2012 2nd International Conference on Industrial Technology and Management (ICITM 2012)
IPCSIT vol. 49 (2012) © (2012) IACSIT Press, Singapore
DOI: 10.7763/IPCSIT.2012.V49.11

Requirement Analysis Construction in Business Intelligence Formulation Model for Dairy Agro industry Medium Scaled Enterprise in Indonesia

Rina Fitriana[1)], Eriyatno[2)], Taufik Djatna[3)]

[1] Department of Industrial Engineering Trisakti University Jakarta Indonesia
[2,3] Dept of Agro-Industrial Technology Bogor Agriculture University, Bogor,West Java, Indonesia
rinauda@yahoo.com, rinaf@trisakti.ac.id

Abstract. Our motivation is to construct a requirement analysis of the Business Intelligence formulation model for Dairy Agro Industry medium scaled enterprise in Indonesia. The method of this paper is a combination of Business Intelligence System, Object Oriented Analysis based on Unified Modeling Language (UML 2.0) and Fuzzy FMEA. This paper describes requirements in the finance sub-model with three activities applied for credit, membership recruitment dues and income computation. The paper evaluated quality by using Fuzzy Failure Mode Effect Analysis (FMEA) to identify the major failure causes and effect of potentially defects.

Keywords: Business Intelligence, Unified Modelling Language (UML), Fuzzy, FMEA

1. Introduction

One of the main problems faced by dairy agro industry of medium enterprise is the unavailability of adequate technology and limited resources for the investment capitalization. In dairy agro industry scale medium enterprise there has not been the data warehousing and Business Intelligence Systems. In order for dairy agro industry scale medium enterprise have a competitive advantage in the industry is required information systems that aim to monitor the external environment, namely the behavior of competitors, suppliers, customers, technology, markets, products and services as well as the general business environment focused on the manipulation of large volumes of corporate data in data warehouses that are useful for decision-making process that is a Business Intelligence System (BI). Business Intelligence is a combination of the data warehouse and intelligence systems. Requirement Analysis is using Object Oriented Analysis with Unified Modeling Language. While the formulation of the quality model using Fuzzy FMEA (Failure Mode Effect Analysis). The purpose of this study was to make model Requirements Analysis as a fundamental development of Business Intelligence Systems for Dairy Agro industry scale medium Enterprise. Scope of this research is the requirement analysis of Dairy Agro industry medium scale to meet the Object Oriented Analysis and Fuzzy Failure Mode Effect Analysis is used in quality sub model.

2. Related Work

Requirements analysis in systems engineering and software engineering, encompasses those tasks that go into determining the needs or conditions to meet for a new or altered product, taking account of the possibly conflicting requirements of the various stakeholders, such as beneficiaries or users[5]. UML (Unified

+ Corresponding author. Tel.: + (62-8161938991)
E-mail address: (rinauda@yahoo.com, rinaf@trisakti.ac.id).

Modeling Language) is a methodology of collaboration between the methods of Booch, OMT (Object Modeling Technique) and OOSE (Object Oriented Software Engineering) and several other methods, the methodology most often used today to adopt the widespread use of language "object-oriented programming" (OOP)[1].

Business intelligence in advance exploiting an adaptive approach. The idea is to learn business strategy once new negotiation model rise in the e-market arena. It is used open source software that implements a fully distributed open environment for business negotiation[1]. The relate components of a business intelligence system gives a complete Business intelligence solution with Microsoft SQL Server 2005. [11]

The topic that integrated with BI is Supply Chain Management, Customer Relationship Management, Data Mining, Data Warehouse, Decision Support System, Performance Scorecard, Knowledge Management, Business Process Management, Artificial Intelligence, Enterprise Resource Planning, Extract Transformation Loading, OLAP (OnLine Analytical Processing), Quality Management System, Strategic Management [9].

