Nutrition Management System at a Consumer Electronics Manufacturer

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Abstract: A nutrition management system which currently runs on the canteen of a consumer electronic manufacturer functions as the health service providers, providing a low-salt diet program for disease management (disman) members. However, the existing nutrition management system has a problem coming from registration that does not have an alert system if, for example a disman member incorrectly taking a food and the system delays in reporting. While in the arrangement of food composition, the available problem is the lack of nutrition experts who can help take decisions for the appropriate food composition. The applied method is library research in the field of bioinformatics related to the nutrition management system and canteen registration system. The results is a model of nutrition management system retrieved from journal comparison results, nutritional guidelines, and applications that have been implemented on hospitals. The model is food serving with an expert and registration systems based on the contactless smart card.

Keyword: nutrition management, disease management, bioinformatics, food composition, alert system

1 Introduction

A consumer electronics manufacturer employs around 2.000 people who are divided into some job divisions and they have three shifts. Referring to the big employment and the high activities, the manufacture make a cooperation with a health provider that support the employee's health and productivity.
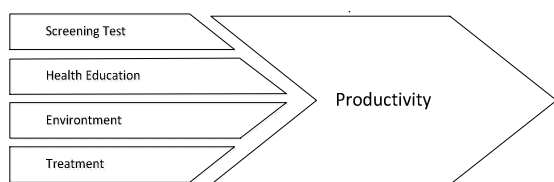

Figure 1. Health Provider Program

The Health Provider that cooperating with consumer electronics manufacturer has established a program needed to increase the company's productivity which covers:

- *Screening Test*, is a medical check-up for employees.
- *Health Education*, which informs employees to be aware of unhealthy situation that appears at the workplace, and also provides solutions to the worst case that may happen.
- *Work Condition* that informs employees on how to maintain a safe working environment.
- *Treatment*. It concerns with if there is an accident, the medical treatment is required by tracing the place of accidents. The treatment will give appropriate attention to the employees without having to cut the cost of treatment, namely the corporate insurance program.

Referring to the mentioned program, the research was done by conducting library research in the field of bioinformatics relating to the nutrition management system program.

2 Problem Formulation

Based on the survey of consumer electronics manufacturer current condition, the Health Provider is providing a low salt program for Disease Management (Disman) member. This program is only for employees suffering from diseases like hypertension, diabetes, and tuberculosis. While the employees outside Disman program, they can freely choose food as they want. There is no smart card registration system for monitoring the Disman member activity on canteen. At present, the Disman members who fail to follow low-salt program will be reminded by report issued every end of the month. This method happens to be less effective and the Disman member are still getting illness at any time.

With the problem above, show a formulation for research question, "*How to build and design IT-based solutions to optimize the management system on nutrition?*".

3 Problem Solution
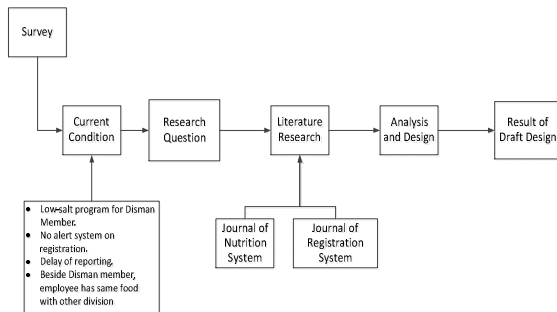
3.1 Methodology

Figure 1. Methodology

In conducting research, the detail of activity is as follows:

- *Survey*

  At this stage, data were obtained from industrial companies and providers of occupational health services company.

- *Current condition*

  At this stage, the researchers knew the existing condition of nutrition management systems based on data obtained from the previous survey. The

details are shown in the problem formulation section.

- *Research Question*

  At this stage, it will formulate research question based from the result of problem formulation.

- *Literature Research*

  At this stage, it will be found the standardization of a model of nutrition management system got from journal of nutrition system and journal of registration system that has been implemented on the industry.

- *Analysis and Design*

  At this stage, the result of literature research will be combined in line to the existing process.

- *Result of draft design*

  At this stage, it will be proposed a recommended draft to be applied for existing system.

