

A Case Study of TNB Network Solution & Support (NSS) Inventory Information System: A Quick Printable and Non-redundancy Web-based Application

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Abstract— This system is proposed to develop a web-based inventory information system for Network Solution & Support (NSS) department of Tenaga Nasional Berhad (TNB), Perak. The purpose of this study is to replace the conventional method which is the manual file system for managing inventory to online system where it can help to save the time especially in the process of updating the new inventory information. Besides that, the conventional method also contains the risk of duplicated files and leads to data redundancy and cost the memory wastage. NSS Inventory Information System is an alternative way to replace the manual file system so that multiple users can access the same data simultaneously at different stations. In addition, NSS Inventory Information System is based on Rapid Application Development (RAD) as the methodology where it involves the process of Requirement Planning, User Design, Construction and Cutover. Furthermore, it is developed by using Java programming language based on Vaadin Framework and MySQL as a database. Based on the testing and usability study, the result is very satisfying based on the staffs from NSS department and the contribution is able to help NSS department from TNB to update the inventory list by replacing the manual file system to a proper information system.

Keywords— *Web-based, Inventory Information, Non-redundancy, Information System, Usability Study*

1. Introduction

The Information Technology (IT) has become one of the most robust industries in the world and it is

supported by [1] where the role of IT is very important and it will impact the economic growth of a country as well as the growth of an organization by increasing the efficiency and productivity. In this case, one of the contributions of IT in industries is web-based application for office works [2, 3, 4]. A web-based application is any program that is accessed over a network connection by using HTTP, rather than existing within a device's memory. In addition, web-based application often run inside a web browser. Unlike traditional applications, web-based application is accessible anytime, anywhere and via any PC with an Internet connection.

Network Solution & Support (NSS) is one of the departments in TNB. One of their activity scopes is to update the following details such as 1) meter readers, 2) personal digital assistant (PDA), 3) PDA printer information across all the stations. NSS department staffs will visit each of the stations to update the recent changes in inventories so that they can identify the status of the inventories. Currently, NSS department staffs in Perak is using Microsoft Excel to manage the inventory information. Usually, they will collect information from each station in hardcopy and then update to their System Administrator in their monthly meeting. System Administrator will update the information in Spreadsheet program. This situation will be critical if any information or data are lost. The proposed system will be helpful for NSS department staffs to check and update the inventory information regularly.

2. Methodology and System Design

The selected methodology to develop NSS Inventory Information System is Rapid Application Development (RAD). This model consists of four phases such as Requirement Planning, User Design, Construction, and Cutover as shown in Figure 1. The reasons to select RAD are 1) RAD is able to reduce the development time and reusability of components where it helps to speed up development, and 2) all the functions are modularized [10].

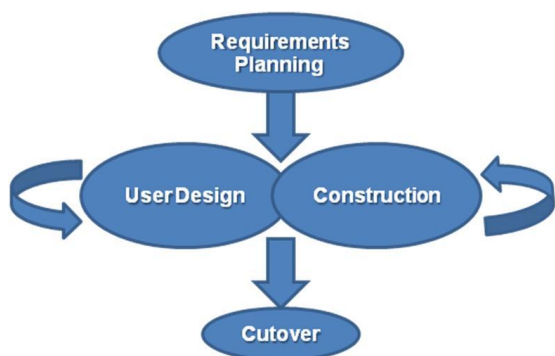


Figure 1. Rapid Application Development Phases

2.1 Requirement Planning Phase

In the Requirement Planning phase, system planning and system analysis has been identified. Therefore, several discussions have been carried out with the head and the staffs of the NSS department to discuss and agree on business needs such as 1) objectives, 2) scopes, and 3) problems before proceed to the second stage.

2.2 User Design Phase

In the User Design phase, the head and the staffs of the NSS department are still continue to interact with the system analysts and develop models and prototypes that represent all system processes which include inputs and outputs. Several Context Diagram, Data Flow Diagram and Flow Chart Diagram have been discussed several times which allows the stack holder (NSS department) to understand and confirmed where the system is able to meet their needs. The literature reviews in term of features, suitable programming language and methodology also have been analysed in this phase. This was done to ensure that the proposed system

was able to meet the requirement and expectation from the user. In addition, the features of the system that had been studied were being considered and would be included into the proposed system if the feature is usable and helpful for the user in performing the tasks. Table 4.1 shows the problem NSS staff faced and the suggested solution for the problem to manage the inventory records.

In addition, decision on the user interface must be done. The appearance of the proposed system must be appropriate and the functions must be stated. The interface design of the proposed system should include the following details such as 1) layout of the system, 2) the position of the navigation bar and 3) the position of the login form. Therefore, the proposed system was divided into two parts which are Data Modelling and User Interface. The importance of Data Modelling is to understand the process easily by using several diagrams incorporated with symbols and text to represents the data flow. According to [11], the design of a system should satisfy its functional needs in practical terms and the absence of functionality will cause the user dissatisfaction. Hence, NSS Inventory Information System user interface mainly focus on usability and functionality to make sure users able to achieve their goals as efficiently as possible, without focusing too much on graphical interface.

