The Development of a Software Tool for Improvement Tracking System Using Dynamic Systems Development Methodology

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Abstract. The present study aims to develop a software tool for improvement tracking system for a waste management company in Indonesia. The tool was built as a system to track the improvement process of following up findings of the validation and verification process in the management system of the company. The company also obtains a few audits by the authorities, certification bodies, and its customers. The company applied several management systems in assuring all persons in charges are responsible for following up on the improvement findings. The outcome of the study is a proven software tool that has supported the top management in making decisions in terms of the improvement processes. The system automatically reports to the top management when the findings of each individual responsible person have not been executed yet as well as the top management can take direct decisions and actions to the current status of their improvements processes.

1. Introduction
A configurable business process model (sometimes referred to as a reference business process model) may be configured to meet the specific requirements of an organization[1]. As information technology today is strongly intermeshed with business processes, requirement specifications for IT-implementations obtain much more significance for enterprises’ prosperity. The on-going technological progress precipitates more valuable IT. This facilitates enterprises to offer more efficient and convenient processes to the customer[2]. During the determination of the appropriate measures of the process models we focused primarily on the BPMN notation. This notation is currently very well sophisticated, it can be considered as a standard tool in the modelling of the business processes in a wide group of process-controlled organizations[3]. The system supports the company’s mission in terms of preserving its commitment to minimize its customer’s environmental risk[4].

This research is a software modeling for Improvement Tracking System (ITS) at a waste management company which includes requirements specification, process, data, and interface modeling, and application architecture. The system is managed and utilized by QEHS (quality, environmental, health, and safety) department of the company. The development process includes the stages of system analysis, system design, programming, testing, and installation[5],[6]. There are the software capabilities that must be present in order for the user to carry out the services provided by the feature, or to execute the use case.
To develop the improvement tracking system using agile methodology produces higher quality software in a shorter period of time. Agile methodologies were developed to streamline the development process and remove barriers to accepting business requirement changes during the development process[7], agile software development framework to assist software practitioners in developing small and medium sized projects, the success of which is pointed out in several industry cases [8] same as software Improvement Tracking System (ITS).

The project is to develop for improvement and customizing the existing ITS. It covers project scope, product description, system features, system interface, functional requirements, and non-functional requirements. The development process includes the stages of system analysis, system design, programming, testing, and installation. For the redesign business process modeling the develop this software use the Agile method with Dynamic Systems Development Methodology (DSDM)[9], because the method of the development process involves the user and matches the project to be worked on.

2. Methods

There are several methodologies of Agile encompasses various methodologies including: Adaptive Software Development (ASD), Agile Unified Process (AUP), Crystal Methods, Dynamic Systems Development Methodology (DSDM), eXtreme Programming (XP), Feature Driven Development (FDD), Kanban, Lean Software Development, Scrum and ScrumBan[10]. In this develop software ITS, use Agile method of Dynamic Systems Development Methodology (DSDM) illustrated in figure 1, which has of five phases [11], As the Feasibility Study, Business Study, Functional Model Iteration, Design and Build Iteration and Implementation.

3. Results and Discussion

The implementation of the develop software ITS in waste management in company will use the Agile - DSDM method as below stage:

Mainly the system supports one of the processes of QEHS Department of company as figure 1. The system is started by initiating finding by QEHS Admin. The system is accompanied by features of system notification by email as figure 2.

![Improvement Tracking System Workflow](image-url)
Figure 2. System Notification

Major features of the system are finding (recording, tracking, and approval), master/lookup tables, application security, email notification, and dashboard. As the conceptual database design using ER (entity relationship) model same as figure 3:

Figure 3. Entity relationship diagram

The database is located into two physical servers. Most entities are placed at ITS database on company SQL Server except Customers table at the company’s existing Operation database on the same server as figure 4.

Figure 4. Conceptual Database Design


**Table 1. Description of Function**

| Requirement Code | Function Name | Description | Actor |
|------------------|---------------|-------------|-------|
| ITS-SRS-001      | Create Finding | Creating new or revising finding and define corrective action plan (CAP). | QEHS Admin |
| ITS-SRS-002      | Open Finding  | Opening a finding to assign CAP to responsible department PIC. | QEHS Manager |
| ITS-SRS-003      | Assigned Finding | Entering corrective action on the assigned CAP. | Responsible Department’s PIC |
| ITS-SRS-004      | CA Approval Finding | Approving or rejecting correction of assigned CAP by Responsible Department PIC. | QEHS Manager |
| ITS-SRS-005      | Closed Finding Inquiry Finding Title | Viewing close correction of assigned CAP by responsible department PIC. | All Users |
| ITS-SRS-006      | Finding Source | Searching for any statuses. | All Users |
| ITS-SRS-007      | Title | Entering, modifying or viewing job titles for employees. | QEHS Admin |
| ITS-SRS-008      | Departments | Entering, modifying or viewing department for employees. | QEHS Admin |
| ITS-SRS-009      | Employees | Entering, modifying or viewing employees and his/her title and department. | QEHS Admin |
| ITS-SRS-010      | Finding Sources User Accounts | Entering, modifying or viewing finding source. | QEHS Admin |
| ITS-SRS-011      | User Accounts | Entering, modifying or viewing user account and defining its user access role and accessible finding sources. | System Administrator |
| ITS-SRS-012      | User Access Roles | Entering, modifying or viewing a user access roles and defining the accessible menu of the user role. | System Administrator |
| ITS-SRS-013      | Dashboard | Show status report and performance report. | All users |

In order to address system requirements we also apply application security, system email notification, and dashboard system.

1. **Application Security**: is to ensure users who access the system are only defined users in the system with a particular role and they only access the system as the defined role. One user only uses one role.
2. **Email Notification**: is triggered either by user event or automatic by system based on correction due date.
   - User event notification works when QEHS Admin submits a finding then the system notifies QEHS Manager for his/her agreement of the finding.
   - System event notification works when a corrective action plan is not done: The system notifies the responsible department PIC and his/her superior every 30 days before the due date.
   - The system notifies the responsible department PIC, his/her superior, his/her director, and the President Director every 14 days from 28 days after the due date.
3. **Dashboard**: is to inform users of performance of following up findings in statistic reports.
   - Finding & Corrective Action Status: shows number of finding for each step: Create, Open, Assigned, In Progress, CA Approval, and Close.
   - Due Date Performance: shows number of finding correction closed before the due date, at due date, and after the due date.
   - Remaining Findings vs. Remaining Due Date Findings: shows trend of number of Remaining Findings compares against Remaining Due Date Findings.

This stage describes detailed functional requirements associates to the features. All SRS of functional requirements below are described in detail Use Case Specifications in table 1 as below.

In this stage as describe of details requirements from the comments users as Simplification workflow, Modifying Finding page, Adding Finding Category in Finding Sources, Applying email notification, Removing Work Order module, Modifying on user role module and Dashboard.

The final stage of the application ITS after modeling the business process is implementing the design into software application by constructing design of database, process, and interface into a working software prototype as ITS tool.

4. **Conclusions**

As the existing workflow in figure 1 about modeling for software Improvement Tracking System (ITS) as software tool of a system to track improvement process of following up finding of validation and verification process in management system of the company also obtains a few audits by the authorities and its customers. The application as ITS tool complied and met user and business requirements. After testing for modeling business process where in the main function in the improvement process of this business process as which expects better response time improvements and with full control from high management levels so that it can be expected by management in proper waste management.

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