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Warehouses information system design and development

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Abstract. Materials/goods handling industry is fundamental for companies to ensure the smooth running of their warehouses. Efficiency and organization within every aspect of the business is essential in order to gain a competitive advantage. The purpose of this research is design and development of Kanban of inventory storage and delivery system. Application aims to facilitate inventory stock checks to be more efficient and effective. Users easily input finished goods from production department, warehouse, customer, and also suppliers. Master data designed as complete as possible to be prepared applications used in a variety of process logistic warehouse variations. The author uses Java programming language to develop the application, which is used for building Java Web applications, while the database used is MySQL. System development methodology that I use is the Waterfall methodology. Waterfall methodology has several stages of the Analysis, System Design, Implementation, Integration, Operation and Maintenance. In the process of collecting data the author uses the method of observation, interviews, and literature.
Keywords: warehouse management system

1. Introduction

In today's products/goods handling industry, it is fundamental for companies to ensure the smooth running of their warehouses. Efficiency and organization within every aspect of the business is essential in order to gain a competitive advantage.

Disorganized warehouse spaces can cause unnecessary labor costs and the incorrect use of storage systems and racking arrangements result in many companies finding their warehouse shelves full, with no space to receive new inventory. When inventory location is not organized and easily available, pickers will take longer to find items that need to be shipped. This can ultimately lead to a backup in labor. Forklift operators often make multiple trips around the warehouse searching for slots in the storage racking for new inventory. This results in them slotting the pallet of inventory wherever they find an empty space. As the pallet family and size is not carefully considered in its allocation, you will eventually find a large amount of inventory slotted in an unorganized manner, with no room to reorganize due to limited warehouse space.

A cloud-based inventory management app that designed and developed inventory management, control, and tracking apps to make inventory data entry, search, and visualization possible from any location and at any time using web, smartphones and tablets. A smart option to save money with bring your own device (BYOD) barcode scanning and/or inventory, Scan to Spreadsheet is useful for inventory, cycle count, marketing event scanning, and other times when scanning to create a list is necessary.

2. Methods

The concept of the method in making this application is to compare between existing conditions with the expectations of the users and the general knowledge of the various literature.

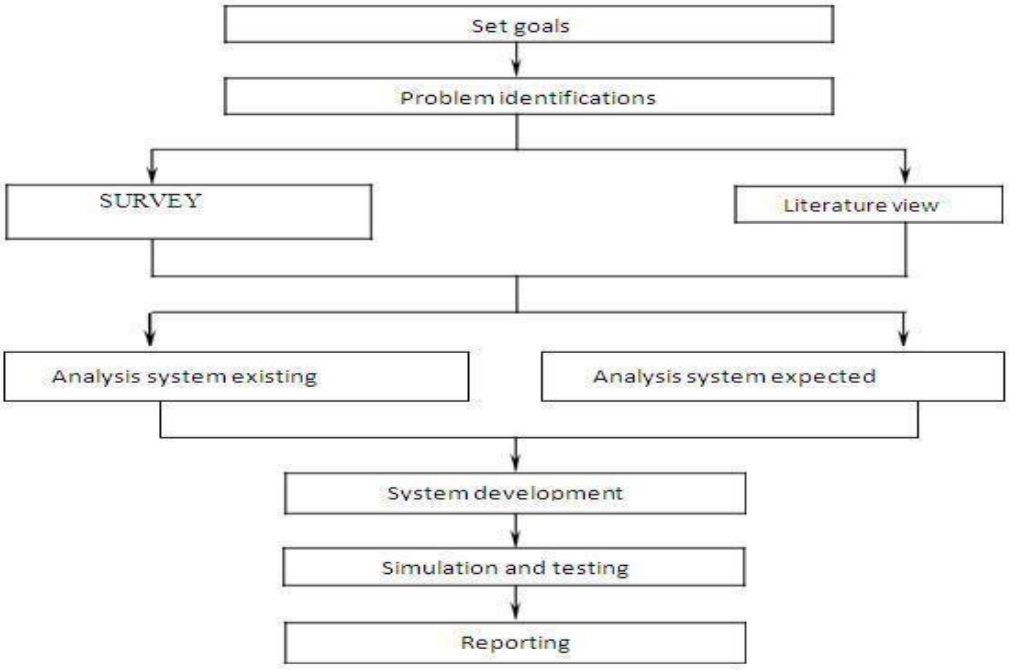

Figure 1. Methods

3. System analysis, design and development

System analysis is the translation of a complete information system into several parts of its components in order to be able to identify and evaluate various problems or obstacles that arise in the current system so that later can be done countermeasures, improvements and also development system.

3.1. System analysis

3.1.1. Current versus expected system

in this section the authors analyze the problems that exist and identify the expectations of all parties, whether internal or external users.