2.3 Construction Phase

In the Construction phase, it focuses on program and application development tasks such as the user interface. The user interface would be created by using the Vaadin Framework application. The suggested programming language was Java in IntelliJ IDEA JDK and Jetty would be used as a web server. Besides that, the inventory details will be stored in MySQL database [5]. However, the stack holder (NSS department) still continue to participate and suggest the changes or improvements based on the prototype.

2.4 Cutover Phase

In the Cutover phase, it focuses on resembles the final tasks which include testing and user training. Therefore, the testing should be carried out as planned once the system has been developed. The user must input the data and check whether the output is as expected. If the output is not expected,

it will be recorded for improvement of future work. The testing should be done in terms of usability and functionality to achieve the product objectives. The suggested test should be carried out are alpha and beta testing. Alpha testing was conducted within the organization and the main focus of alpha testing is to test the functionality of the system. Besides that, beta testing also known as field testing which is takes place at customer’s site. The test will be carried out by providing questionnaire to know how far the system is helpful for NSS department staffs to maintain the inventory information.

Table 1. Analysis Problems of NSS Department

Problems	Solutions
NSS staff goes to each station to collect the inventory information and update it to the head of the department (face by face). Hence, time consuming in process of update the information.	Develop a system where NSS staff can update the information wherever they are. It helps to save their time and energy.
There is a lack of security in current manual file system. Without the knowledge of NSS staffs, unauthorized users may access to confidential information. Since the inventories are belongs to TNB, the information is highly confidential.	Develop a system where only the NSS department staff can access it. In this case, system with effective password protection features will make the system couldn’t access by unauthorized user. The NSS department staffs only can access the system.
When the NSS staff unknowingly update the inventory information more than once, it makes duplication of data entry. It makes time-consuming and resources were being wasted.	Develop a system where the repeated data shouldn’t upgrade or save on the database or pop up the dialogue box “Data Already Exist”.
NSS Staffs couldn’t print out the information by station in a page.	Develop a system with printing features where NSS Staff can print out the inventory information by station in a page.

3. Context, Data Flow and Flow Chart Diagram

Three types of diagrams which are Context Diagram, Data Flow Diagram and Flow Chart Diagram have been used to describe the process of system development [7, 8]. The Context Diagram shows the system under the consideration as a single high-level process and shows the relationship that the system has with other external entities such as ADMIN (system administrator) and STAFF (staff from NSS department) as shown in Figure 2. Basically, the system consists of two user profile which are ADMIN and STAFF. Then, the ADMIN is able to add new inventory details, update inventory details as well as create user ID and password, while the STAFF is only able to update the inventory details and update their own user ID and password.

Data Flow Diagram shows the flow of information for the system to the user. Furthermore, it illustrates how the data is processed by a system in terms of inputs and outputs. Figure 3 shows Gane and Sarson types of notation for Data Flow Diagram Level 0. Basically, it contains four levels and processes which starts from 1) Login, 2) Add Details, 3) Update Details, and 4) Print Details. In addition, two types of Data Store which are 1) users and 2) station_info while only one type of external entity which is User inside Data Flow Diagram.

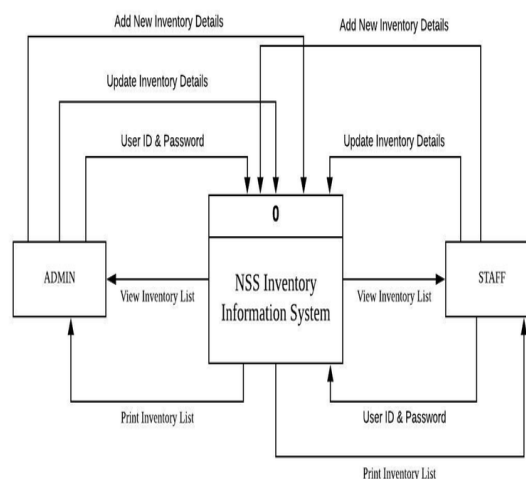


Figure 2. NSS Inventory Information System Context Diagram

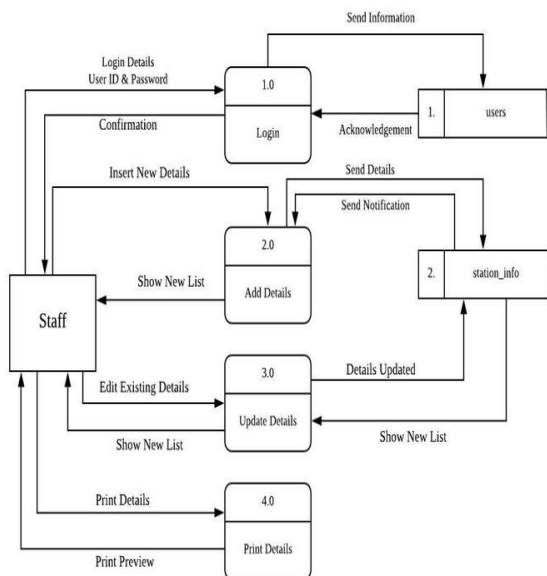


Figure 3. NSS Inventory Information System Data Flow Diagram

Flow Chart Diagram is a visual representation which can be used to explain the process of the system from the beginning until the end of the proposed system. Different types of symbols and shapes are used to show the process, decisions, input and output. Figure 4 shows the Flow Chart Diagram for the NSS Inventory Information System.

