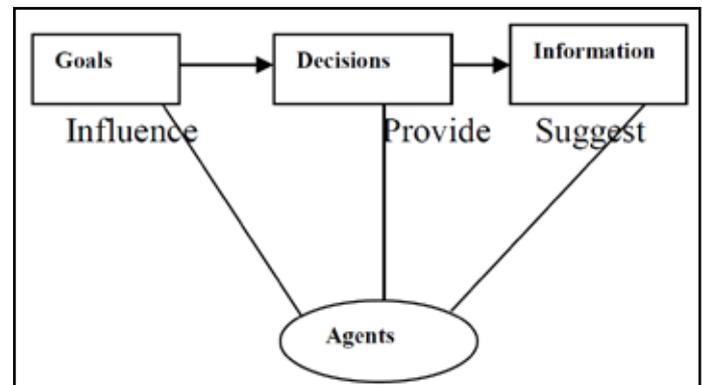
II. Agent Goal Decision Information Model

Fig. 1: 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 [8-9]. AGDI model is used to support organization modelling and goal modelling activities. AGDI uses the following concepts for requirement modelling

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 [8]. 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.
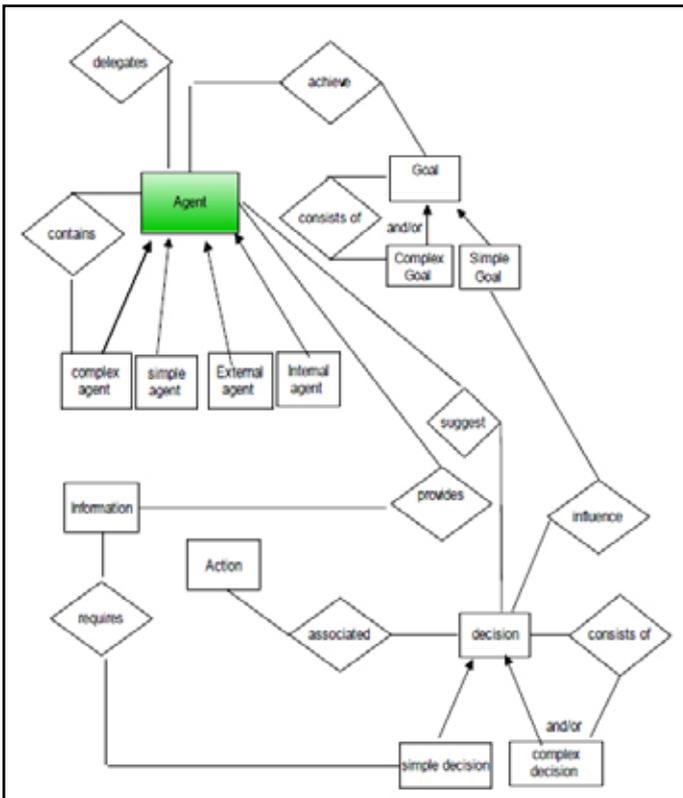

Fig. 2: AGDI Model

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 illustrate this approach we take an example of general banking system where each and every agent influences the organization, goal & decision models.
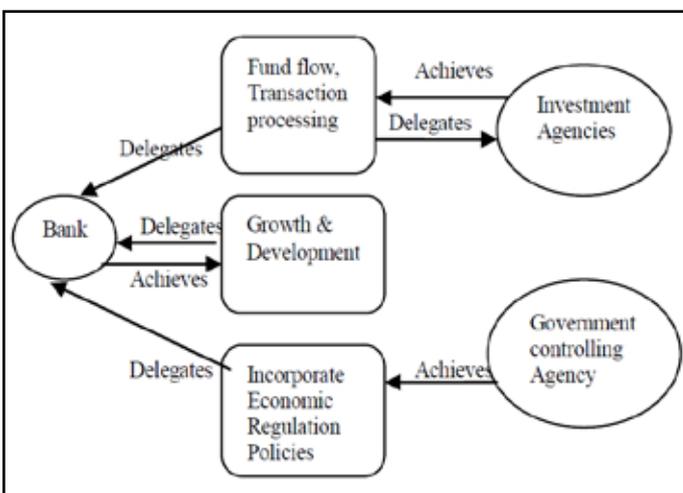
A. Organization Modelling

