PROCEEDINGS

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2014 International Conference on Advanced Computer Science and Information Systems

October 18th and 19th 2014
Ambhara Hotel, Blok M
Jakarta, Indonesia

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(Proceedings)

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Welcome Message from General Chairs

On behalf of the Organizing Committee of this International Conference on Advanced Computer Science and Information Systems 2014 (ICACSIS 2014), we would like to extend our warm welcome to all of the presenter and participants, and in particular, we would like to express our sincere gratitude to our plenary and invited speakers.

This international conference is organized by the Faculty of Computer Science, Universitas Indonesia, and is intended to be the first step towards a top class conference on Computer Science and Information Systems. We believe that this international conference will give opportunities for sharing and exchanging original research ideas and opinions, gaining inspiration for future research, and broadening knowledge about various fields in advanced computer science and information systems, amongst members of Indonesian research communities, together with researchers from Germany, Singapore, Thailand, France, Algeria, Japan, Malaysia, Philippines, United Kingdom, Sweden, United States and other countries.

This conference focuses on the development of computer science and information systems. Along with 4 plenary and 2 invited speeches, the proceedings of this conference contains 71 papers which have been selected from a total of 132 papers from twelve different countries. These selected papers will be presented during the conference.

We also want to express our sincere appreciation to the members of the Program Committee for their critical review of the submitted papers, as well as the Organizing Committee for the time and energy they have devoted to editing the proceedings and arranging the logistics of holding this conference. We would also like to give appreciation to the authors who have submitted their excellent works to this conference. Last but not least, we would like to extend our gratitude to the Ministry of Education of the Republic of Indonesia, the Rector of Universitas Indonesia, Universitas Tarumanagara, Bogor Agricultural Institute, and the Dean of the Faculty of Computer Science for their continued support towards the ICACSIS 2014 conference.

Sincerely yours,
General Chairs

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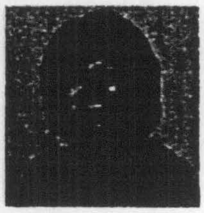
Welcome Message from The Dean of Faculty of Computer Science, Universitas Indonesia



On behalf of all the academic staff and students of the Faculty of Computer Science, Universitas Indonesia, I would like to extend our warmest welcome to all the participants to the Ambhara Hotel, Jakarta on the occasion of the 2014 International Conference on Advanced Computer Science and Information Systems (ICACSIS).

Just like the previous five events in this series (ICACSIS 2009, 2010, 2011, 2012, and 2013), I am confident that ICASIS 2014 will play an important role in encouraging activities in research and development of computer science and information technology in Indonesia, and give an excellent opportunity to forge collaborations between research institutions both within the country and with international partners. The broad scope of this event, which includes both theoretical aspects of computer science and practical, applied experience of developing information systems, provides a unique meeting ground for researchers spanning the whole spectrum of our discipline. I hope that over the next two days, some fruitful collaborations can be established.

I also hope that the special attention devoted this year to the field of pervasive computing, including the very exciting area of wireless sensor networks, will ignite the development of applications in this area to address the various needs of Indonesia's development.

I would like to express my sincere gratitude to the distinguished invited speakers for their presence and contributions to the conference. I also thank all the program committee members for their efforts in ensuring a rigorous review process to select high quality papers.

Finally, I sincerely hope that all the participants will benefit from the technical contents of this conference, and wish you a very successful conference and an enjoyable stay in Jakarta.

Sincerely,
Mirna Adriani, Dra, Ph.D.
Dean of the Faculty of Computer Science
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ADVANCED PROGRAM ***ICACSIS 2014***

CONFERENCE INFORMATION

Dates	October 18th (Saturday) – October 19th (Sunday) 2014
Organizer	Faculty of Computer Science, Universitas Indonesia
	Department of Computer Science, Institut Pertanian Bogor
	Faculty of Information Technology, Universitas Tarumanegara
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PROGRAM SCHEDULE