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3.2 Requirement Information

Some of the researches require information used to design the interface with users, that is the module nutrition published contained in the journals Kim et al[1]. This module is used as a standard reference to design the system. Here is a description of the module.
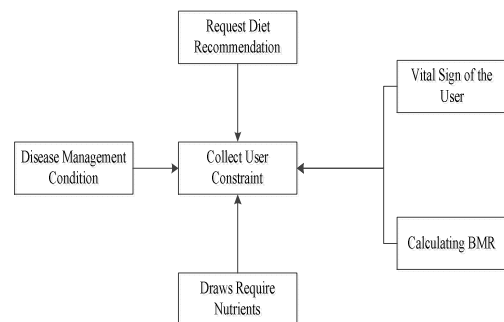

Figure 2. Nutrition Extraction Module[1]

The nutritional information above is also present in other journals, such as those used by Heinonen et al[2], Kashima et al[3], Lee et al[4], Snae et al[5], and Youbo Lv[6]. Besides it, there are also supporting information, including name, sex, age, height and weight. This is appearing in the journal from Snae et al[5] and Youbo Lv[6].

Then, from those journals, the conclusions drawn and adapted to the requirements set out in Indonesia, which was taken from a book by Altmatsier[7]. Results include:

- Personal data, including sex, age, height, weight, body mass index (BMI), basal metabolic rate (BMR) and activity.
- Nutritional data, including energy (kcal), protein (g), carbohydrate (g), lipid or fat (g), calcium (g), iron (mg) of vitamin A (RE), thiamine or vitamin B1 (mg), and vitamin C (mg).

3.3 Result

Figure 2 presents the design of workflow that researchers proposed after combining with the standards nutrition module (Figure 2).
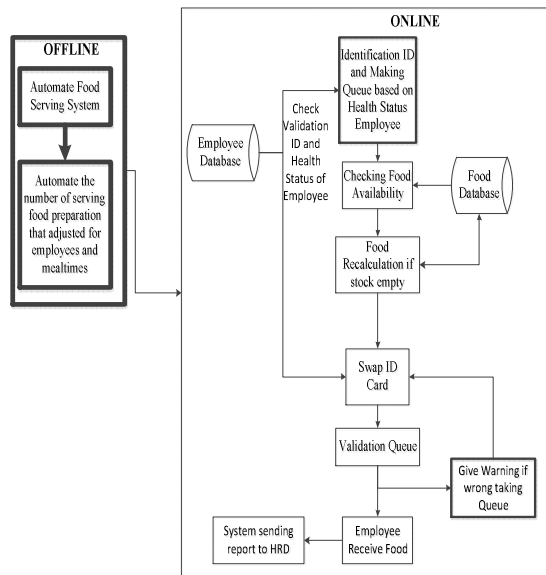

Figure 3. Proposed Workflow

The part that given the thick lines are the parts that will be added to IT systems, there are:

OFFLINE Part, applying an expert system to calculate the nutritional content tailored to the needs of employees, which is used for automation of food preparation and distribution of food portions based on the number of employees and mealtimes.

ONLINE Part, apply Canteen Registration Control System Based on Contactless Smart Card, which is used to identify the employee

based on health status of every employee and to take food.

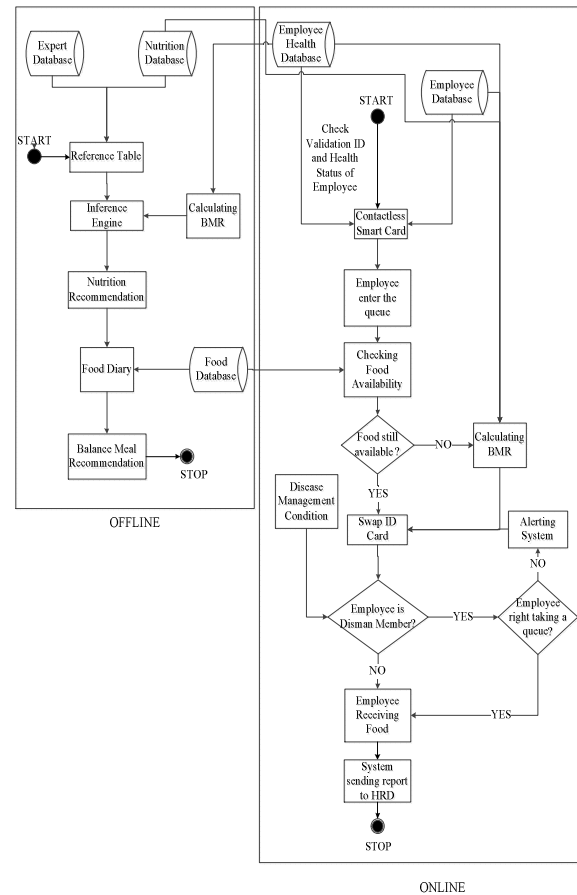### 3.3.1 Workflow Design Of Overall System