Fig. 3: Organization Model

In the organization modeling, we identify the various stakeholders as agents and their expectation as goals of the agent. Here in our banking example Government controlling agency such RBI in India and investment agencies are external agents whereas bank itself is a complex agent - customer, staff & higher management.

Bank has three goals to achieve:

1. Fund flow – Perform money transfer activities to get cash in hand for investments. Now this goal can be achieved by the investment agencies to invest the bank cash and bank itself is delegate to achieve this goal as only bank headquarters have the authority of investment. This cash flow is also achieves by routine bank financial activities performed by the bank staff.

2. Incorporate Economic Regulation Policies – various economic policies and rules have been incorporated by government as per the country wide prospective. Government financial agencies such as Reserve bank of India delegate bank to apply these policies to get benefit for global economy. Bank staff and management works as per these regulations.

3. Growth & Development – This is the main objective of any financial organization. Our focus is on this goal. We explore this particular objective in detail while discussing the sub goals and decisions with information requirement to achieve this goal.

The bank itself and other external agents such as investment agencies are delegates to achieve this goal. Now let us consider the bank's Designation hierarchy:
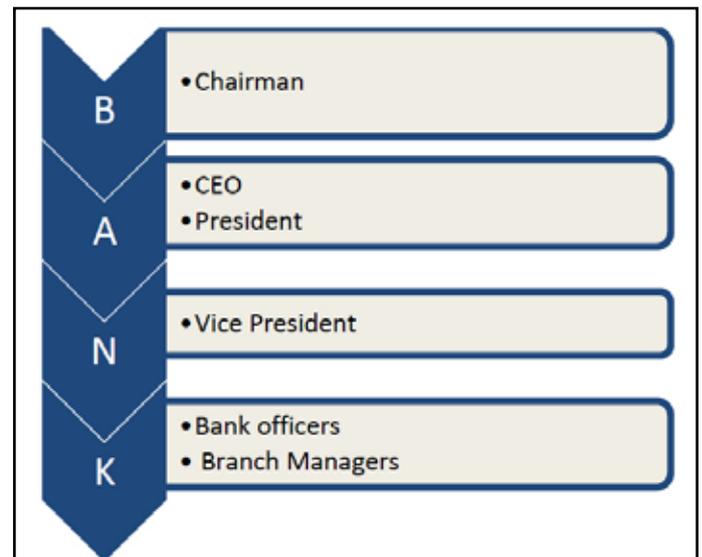

Fig 4: Bank Hierarchy

These will work as internal agent for the banking system. These agents are responsible to accomplish the goals so these agents' delegates to achieve the goals and its sub goals. These agents will have roles and positions to play in achieving the goals of the bank. It must be in notice that many a time more than one sub goals are delegated to one agent. This will show the agent goal dependency in the banking system.

The bank designation hierarchy shown in fig. 5 [25] and goal dependency between the actors, the organization model can be simplified and reconstructed as shown in fig 6. In some banking systems these designations can be replaced by Assistant general manager, General managers, Executive director or chief managing Director but these designation can be inter changeable by the designations mentioned in the fig 5. As chairman is the most