Principles for the implementation of UML binary associations in Java, paying special attention to multiplicity, navigability and visibility. [7]

There are many paper integrated between BI and Artificial Intelligence. A business intelligence application of neural networks in analyzing consumer heterogeneity in the context of eating-out behavior in Taiwan. The data set for this study has been collected through a survey of 800 Taiwanese consumers. The results of our data analysis show that the neural network rule extraction algorithm is able to find distinct consumer segments and predict the consumers within each segment with good accuracy. [4] A hybrid fuzzy-Delphi-AHP approach to propose a more comprehensive framework with specific business elements, and also points out six performance indices for firms to adjust business strategy. In order to reduce business risk in developing international markets, using the alliance model is a key strategy for information service firms. On the other hand, firms should handle more accurate business information to support their business intelligence (BI) system to make better business decisions. [8]

FMEA is a design technique which systematically identifies and investigates potential system (product or process) weaknesses. It consists of a methodology for examining all the ways in which a system failure can occur, potential effect(s) of failures on system performance and safety, and the seriousness of these effects. [10]

3. Research Method

The study was conducted to Dairy Agro industry scale Medium Enterprises in Indonesia. The systems approach combined with the design of Business Intelligence systems which consists of 4 stages to obtain the Business Intelligence system prototype. The 4 stage is Analyze, Design, Planning, Implementation and Controlling.[3]

Research method is using Object Oriented Analysis and modeling language is using the Unified Modeling Language (UML) [2]

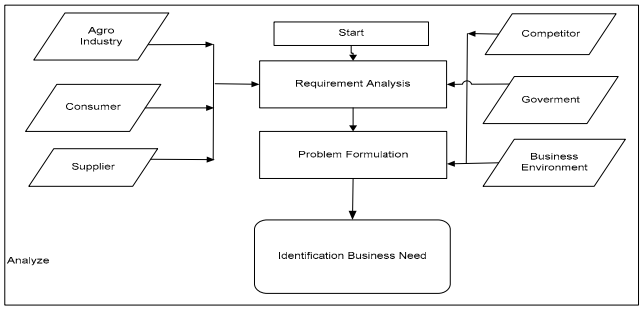

Fig 1. Research Framework in Analyze Business Intelligence System

4. Requirement Analysis Construction in Business Intelligence Formulation Model

4.1. UML (Unified Modelling Language)

Requirements analysis is critical to the success of a systems or software project. In this paper requirement analysis is using Object Oriented Analysis using UML. Use case diagram in UML is a description of the context of a high ranking how the software will be used by users. Any objects that interact with the system / software (such as a person, a hardware, other system and so on) is an actor for the system / software us, while the use case is a complete description of how the system / software for the actor behave. Actor in Milk Agro are Farmers, Production, Quality and Finance. In this study UML models using Power Designer 16.0. In UML we make Use Case diagram, state chart diagram, activity diagram, and class diagram. After the class diagram is correct we generate into Object Oriented Model with object language Java. After there is no error in the model in Object Oriented Analysis we generate into Physical Data Model with DBMS SQL Server 2008. After all the database is finished, we can make data warehouse. Business intelligence is combination of Data warehouse and Intelligence System.

4.2. Financial Sub-Model

In Finance Sub Model there are three activities applied for credit, taking membership due, calculating income. This is the formulation of the income and total income of the farmers.

The income of Farmers is the total number of multiplications of fresh raw milk is the milk cows (Bs) with a unit price of fresh raw milk set by the agro-industry (unit)

This is the formula .

$$\mathbf{P_{farmers} = \sum B_s \text{ x } H_{unit}}$$

Description:
$P_{farmers}$ = the income of farmers (Rp)
Bs = Fresh milk (Liter)
H unit = unit price per liter of fresh milk set by Dairy processing industry. (Rp / Liter)
Total income of Farmers ($PT_{farmers}$) is the income of farmers received after deduction of farmers installment and the amount of the agreed dues.

$$\mathbf{PT_{farmers}=P_{farmers} - CP_{farmers}\text{-}iur}$$

Description:
PT $_{farmers}$= Total income of Farmers (Rp)
CP $_{farmers}$=Farmers installment Loan (Rp)
IUR = the amount of the agreed dues

