

Optimization On Health, Safety and Environment (HSE) By Developing Medical Check Up Information System (MCUIS)

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Abstract— PT. XYZ is a multinational company in Jakarta, Indonesia which has permanent employees of approximately 12,000 employees. As a company that implements Health, Safety and Environment (HSE) policy, PT XYZ holds annual Medical Check-Up (MCU) activities for all permanent employees. Unfortunately, MCU experienced a number of issues such as uneven scheduling, filling in the same data on the MCU Question Form every year, unable to find out employees who had not done MCU, manually filling the Employee Questionnaire Form, distribution of MCU results that takes a long time, the MCU results are missing, employees do not pay attention to the results of the MCU, and HR Medical cannot analyze the results of the MCU. The purpose of this research is to build a system called Medical Check-Up Information System (MCUIS) which able to solve these problems. SIMCU is a web-based information system, uses ASP.NET as its programming and Oracle as DBMS. SIMCU was made using Phased Development-based methodology as the system breaks into four phases. With the implementation of MCUIS Phase I, based on Net Quality Income (NQI) calculation, PT XYZ can save the budget spent as much as IDR 744,238,000 per year by reducing the printing of forms and results of the MCU. Besides, SIMCU phase I can reduce distribution time from seven days into one day, reduce potential missing MCU results from 200 on average into zero, and analyze MCU results

Keywords—*phased development, MCU, Health Information System, NQI*

I. INTRODUCTION

A. Background

The importance of the employees' health as company assets is very well recognized by the government. This is can be seen by Law No.1 year 1970 concerning occupational health and safety [1]. In another constitution, No. 02/Men /1980 section 3 subsection 2 states that companies must periodically check the health of their employees [2]. Supporting the law, PT. XYZ as one of the leading manufacturing companies in Jakarta applies the Health, Safety and Environment (HSE) policy in managing its employees. One of the programs is the annual Medical Check-Up (MCU) for all permanent employees of PT. XYZ, which currently number approximately 12,000 employees. The MCU is carried out by the HRD department. MCU is conducted to detect health problems that have not shown symptoms and determine the level of health of employees.

Unfortunately, the implementation of the MCU at PT XYZ encountered the following problems:

1. Interruption of production plant activities due to the scheduling and determination of MCU participants is still done manually by HR Medical. For now, PT XYZ does not have an application or system that facilitates HR Medical to find out the number of employees and the list of employees who work in a particular section so they choose the MCU participants randomly without finding out what section that employees are working on.
2. The implementation of the MCU does not go according to the plan so there is a long queue.
3. Filling in the same personal data on MCU Question Form for every year.
4. HR Medical cannot find out which one employee have not conducted MCU
5. Filling in questionnaire about MCU process which is still done manually which requires high cost due to form questionnaire printing.
6. The distribution of the MCU results takes long time, which is approximately seven days.
7. The MCU results are not received by employees, or received by employees but are missing.
8. Employees do not pay attention to the results of the MCU due to lack of knowledge of health referral values.
9. The results of the MCU cannot be analyzed by HR Medical because the history of the employee's health track record is not recorded.
10. PT. XYZ policy state that MCU result with category normal is not given to the employee, which is causing the storage space of HR Medical to become full.

These problems make the HR Medical looking for alternative solutions. The solution offered is to build information systems that able to automate and improve the MCU business process

B. Related Research

Previous research in the implementation of the MCU stated that the problems during the implementation. Some problems are lack of distribution of MCU results to employees [3], data redundancy [4], and lack of employee participation in the MCU process [5]. A medical information system have been developed to solve these problem. Research on the implementation of the MCU in the military health department and Navy Hospitals in the west region of Indonesia produced an information system to eliminate

various errors such as assessment in accuracy and difficulty in data search [6].

Other research focuses on the processing and analyzing of MCU results data by building data warehouses [7] and utilizing big data technology [8].

C. Research Purpose

Due to issue and problem that occurred in the implementation of MCU at PT XYZ, it was determined that the purpose of this research is to create Medical Check Up Information System (MCUIS) that is able to:

1. Eliminating the potential missing MCU results from two hundred (approximately) into zero.
2. Facilitate HR Medical in analyzing MCU results.
3. Reducing the time of distributing the MCU results
4. Eliminating the printing and distribution costs of the MCU results for approximately 12,000 employees.