influential and powerful person on post, chairman is delegates to achieve growth and development goal. Growth and development can be achieved in terms of economic growth, infrastructural growth and HR growth. Therefore these three are the sub goals of the main goal. Further these sub goals have been more classified into simple sub goals. Such as to get economical growth bank need to gain maximum profit and more returns on the investments. Next from the bank designation hierarchy president is delegate to achieve these 2 simple sub goals as president is allowed to invest the bank's cash into various agencies. Similarly hire efficient staff will have simple sub goal staff welfare policies whereas infrastructural growth can be achieved by opening more and more new branches to involve more and more customer while development in the bank's organization. Chief executing officer of any bank has to deal with these extension and development decisions therefore CEO is delegates to achieve these 2 simple sub goals. This simplified organization model haves the simple goals to be achieve by various agents.
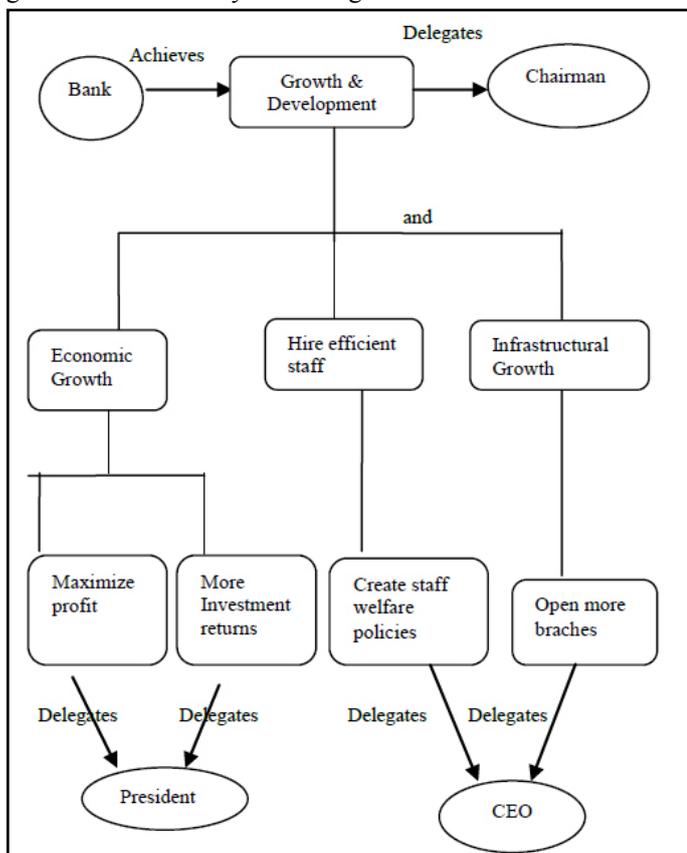

Fig. 6: Simplified Organization Model

B. Goal Modeling
In the goal modeling agents will suggest various decisions that will have to taken to achieve the goals mentioned in the organization model. Considering our main objective discussion and keeping the fig. 6, we will continue with maximize profit goal. As shown in fig agent president is delegate to achieve this goal by suggesting simple and complex decision as shown in fig. 7. It shows the following decisions to be made:
1. Reduce expenses
2. Increase earning>Attract more customers
3. Loan interest

Here decision 2, 3 are complex decisions which is further broken into one simple sub decision. To get maximum profit bank need to reduce its expense this will be explore in future. Now these all simple decisions and manager is delegated to take them.