Table 1. Current versus expected system

Item	Current/Existing	Next/Hope
Assambly and FG Handover	Data Kanban recording by manual/visual (handwriting)	Kanban be created by barcode system.
Storage/Rack/Area	There is no system to monitor the position of goods	FG Warehouse is divided into several locations. Goods are actually monitored.
Delivery Export	Control and checking is done manually, and has not been monitored actual arrival of goods	Conducted cross check with barcode scan for items in box, pallet, packling list and case mark

Table 1. Current versus expected system (cont.)

Item	Current/Existing	Next/Hope
Control Truck	Monitor truck has been done over the phone	Control with GPS, and reporting when goods arrive at customer by App Android based
Delivery preparation process	KANBAN, DIS and DO are visually processed	Checking using Barcode scanner
Input Data	manually data input and not integrated yet	
Monitoring Stock, goods location,	all items can't be monitored in an integrated system	Monitoring by dashboard infromation system

3.1.2. Flow process
The current process can be seen in the flow diagram below.

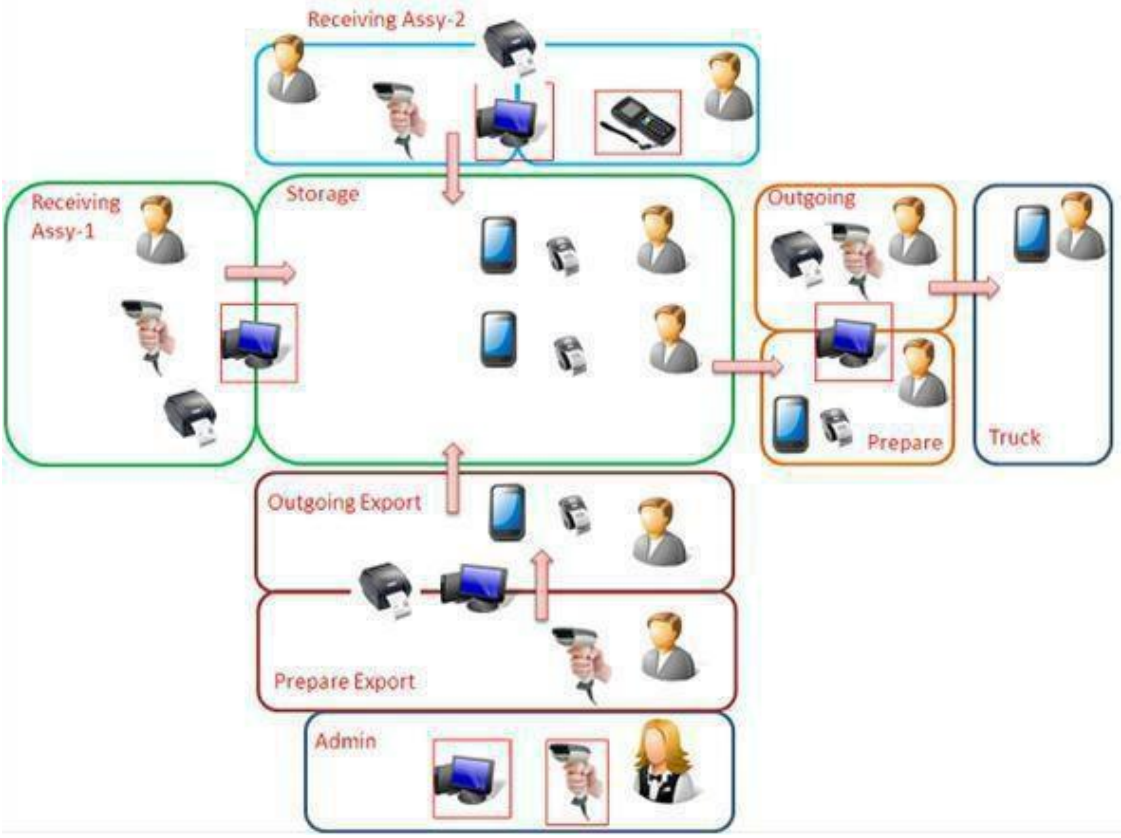

Figure 2. Warehouse expected flow

3.2. System design

3.2.1. Key features
Key features of this application are:

- Real-time inventory synching to create, disperse, manage, and track
- Barcode scanning with mobile devices (Android)
- User-friendly interfaces with easy navigation

- Applicable for any type warehouse manufacture companies (study case in three companies)

3.2.2. Technology

Technologies that are used in making this application include using Google Map API provided by Google. Details can be seen in the following figure;