Saturday, October 18th, 2014-CONFERENCE			
Time	**Event**	**Event Details**	**Rooms**
08.00-09.00	Registration		Dirgantara Room, 2nd Floor
09.00-09.30	Opening	Opening from the Dean of Faculty of Computer Science Universitas Indonesia/General Chair of ICACSIS 2014	
09.30-10.15	Plenary Speech I	Dr. Ir. Basuki Yusuf Iskandar, MA from Ministry of Communication and Information	
10.15-10.30	Coffee Break		
10.30-11.15	Plenary Speech II	Prof. Dame Wendy Hall from Southampton University, UK	
11.15.12.30	Lunch		
12.30-14.00	Parallel Session I : Four Parallel Sessions	**See Technical (Parallel Session I Schedule)**	Elang, Kasuari, Merak, Cendrawasih Room, Lobby Level
14.00-15.30	Parallel Session II: Four Parallel Sessions	**See Technical (Parallel Session II Schedule)**	Elang, Kasuari, Merak, Cendrawasih Room, Lobby Level
15.30-16.00	Coffee Break		
16.00-17.30	Parallel Session III : Four Parallel Sessions	**See Technical (Parallel Session III Schedule)**	Elang, Kasuari, Merak, Cendrawasih Room, Lobby Level
17.30-19.00	Break		
19.00-22.00	Gala Dinner	Dinner, accompanied by music performance and traditional dances	Dirgantara Room, 2nd Floor

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Sunday, October 19th, 2014-CONFERENCE			
Time	**Event**	**Event Details**	**Rooms**
08.00-09.00		Registration	Dirgantara Room, 2nd Floor
09.00-10.00	Plenary Speech III	Drs. Harry Waluyo, M.Hum from Directorate General of Media, Design, Science & Technology Based Creative Economy	
10.00-10.15		Coffee Break	
10.15-11.30	Plenary Speech IV	Prof. Masatoshi Ishikawa from University of Tokyo, JP	
11.30-12.30		Lunch	
12.30-14.00	Parallel Session IV : Four Parallel Sessions	**See Technical (Parallel Session IV Schedule)**	Elang, Kasuari, Merak, Cendrawasih Room, Lobby Level
14.00-15.30	Parallel Session V : Four Parallel Sessions	**See Technical (Parallel Session V Schedule)**	Elang, Kasuari, Merak, Cendrawasih Room, Lobby Level
15.30-16.00		Coffee Break	
16.00-16.30	Closing Ceremony	Awards Announcement and Photo Session	Dirgantara Room, 2nd Floor

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Framework Model of Sustainable Supply Chain Risk for Dairy Agroindustry Based on Knowledge Base

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Abstract—**The objective of this paper was to develop a framework model for sustainable supply chain risk for dairy industry based on knowledge base. It presented a conceptual framework with integrated risk supply chain and knowledge base systems. The critical point of dairy located on the product which has the characteristic easy damage. Risk-damaged dairy contaminated with bacteria due to improper handling of dairy. Risk occurred in each activity in the supply chain network ranging from farmer, cooperative and dairy processing industry. The structured approach of supply chain risk divided into the phases of risk identification, risk measurement and risk assessment, risk evaluation and risk mitigation and contingency plans; and risk control and monitoring system based on knowledge base system. Adding Knowledge base component to risk supply chain will produce the following process: knowledge base risk capture, knowledge base risk discovery, knowledge base risk examination, knowledge base risk sharing, knowledge base risk evaluation and knowledge base risk repository. The relationship between risk factor, risks and their consequences are represented on Failure Mode and Effect Analysis (FMEA) and Hierarchical Risk Breakdown Structure (HRBS). Likelihood of risk event occurring, the level of dependence between risks and severity of risk event are quantified using linguistic variables and fuzzy logic. The proposed system was designed by Intelligent Decision Support System (IDSS). The design of this model was able to improve the effectiveness of decision-making with regard to the organization of knowledge, storage and sharing of knowledge in the agro-industry supply chain risks dairy.**

Keywords : supply chain risk, dairy agroindustry, fuzzy logic, knowledge base

I. Introduction

Risk management defined as an effort to reduce the risk and minimize the losses arising from uncertainty risk [13]. Risk and uncertainty on supply chain risk of dairy obtained from the characteristics of perishable dairy products [18] and [27]. This risk arises from the activity of a series of agro-industry supply chain activities in dairy from farms, shipping dairy to cooperatives, cooperative storage and delivery of dairy in the cooperative to Dairy Processing Industry (IPS). The risk of dairy supply chain that has a major impact is the risk of dairy that contaminated by bacterial of antibiotics.