It is also a fact that Profit gaining though internal agent as a bank is a combined efforts by each bank branch so branch head known as branch manager is delegated to achieve this goal by taking above mentioned simple decisions.
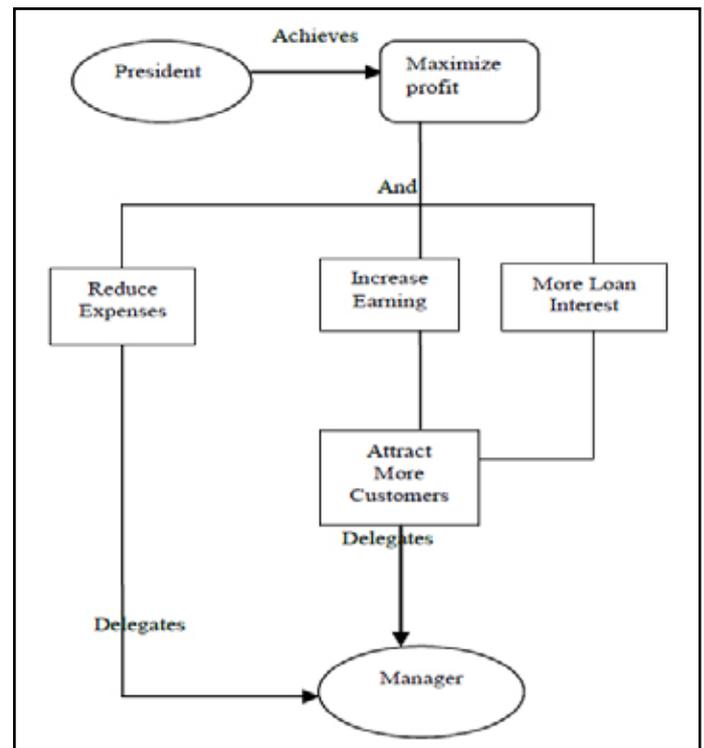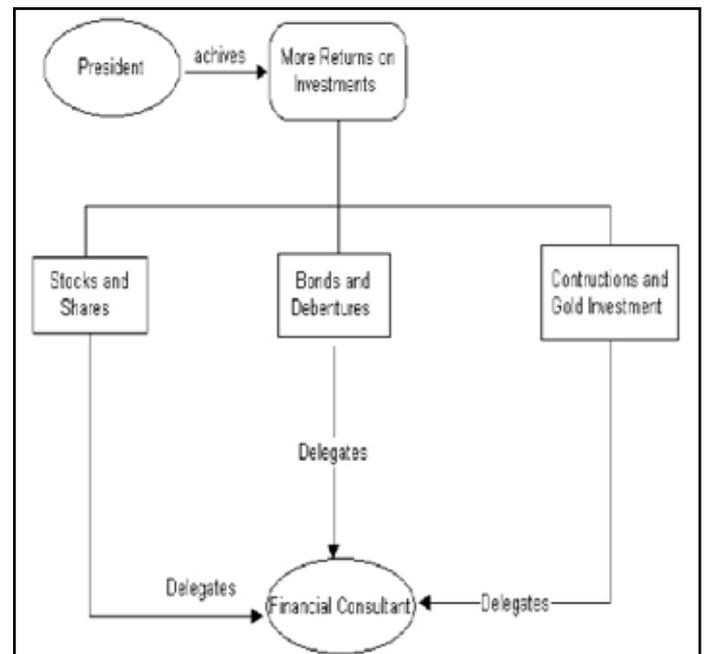

Fig. 7: Goal Model 1

Fig. 8: Goal Model 2

Continue with our organization model in fig 6, to achieve economic growth objective president wants to get maximum returns on the bank investments in the various domain. Generally a bank invests their deposit amount into stocks & shares, bonds & debentures, gold & constructions. Figure 8 explore this option of the bank economic growth goal. Here the goal maximum investment returns is further subdivided into 3 sub goals. To do these investments an agent financial advisor which may be an agent, broker or financial advisor has been delegated.

C. Decision Modeling

In the decision modeling, agents are needed information to support the indentified simple decisions during the goal modeling. Here in our example to support the simple decision —attach more customer‖ made in goal modeling requires following set of information by the agent manager:

1. Popular customer friendly policies- pick the best bank policies and procedures, popular in the existing customers for user friendly banking to get attract more depositors and customers. In this way more funds are available in the bank for loan and investments.

2. List of customers using bank facilities- list out the bank customers who are using bank credit/debit cards, ATM cards and do non-financial transactions such as mini statements, balance enquiry etc. As bank charges fees to provide these services this will ultimately increases the bank earnings. This list also provides the list of customers who are not currently using any of the bank beneficial schemes such as sms alerts, insurance policies of bank etc. and agent branch manager can motivates them to avail such a bank offers. In this way bank get more customers and hence get more earning.