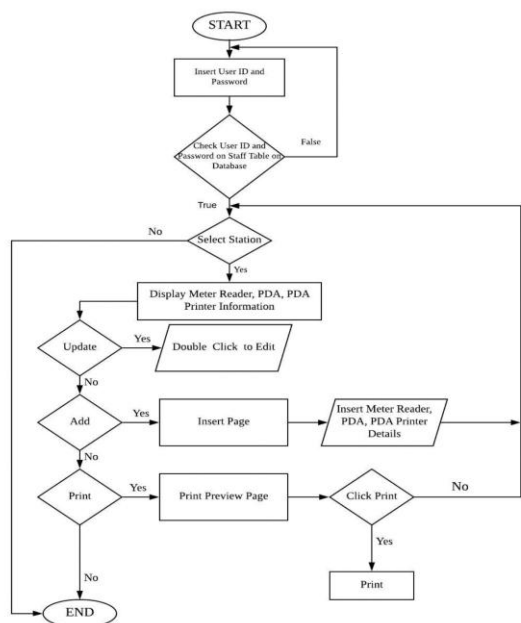


Figure 4. NSS Inventory Information System Flow Chart Diagram

Firstly, the user needs to input the ID and Password correctly before enter to the system. Secondly, the user needs to select the name of the station before inserting the quantity of the display meter reader, PDA, and PDA’s printer. If the record exists, then the user just needs to update the record. After updated the record, the user can choose the option to print the preview page before it ends the flow.

4. Evaluation and Discussion

Testing questions are also used to access the overall application. The testing questions are concerned with the opinions and feedback from the users on the content design of this application. The questionnaire (ten Questions) was designed in the Level of Satisfaction (3 Point) which are “Bad”, “Average”, and “Good” as shown in Table 2. In the evaluation of the application, ten participants were invited to evaluate the application. The respondents comprise the staffs from NSS department where the staffs will use the application after it is implemented. The group consisted 9 males and 1 female with an average age 34 and proficiency with English.

For question one, nine among ten respondents gave “Average” or “Good” and agreed that the instructions are easy to understand. For question two, eight among ten respondents gave “Good” and admitted that the inventory details in the system are useful to staffs from NSS department. For question three, three among ten respondents disagreed (“Bad”) that the details on the inventory system are complete. For question four, 70% of the respondents gave “Good” and acknowledged that the online platform is easy to reach. For question five, six and seven, 60% of the respondents gave “Good” and admitted that the security of this inventory system data is reliable, time saving, and able to provide accurate information. For the last three questions, majority of the respondents (more than 70%) conformed three questions which are 1) the system is able to print out in a page for each station, 2) the data redundancy can be avoided as well as 3) not easy to lose the inventory information.

Table 2. Result of the Evaluation of NSS Inventory Information System

	Bad	Average	Good
1) Instructions are easy to understand.	1	4	5
2) Inventory details in system are useful to staffs.	0	2	8
3) Details on this inventory system are complete.	3	3	4
4) Online platform is easy to reach.	0	3	7
5) The security of this inventory system data is reliable.	1	3	6
6) Time saving.	1	3	6
7) Accurate information.	0	4	6
8) Print out in a page for each station.	0	2	8
9) Data redundancy can be avoided.	0	1	9
10) Not easy to lose the inventory information.	1	2	7

5. Conclusion and Future Works

NSS Inventory Information System is a web-based application which is developed for NSS Department at TNB. NSS Inventory Information System will be useful for the staffs to maintain the inventory records by saving the time and can avoid data redundancy. It is also secured system where the user id and password of the staffs is updated in database only can access the system. The staffs can view the existing details for each station. On the other hand, staffs can edit the existing records where they double click to edit the details and save it in the View Page. Apart from that, staffs can

print out the details in PDF format for respective station in a page. One of the problems faced by the staffs is unable to print out the details for each station in a page in spreadsheet. The problem has been solved in this system. The interface design is mainly focus on functionality of the system. However, they are some improvement should be carried out as a future work to ensure the NSS Inventory Information System works better and efficiently such as to create the QR Code where the staff can scan the code rather than key in the ID of the device. In addition, search function should be included to ease the admin to find the details by entering the ID of the employee. In a nutshell, NNS Information System is a helpful platform for the NSS staffs to manage the inventory details effectively. In the era of technology, managing the inventories manually can be replace with this systematic system and there are many advantages such a 1) time saving, 2) easy to update and 3) can avoid data redundancy.

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