The implementation of supply chain risk management can improve the quantity and quality of knowledge, reducing the chances of risks and risk impacts [6]. According to [11] there is a strong influence of supply chain risk management to continuous improvement in the supply chain process.

Data and information related to the achievement of production and quality of dairy available and some have been well documented in the cooperative and the industry. However, these data have not been analyzed further to serve as a useful source of knowledge for all stakeholders in the dairy supply chain network. Research has been done by [2], [5], [18] and [28] only at the stage identify and analyze the risks and problems that occur in the dairy supply chain. Research has not been done in a comprehensive treatment plan and its effect on the overall supply chain performance. Improving production and quality of dairy is necessary to increase access to information and knowledge sharing specifically in understanding the characteristics of the dairy industry, dairy production and marketing systems [28].

This study is in line with the partnership program dairy farmers and sustainable food security facilities are realized through a partnership between the Frisian Flag, the Dutch government, the government of Indonesia, Bandung Cattle Breeders Cooperative North (KPSBU) Lembang and Bandung Southern Cattle Breeders Cooperative (KPBS) Pangalengan. This partnership program is based on three main pillars of quality improvement through the optimization and improvement Milk Collection Point (MCP), an increase in the quality and quantity of knowledge to farmers and dairy cooperatives and increased employee productivity sustainable dairy farm business. The third main pillar in the partnership

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program is closely related to the research to be conducted.

This research will develop the integration of knowledge management with a sustainable supply chain risk in the dairy agro-industry. Aspects of the sustainable supply chain consists of environmental, social and economic [7]. In this study a model of supply chain risk of dairy agro-industry base on knowledge base will be designed as a systematic system to regulate the organization of knowledge which will be used to identify, analyze and risk management plans that specify the impact on supply chain risk can be minimized through the dairy agro-industry integration of supply chain risk management and knowledge base. The design of this model is expected to improve the effectiveness of decision-making with regard to the organization of knowledge, storage and sharing of knowledge in dairy agro-industry supply chain risks. His influence on the performance of supply chain risk can be measured quantitatively that will assist stakeholders in decision making.

II. METHODS

A. Framework

According to [21], the risk of supply chain influenced by avoidable risk exposure and unavoidable risk exposure. In this study, the risk will be identified based on both. There are three components to be considered in the design of models i.e. performance profile, risk profile and risk exposure. Framework of the integration of supply chain risks with the knowledge base can be seen in Figure 1.

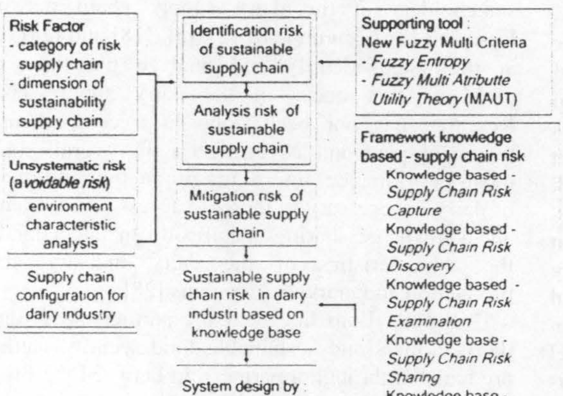

Fig. 1 Framework model of sustainable supply chain risk for diary agroindustry based on knowledge base

Framework model of sustainable supply chain risk for dairy agroindustry based on knowledge base will be developed by three main phases, that is