3. Records of loan interested customers – list the customers who are interested to availing any type of loan from the bank as the bank majorly earn profit from the difference of interest rate paid to the depositors of saving accounts and the loan repayment interest accrued by the bank from the borrower. For example say bank will give 8% interest rate on saving bank accounts whereas charges 12% interest rate on loan accounts. So 12-8= 4% is the bank profit. Therefore increase of the loan amount will increase the bank earnings. This will be subject of availability and eligibility. Hence personal and financial information of loan interested customers is also required by the branch manager.
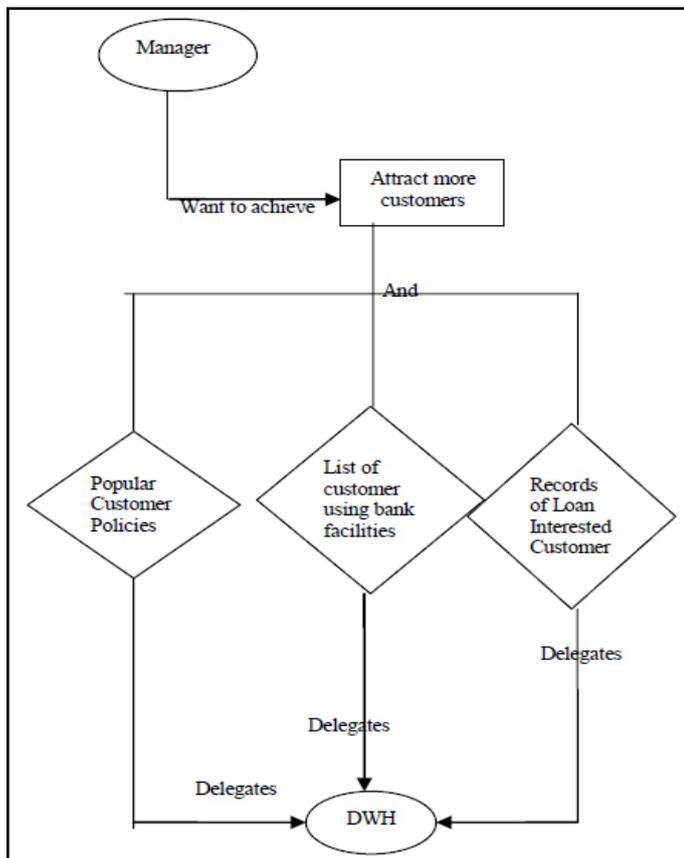

Fig. 8: Decision Model 1

Similarly to achieve high returns from stocks & shares or from bonds & debentures the information regarding the highest profitable shares in the last economic quarter is required. Market risk factors such as natural disasters, growing competitors and growing industries are very important therefore market risk metrics plays a vital role in investment decisions such as releasing mutual funds for the bank organization. This is an interesting point that the worldwide currency rates of different countries such as dollars effects a lot on market's financial growth [25] and affects the investment returns. Therefore one should keep in mind these types of information before making an investment decision. Fig 10 shows these information requirements by modeling in decision model 3.