II. METHODOLOGY

This research process was carried out with the following stages :

1. Problem identification and formulation
2. Research Design
3. Development of MCUIS using phased development-based method which is consist of several steps :
 - a. Planning
 - b. Analysis
 - c. Design
 - d. Implementation.
4. Presentation of research result
5. Presentation of research conclusion

Problem identification and formulation is obtained by doing a user interview, analyzing the business internal process and doing a literature review. The phased-development method in developing MCUIS is selected as the research scope was quite large and therefore break into four phases and will be explained in section III.

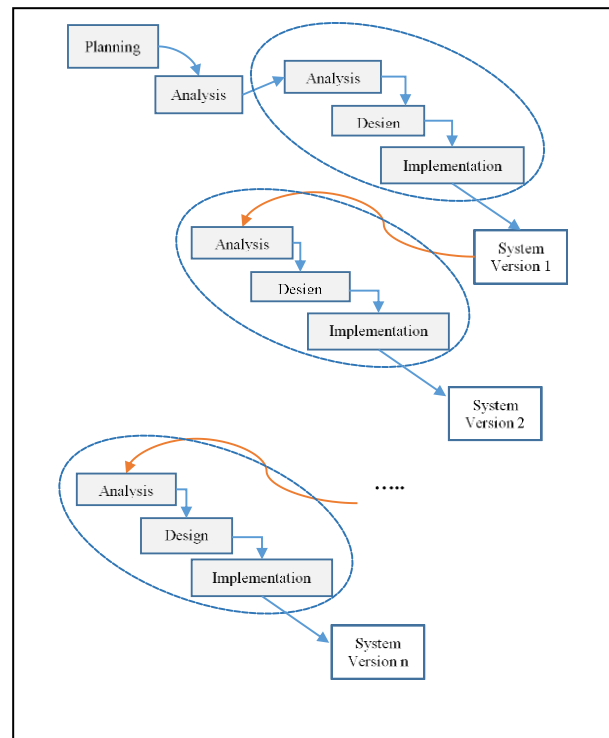


Fig. 1. Phased Development-based method

III. RESULT AND DISCUSSION

A. Business Process Analysis Medical Check Up PT.XYZ

At present most of MCU process business is done manually. The MCU process business can be seen in Figure 2, and can be briefly explained as follows:

1. The MCU activity begins with the selection of health suppliers and then continues with the scheduling of MCU conducted by HR Medical and health suppliers.
2. The next process is to fill the MCU Question Form by employees for registration purposes
3. Employees conduct checks which include direct check-up, indirect check-up, and doctor check-up.
4. After conducting a series of checks, employees fill in the Employee Questionnaire Form which is then submitted to HR Medical as an evaluation of health suppliers.
5. Health suppliers do the inspection data processing to get the MCU results. The MCU results are printed and given to HR Medical.
6. HR medical follows up on the results of the MCU where the results of the MCU with abnormal categories will be given to employees. The MCU results with normal categories will be archived in HR storage.

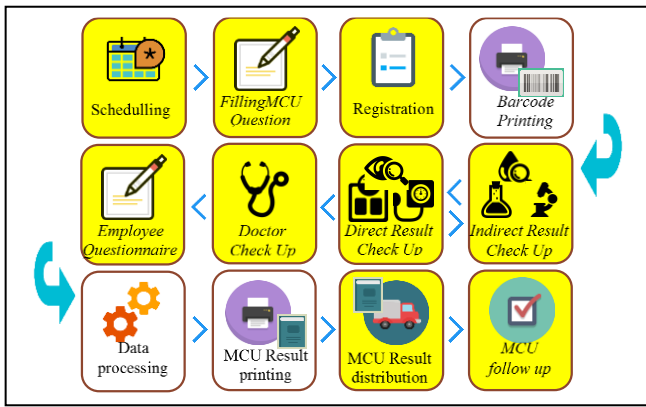


Fig. 2. Business Process Medical Check Up PT.XYZ

B. Business Process Improvement (BPI)

To make the MCU business process more efficient, improvement is carried out by adding some process that does not yet exist and automating the manual process. The process added is viewing and analyzing the MCU data results of all employees by HR medical. Another process added is the addition of knowledge management regarding the results of the MCU for employees in reading the MCU result. With the addition of this function, HR Medical can find the employee's MCU result easily and can find out the type of abnormal checks that have the most sufferers. Whereas for automation includes the registration, scheduling, implementation and distribution of MCU results.