1. Phase 1, determination of risks factors
   Determination of risk factors using fuzzy entropy and Fuzzy Multi-Attribute Utility (FMAUT) [7] to evaluate and compare the sustainable supply chain risk factors.
   a. Determination of risk factors that influence the sustainable supply chain for dairy agro-industry.
   b. Collecting the data.
   c. Determination of risk factors weight using fuzzy entropy.
   d. Evaluation of risk factors that determined by Fuzzy Multi-Attribute Utility (FMAUT).
2. Phase 2, model development
   Model 1. model risk identification of sustainable supply chain in dairy agroindustry.
   Risk identification on activities in farms, cooperative and dairy processing industries using Failure Mode and Effect Analysis (FMEA) dan Hierarchical Risk Breakdown Structure (HRBS). FMEA is used to determine the stages processes, potential failure modes, failure effects, potential, potential causes. A HRBS has been developed and the structure of this provides the basis for a stratified classification of risks and development of a nomenclature for describing transportation risk.
   Model 2. Model risk analysis of sustainable supply chain in dairy agroindustry.
   Likelihood of risk event occurring, the level of dependence between risks and severity of risk event are quantified using linguistic variables and fuzzy logic.
   Model 3. Model risk mitigation of sustainable supply chain in dairy agroindustry.
   Risk management strategies to be designed referring to the grouping of risk management strategies [4] which consists of four groups: risk avoidance, risk reduction, risk transfer (transferring risk) and risk retention (own risk).
   All three models will be the basis knowledge for designing the prototype system of sustainable supply chain risk of dairy agro-industry.
3. Phase 3. The design system of sustainable supply chain risk for dairy agro-industry based on knowledge base.

The system is designed to use Intelligent Decision Support System (IDSS).

B. Data Collection and Analysis

Sources of data used in this study were obtained from secondary data sources and primary data sources. Sources of secondary data obtained from the study of literature, the results of previous studies, scientific journals and documentation of existing data in the relevant institutions. Sources of primary data obtained from direct observation, interviews, questionnaires and discussions with experts and stakeholders in the dairy agro-industry supply chain network. Focus Group Discussion (FGD) with experts and stakeholders to assess and evaluate the risk exposure that might occur in dairy agro-industry supply chain. Expert came from academics and praticioners (farmers, manager of the cooperative, manager of dairy processing industry). In addition FGD results are

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also used to build a knowledge base associated in determining the types and sources of risk, measuring the level of risk and evaluate its impact and cost of handling risk.

Secondary data used include data delivery to the dairy cooperatives, dairy quality data (specific gravity, alcohol), cow mortality data (number and causes), concentrate feed price data, data on the number of livestock, data of amount dairy received from the farmers, data of amount dairy delivery to IPS, data of dairy acceptance of cooperative, data of milk powder production quantities, and process failure data. Primary data e.g. environment characteristic of dairy agro-industry supply chain and dairy agro-industry supply chain configuration.

C. System Modeling

The system will be designed to integrate the supply chain risks with the knowledge base [24], as shown in Figure 2.

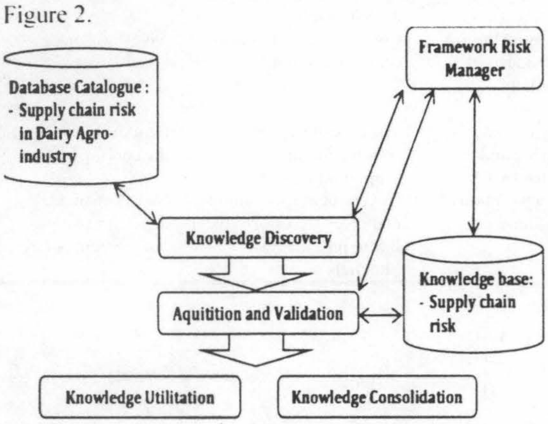

Fig 2. The supply chain risks integrated with the knowledge base

III. Results and Discussions

A. Determination of Risk Factor

Risk factor be important think to develop a model of sustainable supply chain risk in dairy agroindustry based on knowledge base. Risk factor will determine based on risk supply chain categories [25], risk transportation categories [4] and dimension of sustainable supply chain consisting of sosial, economic and environment dimension.

Risk supply chain categories [25] consisting of demand risk, delay risk, disruption risk, inventory risk, manufacturing (process) breakdown risk, physical plant (capacity) risks, supply (procurement) risk, system risks, sovereign risks and transportation risks. Risk transportation categories [4] consisting of product loss (product pilferage, shipment jettison, piracy and hijacking), product damage (equipment accidents, foor freight handling, improper equipment), product contamination (climate control failure, product tampering), delivery delay (supply chain interruption, security breach). Example of defining risk categories at supply chain risk in dairy agroindustry can be seen in Table I.