Fig 9 shows that for making profit, bank invests in the gold to maintain gold deposits and in real estates. Sometime banks finance the whole under construction residential projects or tie up with the construction projects to gain profit. To make such type of investment decisions, reports of ongoing construction projects with the demand and supply ratio- to check whether the type of candidate construction project is successful in the specified geographical region or some other type of construction projects such as commercial projects are profitable in the region and the land rate pattern for last 2 years is required. This type of nformation is used for the future prediction about the success rate of the various ongoing construction projects. To invest in gold deposits the bank will consider the gold rates pattern in the last one or two economic quarter. These all information will support or used in achieving the sub goals gold and construction investments. Hence constitute the third decision model.
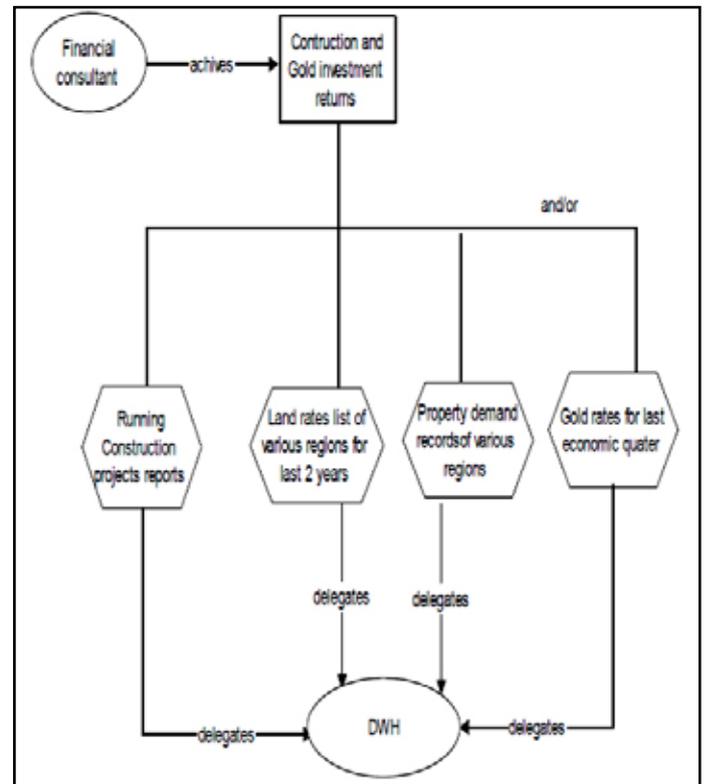

Fig. 9: Decision Model 2

Continue with goal model 1 in fig. 7 to achieve maximize profit reduction in expenses is also the sub goal to be meet. This results in the decision model 4 shown in fig 11. Reduction in running cost can be achieved by keeping track on the items used daily in the operational environment. To do this we need a list of product maximum used in last 2 year with price list from different product

manufacturers. Quantity of different products used with per unit price can yield cost incurred on various items used in last 2 years. Also we need to consider that how much different items have to purchase more. Therefore we need inventory stock list of each individual product for making budget for the future. Reduction in cost can also be achieved by cost cutting in HR. This can be achieved cross analysis of salary and performance parameters records of each employee. Cost cutting and future increments based on the performance record list of employees can be useful in implementing better staff welfare policy goal.
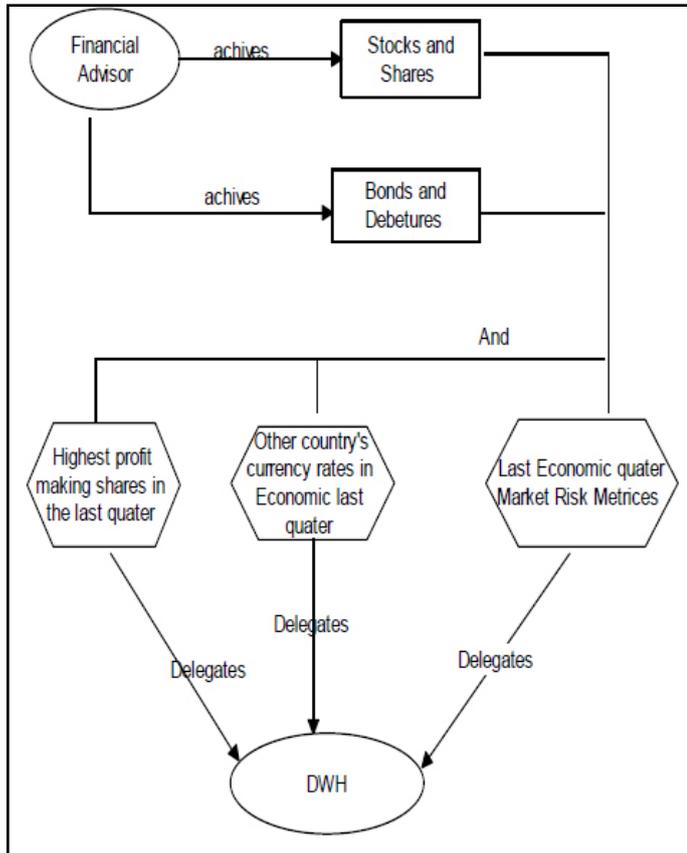