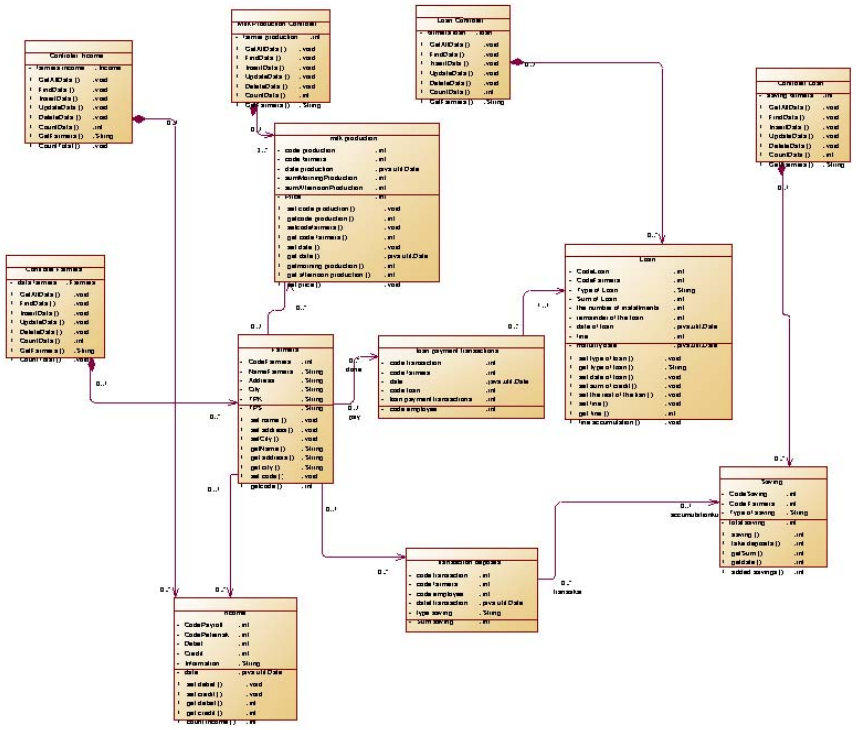

Fig 1. A fragment of Class Diagram Finance Model

Quality Sub-Model

80% of the total production of fresh milk from farmers sold to Dairy processing industry. Therefore, the role of cooperatives is very important to defend the interests of farmers. During this cooperative is a partner of dairy farmers in seeking improvement of fresh milk prices received by farmers by the Dairy processing industry. Foundation that is used by farmers and the Dairy processing industry is when Total Plate Control values between 10-15 million and the value of 11.3% Total Solid, then the farmer will get a price of fresh milk set by Dairy processing industry. The cooperative began to try again to raise the price of fresh milk from the Dairy processing industry led by the Joint Cooperative Milk Indonesia (GKSI). Improve farm management people is a fairly complex problem, not only to change the attitudes of farmers but also how to provide good seed stock and quality of feed ingredients in amounts that meet the needs. Visible impact on the poor quality of milk is shown by the high content of bacteria (Total Plate Count = TPC) and the low value of total solid (TS) is still below the average is below 11.3%. In other words, the problems that occurred at the farmer level is the level of quality of milk produced is still very low, both in terms of total bacteria (TPC) or Total Solid (TS).

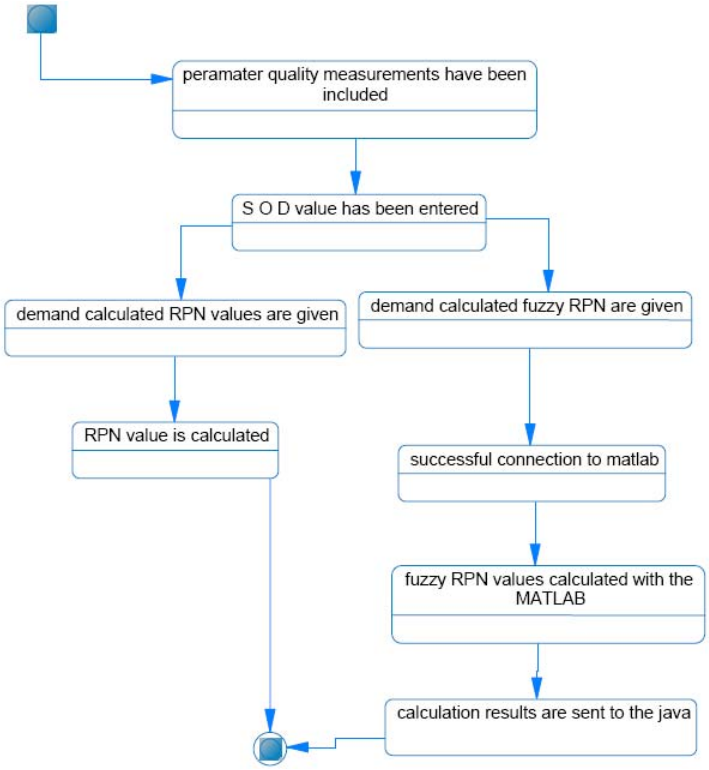

Fig 2. State chart Diagram Quality Model

Each input value is a value system of severity, occurrence and detection is divided into several categories, as follows:

Table 1. Membership function of variable Input [**6**]

No	Severity	Occurrence	Detection
1	Remote	Remote	Remote
2	Low	Low	Low
3	Moderate	Moderate	Moderate
4	High	High	High
5	Very High	Very High	Very High

Table 2. Failure Mode Effect Analysis

Process	Type of Failure	Cause	Effect	Weight			RPN	FRPN	Recommended Action
				S	O	D	SxO xD		
Test of physical, chemical, organoleptic and antibiotic fresh milk received from farmers	Content of Total Plate Control (TPC) is greater than 3 million / ml	High Sanitation at the farmer level and dairy shelters have not been well	Not meet the required quality standards from Milk Processin g Industry	7	7	7	343	692	Standard Operating Procedure is given at the farmer level. Washed cow, farmers hands washed before milking, cleaning bucket
	Total Solid content of less than 11,3 %	Less food concentrates	Lower milk prices	6	6	6	216	593	Members of cooperatives are heavily subsidized food concentrates for cattle food

5. Conclusion

Requirements Analysis as a fundamental development of Business Intelligence Systems for Dairy Agro industry medium scale has been made by Object Oriented Analysis with Unified Modeling Language (UML). Financial Sub Model consisted of three activities applied for credit, membership recruitment dues and income computation. Quality sub-model is constructed based on Fuzzy Failure Mode Effect Analysis with the highest FRPN is 602.

6. Acknowledgment

The first author thank to Research Grants doctoral dissertation from Directorate General of Higher Education Indonesia and Department of Industrial Engineering, Trisakti University Indonesia for funding this research.

7. References

[1] Aciar, S. 2009. Adaptive business intelligence for an open negotiation environment.Digital Ecosystems and Technologies, 2009. DEST '09. 3rd IEEE International Conference on Digital Object Identifier. Page(s): 517 – 522 IEEE Conferences

[2] Booch G, Maksimchuk RA, Engle MW, Young BJ, Conallen J, Houston KA. 2007. Object-Oriented Analysis and Design with Applications. New York: Pearson Education, Inc.

[3] Carlo Vercellis. 2009. Business Intelligence, Data mining and Optimization for Decision Making. John Wiley & Sons

[4] Hayashi, Yoichi. 2010. Understanding consumer heterogeneity: A **business intelligence** application of neural networks. Knowledge-Based Systems. Vol. 23 Issue 8, p856-863, 8p

[5] Hay, David C. 2003. Requirements Analysis: From Business Views to Architecture (1st ed.). Upper Saddle River, NJ: Prentice Hall. ISBN 0-13-028228-6.

[6] H.Shirouyehzad. 2010. Fuzzy FMEA Analysis for Identification and Control of Failure Preferences in ERP Implementation.Journal of Mathematics and Computer Science, vol 1 No 4

[7] Génova Gonzalo, et al.2003. Mapping UML Associations into Java Code. Journal Of Object Technology. Vol. 2, No. 5, September-October 2003

[8] **Ming-Kuen Chen, Shih-Ching Wang.** 2010. The use of a hybrid fuzzy-Delphi-AHP approach to develop global business intelligence for information service firms. http://www.sciencedirect.com/science

[9] Rina Fitriana, Eriyatno, Taufik Djatna. 2011. Progress in Business Intelligence System research : A literature Review. International Journal of Basic & Applied Sciences IJBAS-IJENS vol: 11 No: 03. http://www.ijens.org/Vol%2011%20I%2003/118503-6464%20IJBAS-IJENS.pdf

[10] Segismundo, A. & Miguel, P.A.C., "Failure mode and effects analysis (FMEA) in the context of risk management in new product development", *International Journal of Quality & Reliability Management,* vol .25, No. 9, pp. 899-912, 2008.

[11] Zhijun Ren. 2010. Constructing a Business Intelligence Solution with Microsoft SQL Server 2005. Biomedical Engineering and Computer Science (ICBECS), International Conference on Digital Object Identifier, Page(s): 1 – 4 IEEE Conferences.