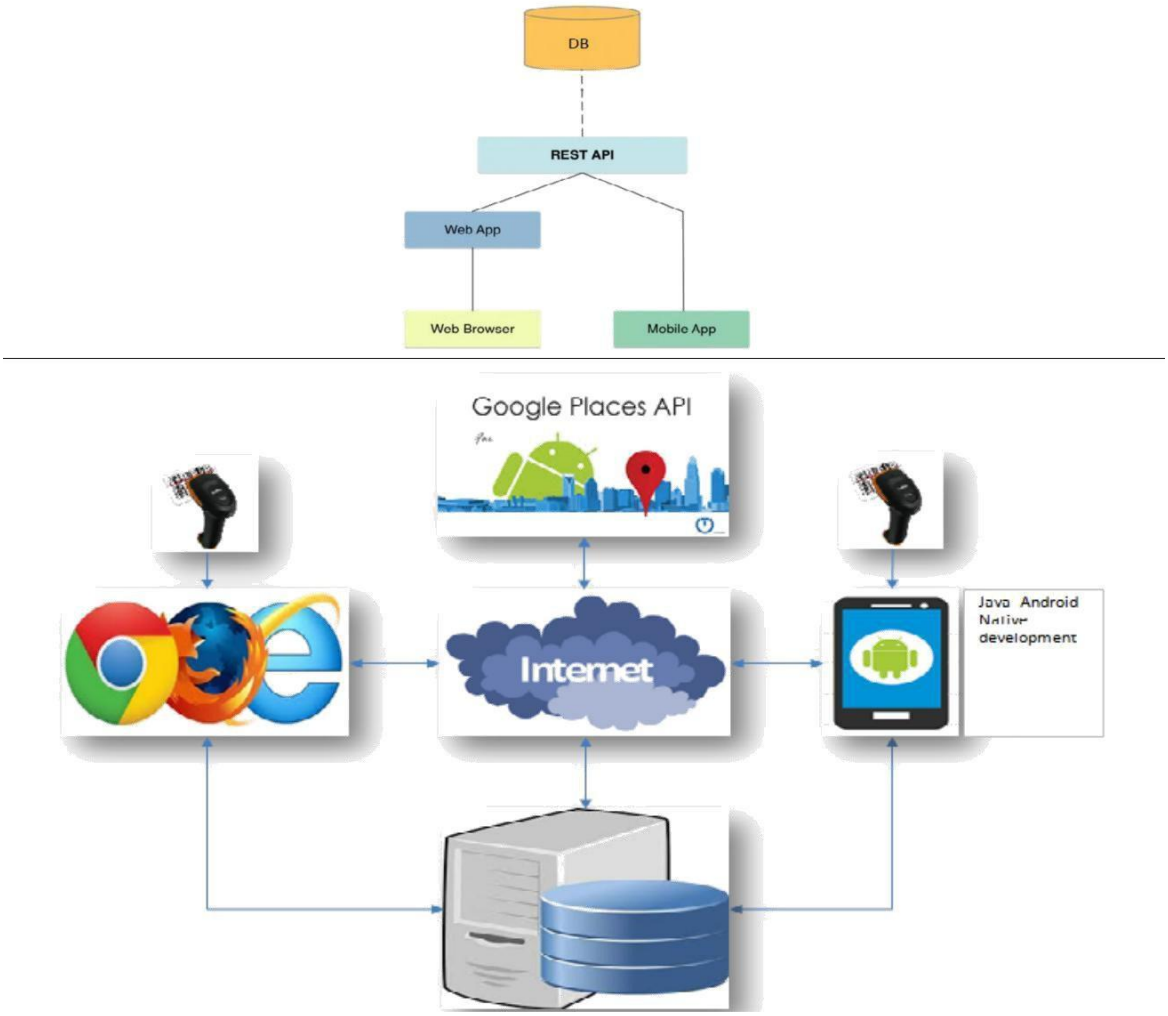

Figure 3. Technology and concept system

3.2.3. Modules

The application consists of several modules. each module. the distribution of modules by function and its users. The following is a list of modules of the created application.

Table 2. List of modules 1

Area	Process	Detail
Receiving	Input production result from assy line	Check model. Lot Number, and Quantity, give barcode each box, and seal plastic cover
		Print barcode for 1 pallet
		Make receiving Document (BSTB)

Table 2. List of modules 1 (cont.)

Area	Process	Detail
Storage	Place Pallet into warehouse storage Area	Warehouse have small section (A1, A2, Etc..)
		PIC Storage input Storage location on system by scan on area barcode
		PIC Storage able to check stock quantity, location, and FIFO
		Non pallet (partial) part handling
Pre Delivery	PIC pick up from storage area, repacking into delivery trolley	PIC pre delivery check stock location, Lot Number
		Scan delivery instruction sheet (DIS), prepare by admin, to check delivery schedule.
		Repacking from pallet into delivery trolley, and scan each box and print trolley barcode, based on DIS