TABLE I
DEFINING RISKS CATEGORIES AT SUPPLY CHAIN RISKS IN DAIRY AGROINDUSTRY

Risk Categories	Defining risk categories	Risk
Demand risk	The risk of non fulfillment of demand in terms of quality and quantity	The content of fats and proteins that do not meet with industry standard
Disruption Risks	The risk of dairy damage due to natural causes or mishandling	• The risk of dairy contaminated by bacterial (TPC content greater than 3 million ml) • The risk of dairy contaminated by antibiotic • Risks of counterfeit dairy
Process breakdown risks	Low risk production	• The risk of lower dairy production • The Risk of damage in cooling unit
Supply Risks	The Risk of dairy supply from farmers to cooperatives, cooperative to Industry	• The Risk of poor dairy quality that received from farmers • The Risk of varying dairy quality

B. Model risk identification of sustainable supply chain in dairy agroindustry

Risk identification is the first stage in risk management. Risk identification is done by using FMEA, which includes the basic elements as follows:

1. Stages of process/input, is defined as the stage of the process that occurs in each of the stakeholders (farmers, cooperatives, IPS)
2. Potential failure mode is defined as the potential risk that occurs in each process/specific activity.
3. Potential failure effects, defined as the impact of potential risk if the risk occurs in a process, which will be measured by the value of severity.
4. Potential causes failure, defined as the cause of the potential risk in each process/activity to be measured by the value of the likelihood of risk (value probability).

Risk identification is divided into three sub-systems, namely farms, cooperatives and Dairy Processing Industry (IPS). Further activities will be determined the critical point of each sub-system. Identification risk at dairy agroindustry supply chain will be divided into two type :

- Activity in each supply chain network, which consists of activities on farms, cooperatives and dairy processing industry.
- Activities dairy delivery, which is divided into two: dairy delivery from farmers to cooperatives and dairy delivery from cooperative to dairy processing industry.

Mapping process on each network at dairy agroindustry supply chain :

- Farmer: nurseries, feeding, cage sanitation, milking, cow health checks, dairy processing, dairy sales.
- Cooperative: collecting milk from farmers, dairy quality checks, dairy pricing.
- Dairy processing industry: acceptance of the co-operative dairy, dairy processing and dairy storage

Identification results can be seen in the table II.

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TABLE II
IDENTIFICATION OF SUPPLY CHAIN RISK FOR DAIRY AGRO-INDUSTRY

The Central Risk	*Activity*	*Potential Failure Mode*	*Potential Failure Effect*	*Potential Causes*	*Current design control*
	Feedings cow	Dairy fat content does not comply with the quality standards of IPS	Dairy composition does not match the quality standards	Weakness of management feed (feed prices are high)	Seeks to improve the composition of feed
	Milking	The low production of dairy (an average of < 12 liters per day)	Low dairy products	Frequency of milking and time distance between milking	Set time milking
Farmer		Dairy contaminated by bacteria	Dairy becomes damaged and rejected by IPS	Conditions and milking equipment are unhygienic	Periodically cleaning equipment
				Limited availability of water	Efforts clean water supplies
		Dairy contaminated by bacteria	Dairy becomes damaged and rejected by IPS	The new dairy cows injected with antibiotics due to illness	The sick cow is not milked
	Acceptance of dairy farmers	Forgery of milk by farmers	Dairy becomes damaged and rejected by IPS	Cheating farmers	The examination of milk forgery
		Quality of milk varies	Low dairy quality	Incorporation of several dairy farmers	No efforts made
Cooperative		Low handling of dairy to processed products (product diversification)	Slow growth in value-added of fresh dairy	Cooperative and human capital limitation	No efforts made
	Dairy storage in cooling unit	Dairy contaminated by bacteria	Dairy becomes damaged and rejected by IPS	The lack of hygiene cooling unit and supporting equipment	Periodic cleaning of the cooling unit
IPS	Acceptance of dairy	The high dairy imports for IPS raw materials	Low absorption of dairy farmers	Government regulation that gives freedom to the IPS to provide Raw Materials	No efforts made, depending on government policy

C. *Model risk analysis of sustainable supply chain in dairy agroindustry*

Risk analysis starts with a risk assessment activities. Measurements were made on three dimensions, namely the probability of occurrence of the risk (probability), the impact of the risk (severity) and non-detectability. Risk measurement is done by using a fuzzy logic approach.