Figure 4 Design Workflow System

In above shown workflow of the designed system that combined from the workflow. With the assumption The design of this system is assumed to have used IT systems.

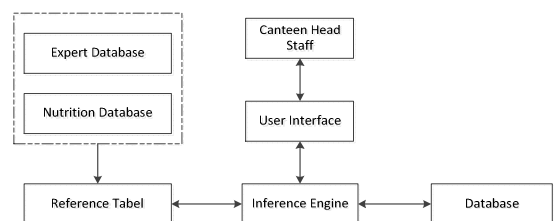### 3.3.2 Design Workflow Diagram

Figure 5. Workflow Diagram Expert System for Management Nutrition.

Figure 5 shows a Workflow Diagram for Expert System. Using Expert database and Nutrition database to create a reference table that will be used to consider which food that suitable for the employees.

3.3.3 Rule Based Design

IF-THEN Rules is a method which facilitates the reading of every condition that occurs in determining whether a decision. As the name implies IF-THEN Rules are divided into two main parts: the part after part after the IF and THEN. Part after the IF is a requirement that must be met and the part after the THEN is executed if the condition is fulfilled after the IF. The method used is Forward Chaining.

Here is an example of rule-based design for the expert systems.

IF resultIMT = normal
  THEN EnergyAmount = (resultAMB * CAf)
ELSE IF resultBMI = skinny
    THEN EnergyAmount = (resultBMR * resultActivity) + 500
    ELSE EnergyAmount = (resultBMR * resultActivity) – 500
EnergyAmountPerServe = EnergyAmount / 3

CarbohydrateAmount = ((65 * EnergyAmountPerServe) / 100) / 4

ProteinAmount = ((15 * EnergyAmountPerServe) / 100) / 4

LipidAmount = ((20 * EnergyAmountPerServe) / 100) / 9

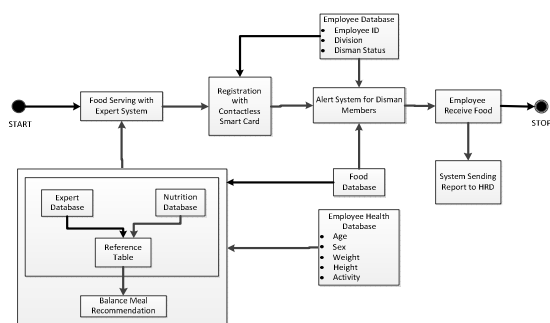### 3.3.4 Registration Control System Design

Figure 6. Workflow Registration Control System.

Figure 6 is a workflow for Registration Control System. Employee Database will be used for registration and validation on contactless smartcard system. The alert system will be given to disman member if their incorrectly taking counter then they should taking the right counter to receive a food.

4 Conclusion

In this study, the researchers propose a design to optimize the system in the nutrition management in the consumer electronic manufacturer canteen. The result will develop the existing workflow supported by IT systems.

4.1 Conclusion and Suggestion

From the results of system design with application of proposed model for the nutrition management, it can be concluded as follows. We emphasize to understand the existing workflow, looking for best practices or standards of the journal reference module that has been implementing IT systems, and then adapted to workflow on nutrition management, and designing an existing workflow by implementing solution IT on the parts that needed to optimize the system.

Suggestions for the next research that this study can be used as a basic reference for the development of nutrition care management system based on desktop applications. Testing the validity of research design can be done after the implemented system and tested samples of the data needed, either from the nutrition management expert system and canteen registration system based on contactless smart cards.

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