Fig. 10: Decision Model 3

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. Data ware house having much business dimensions and have the ability of cross dimension analysis. It can analyze data from various prospective and views. It is different from operational databases to provide strategic information to its users. 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 with the set of models produced during the early and late requirement analysis will kept in DWH to complete the requirement elicitation process
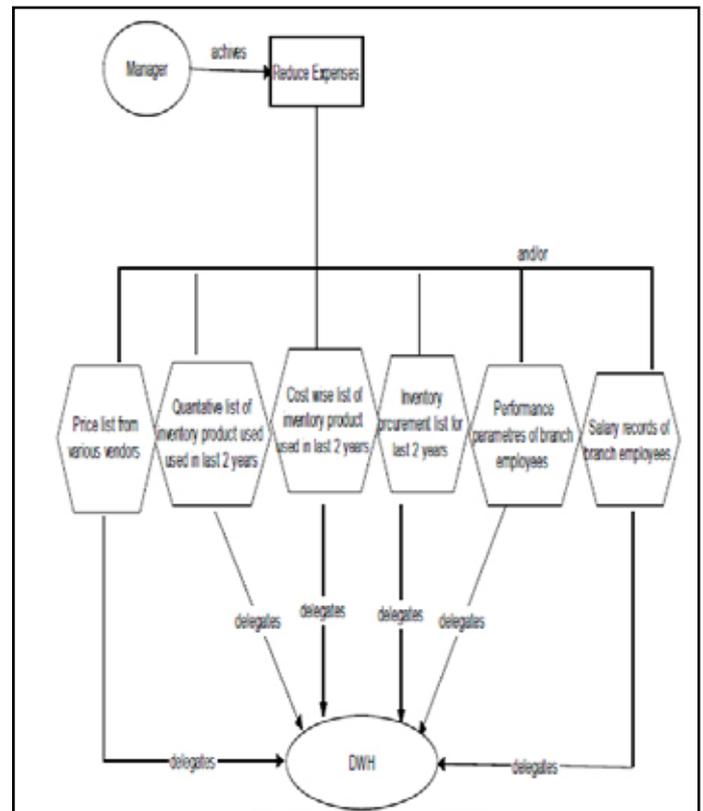

Fig. 11: Decision Model 4

III. Conclusion
This paper involves more banking system agents with more options and exploring various goals and objectives. It indicates dependency in between agents of the bank to achieve organization goals with dependency on DWH to implement these goals. 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 elicitation techniques. This approach has been discussed by taking general banking system case study.

IV. Future Work
In the future work, AGDI can be applicable in other fields such as medical and other domains.
Combining of AGDI with troops methodology or with other approaches of requirement elicitation such as CADWA can extend the accuracy and having more practical approach for successful DWH projects.

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Sandeep Mathur, MCA, M.Phil (cs), Ph.d (Pursuing), Assistant Professor, Amity University, Noida, UP, India

Dr. Girish Sharma, MCA, M.Tech, Ph.D, Associate Professor BPIBS Shakarpur Delhi, India

Dr. A. K. Soni HOD MCA & IT Dept. Sharda University, Greater Noida, UP, India.