The main components :

- Fuzzyfication

  Interpretation of descriptive representation of the membership functions.

Graphical representation of membership functions for fuzzy linguistic variable severity, possibility, non-detectability can be seen in Figure 2.

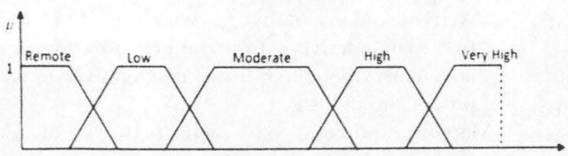

Fig 2 Graphical representation of membership functions for fuzzy linguistic variable severity, possibility, Non-detectability

Inference System (FIS) mamdani, with the possibility of input fuzzy linguistic variables, impact and exposure, and the output is a fuzzy linguistic FRPN (Fuzzy Risk Priority Number).

Then to assess the level of risk variables used Fuzzy

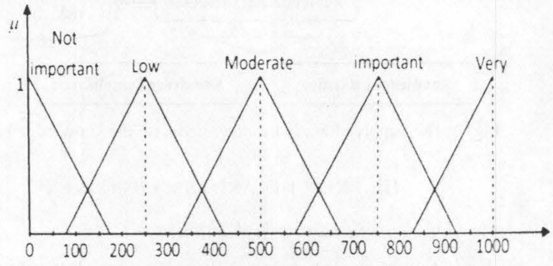

Fig 3 Representation of fuzzy membership function charts for variables linguistic Fuzzy Risk Priority Number (FRPN)

TABLE III
DOMAINS ASSOCIATION FOR VARIABLE OUTPUT FUZZY LINGUISTICS

Variable Output Linguistics	Domains Association Fuzzy
Not Important	(0,0,175)
Low	(75,250,425)
Moderate	(325,500,675)
Important	(600,750,925)
Very Important	(825,1000,0)

Membership function :

$$\mu[x] = \begin{cases} 0; & x \leq a \text{ or } x \geq c \\ \dfrac{x-a}{b-a}; & a \leq x \leq b \\ \dfrac{c-x}{c-b}; & b \leq x \leq c \end{cases} \quad (1)$$

- Fuzzy Rule Base

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Fuzzy rule base describing the critical level of risk with any combination of input variables. Rule formulated in the form of linguists and expressed in the form of IF-THEN. Rule describes all possible combinations of input factors. Proposition which follows IF called the antecedent, while the proposition that follows the THEN called the consequent.

R1: IF x is M_i THEN y is N_i , i =1.2.3. .....K

- x : input variable (possibility, detectability, severity)
- M : constant linguistic antecedents (qualitatively defined function)
- Y : output variable (FRPN)
- N : constant consequent linguistic

as an example :

IF Possibility high **AND** detectability is Moderate **AND** severity is very high **THEN** the risk of damage is very important.

For simplifying the computation of the fuzzy representation it may be used non numeric representation as suggested by [14].

D. Model risk mitigation of sustainable supply chain dairy agroindustry

The selection of appropriate risk handling proposals will be determined based on the value of risk exposure and cost considerations (Fig.4). In this model will be collected knowledge to formulate plans. strategies and actions to reduce the chances of risks and reduce or minimize the impact of risk. The design of this model is made up of three main stages. i.e. the evaluation of risk (risk ranking and risk acceptance). risk response planning and risk monitoring.

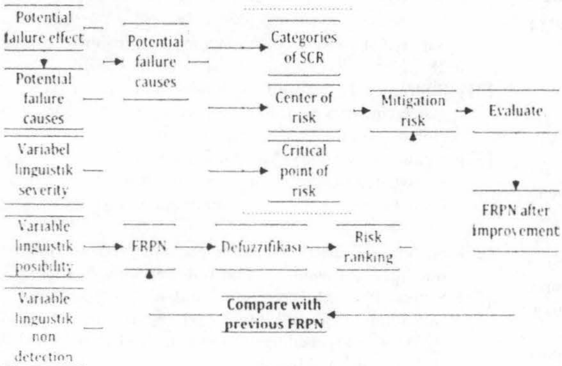

Fig 4 Linkage process of risk mitigation

E. The integration of knowledge base and supply chain risk management in the proposed framework

Framework Knowledge Base Risk Management (KBRM) designed consisting of:

1. KBRC – Knowledge Base Risk Capture
   At this stage, the risk of capture is done based on the results of previous research, literature study, observations directly to the field, relevant articles as explicit knowledge and tacit knowledge from experience of experts and practitioners in the dairy agro-industry supply chain. The KBRC output is a risk catalog of the all identified risk ranging from farms, cooperatives until the Dairy Processing Industry (IPS).
2. KBRD - Knowledge Base Risk Discovery
   The development of tacit and explicit knowledge from data and information that already exist and have been identified previously. At this stage will find regularities, patterns or relationships within a data set.
3. KBREx – Knowledge Base Risk Examination
   Testing of risk knowledge from the level of accuracy and correctness. Elimination of risk is determined based on the objectives to be achieved in the design model of knowledge management supply chain risk for dairy agro-industry.
4. KBRS – Knowledge Base Risk Sharing
   The dissemination knowledge on the risk of all stakeholders dairy agro-industry supply chain network. Stages of risk management related to sharing knowledge are the stages of risk analysis and risk handling.
5. KBRE – Knowledge Base Risk Evaluation
   This process will serve as a sustainable process to cancel the existing risks or identification of new risks. Performance evaluation is related to the execution of risk and risk oversight.
6. KBRR – Knowledge Base Risk Repository
   To Serves to unify information that has been stored and selected to be a knowledge base of dairy agro-industry supply chain risks.
7. KBREdu – Knowledge Base Risk Education
   Design implementation by educating stakeholders dairy agro-industry supply chain. Education can be a training or group discussion.

F. System Design

The Prototype of supply chain risk design system is expected to facilitate the decision making process to determining the risk management actions that must be performed based on the results of the risk assessment (Fig 5). In addition, the system can also trace where is the risk, its causes and effects caused if the risk was occured. The system can also display the amount of risk (risk exposure) which are used as the basis for determining the risk management strategy.

IV. Conclusions and Recommendations

Model of sustainable supply chain risk for dairy agroindustry based on knowledge-base milk was designed as a systematic system to regulate the organization of knowledge which was used to identify, analyze and determine the impact of risk management plans so that the risk of agro-industries in dairy agroindustry supply chain through the integration of supply chain risk management and knowledge base system . Based on identification and analysis of risks to the three agroindustry sub-systems, namely agroindustry farms, cooperatives and dairy processing industries showed that there were many risks faced by agroindustry stakeholders, such as risk-damaged dairy

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contaminated with bacteria. the risk of decreased productivity of dairy. milk fat content risk not in accordance with industry specifications and so on. These risks needed to be measured and analyzed as a basis for determining appropriate risk management strategies. The design of this model was expected to improve the effectiveness of decision-making with regard to the organization of knowledge. storage and sharing of knowledge in the agro-industry supply chain risks dairy.

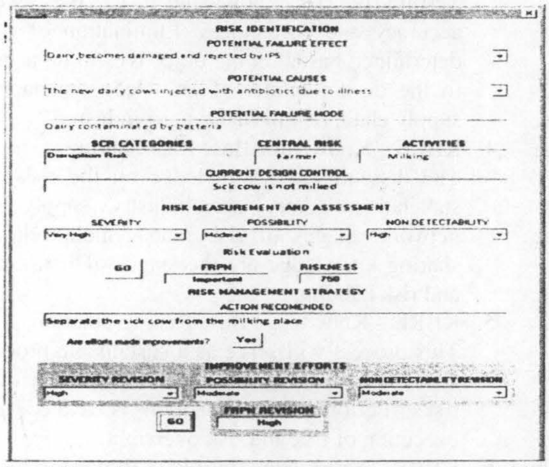

Fig. 5. Examples of risk management strategy system usage at dairy agroindustry

Future research would aim improve framework model and implement it at variouse companies and report the findings In addition the future research encourage to investigate the other component. such as drivers. risks categories. supplier. evalution criteria and performance measurement.

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