With a broad scope of business processes the development of MCUIS is divided into four phases as follows:

1. Phase 1: MCU results, MCU management, and analysis.
2. Phase 2: MCU registration
3. Phase 3: MCU scheduling
4. Phase 4: operational MCU

This research includes the development of the first phase of MCUIS.

C. MCUIS Design and Development

MCUIS phase I is made with web-based application. This systems was built using ASP.NET programming language with a framework developed by PT. XYZ. MCUIS uses a three-tiered client-server architecture where the architecture is divided into three, namely presentation tier, logic tier (IIS 7.5), and data tier (SQL Server and Oracle). SQL Server is used for LDAP data process while Oracle is used for MCU transactional data process.

MCUIS Phase One consists of three modules as follows :

1. Module MCU result ; it is used to see the results of the MCU for all employees
2. Module MCU management; this module is used to manage reference values and MCU results for each health supplier

3. Module MCU analysis; this module is used to find out ten types of checks that are outside the referral value and to find out employees who experience problems in certain types of checks.

The relationship between modules can be seen in Figure 3. After the health supplier manages the reference value and results of the MCU, the employee and HR Medical can see the results of the MCU. Employees can also know the type of examination that is not in accordance with the referral value and can find out its description from the company's Knowledge Management In addition, after health suppliers manage the MCU, HR Medical can run the module MCU analysis.

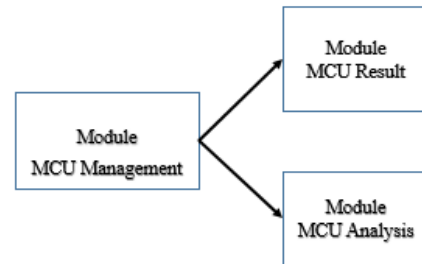


Fig. 3. Module dependency at MCUIS Phase One

There are three categories of MCUIS users, i.e health suppliers, HR Medical, and employees. Health suppliers can manage MCU results and manage referral values. HR Medical can register employees who will conduct the inspection, view the results of the MCU of all employees, view employees who have or do not have MCU results, warn employees who do not have MCU results to do MCU, print MCU results, view the ten most types of checks problematic, and view a list of employees who have problems with certain types of checks. Employees can view the results of the MCU and print the results of the MCU. The general description of MCUIS can be seen in Figure 4.

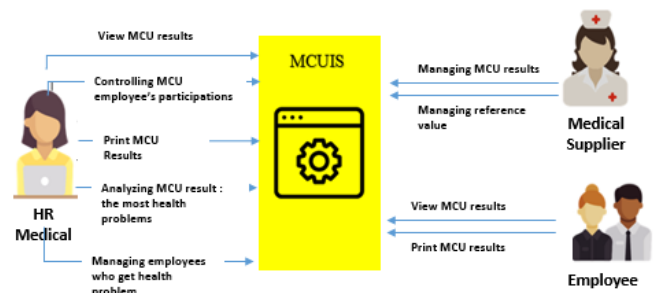


Fig. 4. General Description of MCUIS

D. MCUIS Testing And Implementation

Testing is conducted to ensure MCUIS Phase One can meet user requirements, ensure the achievement of the objectives, ensure there are no errors, ensure validation runs properly, and ensure easy access to the user. The testing is conducted based on business process flow involving all categories of users and all existing functions. The results of these tests are as follows:

1. MCUIS Phase I removes the potential of the missing MCU results which were originally around two hundred to zero MCU results. Each MCU result will be stored in the database.
2. MCUIS Phase I facilitates HR Medical in analyzing MCU results especially the type of examination that is outside the referral value. Data can be seen based on the year of the MCU and the particular plant. Besides, reports are displayed in the form of graphs to make it easier for users to make comparisons between data. An example of a user interface can be seen in Figure 5.

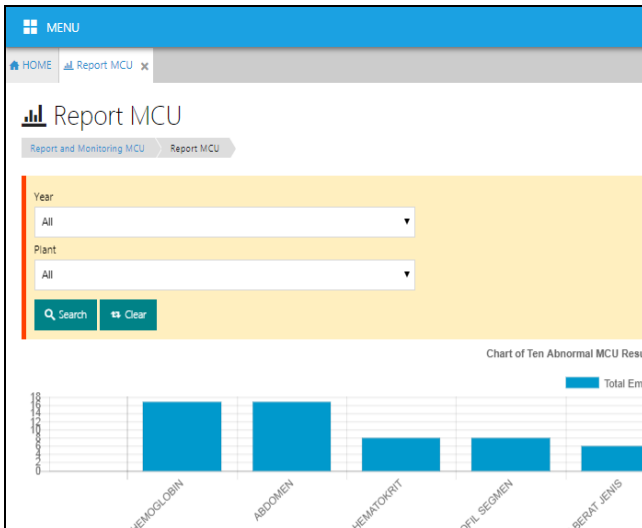


Fig. 5. User Interface Example for Report MCU

3. The time for distributing the MCU result, which is sending the MCU results from health suppliers to the company and sending the MCU results from HR Medical to each employee, can be reduced from approximately seven days to one day.
4. MCUIS Phase I eliminates the cost of printing MCU results for 12,000 employees. Employees can view the MCU results directly from the system. If a hard copy is required, employees or HR medical can print directly in pdf format. An example of the user interface of the MCU results can be seen in Figure 6.

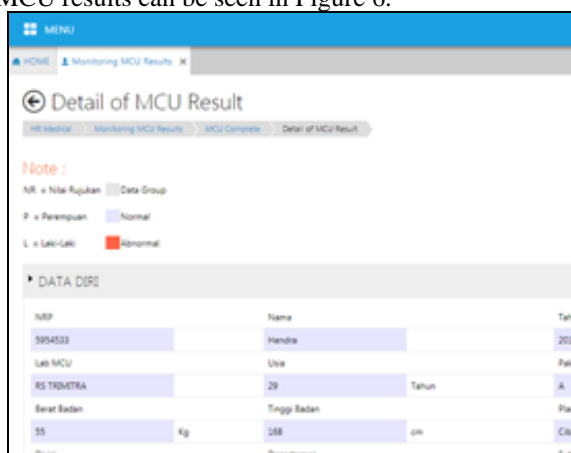


Fig. 6. User Interface Example for MCU Result

The implementation of MCUIS is conducted at the HRD department. After implementation, the value of

MCUIS can be determined by calculating the value of Net Quality Income (NQI) from the system. NQI is calculated based on benefits obtained minus costs spent for one year. Benefits obtained include saving material consumption, decreasing rework/scrap, and decreasing the level of risk. While costs spent include man hours costs from the software development team [9]. From the results of the NQI calculation, it was obtained that the implementation of MCUIS could reduce the printing costs of the MCU results in the amount of 12,000 MCU package costs of IDR 566,388,000.00 and eliminate the distribution costs of IDR 377,600,000.00. The costs spent in the form of a development team man-hours are as much as IDR 200,000,000.00 so that the total profit gained from the construction of the MCUIS Phased I reached as much as IDR 744,238,000.00. NQI calculations can be seen in Table I.

TABLE I. NET QUALITY INCOME (NQI) MCUIS IMPLEMENTATION

NO	DESCRIPTION	VALUE	
1.0.0	Tangible Benefit		
1.1.0	Operational Cost Decrease		
1.1.1	Material consumption saving	IDR	566,638,000
1.1.2	Distribution cost decrease	IDR	377,600,000
	# TOTAL TANGIBLE BENEFIT	IDR	944,238,000
2.0.0	COST OF IMPLEMENTATION* (incremental cost)		
2.1.0	Project Development		
2.1.1	Manhour tim	IDR	200,000,000
	# TOTAL COST OF IMPLEMENTATION	IDR	200,000,000
	NET QUALITY INCOME (BENEFIT - COST)	IDR	744,238,000
	BENEFIT/COST (HIGHER BETTER)		4.72119

IV. CONCLUSION

Based on the implementation and results of the MCUIS phase I testing, it can be concluded :

1. MCUIS Phase I eliminates potential missing MCU results as it is stored in the database
2. MCUIS Phase I provides analysis functions to facilitate HR Medical in analyzing MCU results.
3. MCUIS Phase I reduces the distribution time of the MCU results from approximately seven days to one day.
4. MCUIS Phase I eliminates the cost of printing and distributing the MCU results to approximately 12,000 employees.
5. MCUIS Phase I can save the budget spent as much as IDR 744,238,000 per year by reducing the printing of forms and results of the MCU

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