Table 2. List of modules 2

Area	Process	Detail
Delivery Local Customer	Loading to Truck base on Delivery Note (DN) and monitoring truck movement	PIC prepare trolley base on DN, scan DN Barcode, and Trolley Barcode for confirmation
		Input data for trucking, vendor, plate number, driver, destination
		Hand over GPS device to driver
		Tracking Truck position
		Hand over part from Trucking driver to customer, report, take a picture
Delivery Export	PIC pick up from storage area, repacking into delivery box	PIC pre delivery check stock location, Lot Number
		Scan delivery instruction sheet (DIS), prepare by admin, to check delivery schedule.
		Repacking from pallet into carton box, and scan each box and print export pallet barcode, based on DIS
		Scan export pallet barcode and packing list barcode to re confirm
Stock Control	Admin and Storage PIC able to control and monitoring stock in warehouse	Warehouse member able to see stock level in LED Monitor, real time, data shown on graphic
		Data shown stock level quantity, each model, Lot Number
		Warehouse member can see stock position, rack position
		Warehouse member can see how long will extent for remaining stock, comparing with delivery plan. Production plan
Import Part	Input production result from Assy line	Check model. Lot Number, and Quantity, give barcode each pallet/boxes
		Record for Invoice, Packing List document from origin country
		Make receiving Document (BSTB)

Table 2. List of modules 2 (cont.)

Area	Process	Detail
In transit	Part production on KID Plant-1 delivery to KID Plant for storage, and vice versa	Part production from Plant-1, but delivery to Plant-2 for storage, and delivery to customer, part stock in Plant-2, and vice versa
Other Account	Combine Part	Part more than 1 part number, but delivery to customer only 1 part number
	Import/Export data to other system from Customer or internal (PRONES)	To prevent additional job, can use data from other system/platform
	Disposal	Part dispose/scrap if not use/NG
	Picture/Data Storage	Warehouse member can storage data (PDF,JPG format) for traceability and paper less
	Temporary Warehouse	If part pending, rework, repair, stock will be separate from OK part, until judgment OK/NG from quality. Classification
	Initial Delivery/First Delivery	Information for initial delivery, due to new model, design change
	Part Borrow	Data if part borrow by other department
	Return /Claim Part	Data if part returned from customer/claimed

Table 2. List of modules 3

Area	Process	Detail
	Transfer Stock	Change stock from part number A to part number B
	BOM	Bill of Material, Part Database
Other	Daily Sales	Report detail all PO monthly
Planning and Monitoring	Monitoring Daily	Daily report for stock level, delivery schedule, etc.
	Delivery Plan	Input delivery plan, weekly, monthly, 3 month
	Traceability	Print out data base on Model, Lot Number, delivery date, etc.
	Production plan	Input production plan weekly, monthly
Packing control	BOM Packing	List of packaging, model, size
	In-Out Packing	Input data from incoming supplier/customer and Out data base on actual delivery quantity
	Delivery Tag	Print delivery tag from system, based on part number
	Packaging Stock Report	Report for packaging stock

3.3. System development

The author uses Java programming language to develop the application, which is used for building Java Web applications, while the database used is MySQL. System development methodology that I use is the Waterfall methodology. Waterfall methodology has several stages of the Analysis, System Design, Implementation, Integration, Operation and Maintenance.

3.3.1. User intervace (UI)

Web interface made responsive so that can be accessed in various sizes screen without damaging appearance. here are some examples of its user interface.

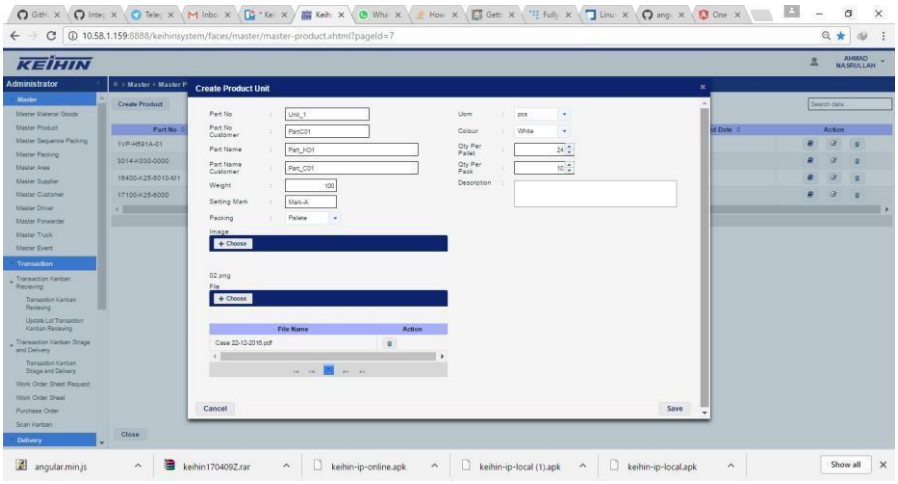

Figure 4. Master Product for Unit/Pcs

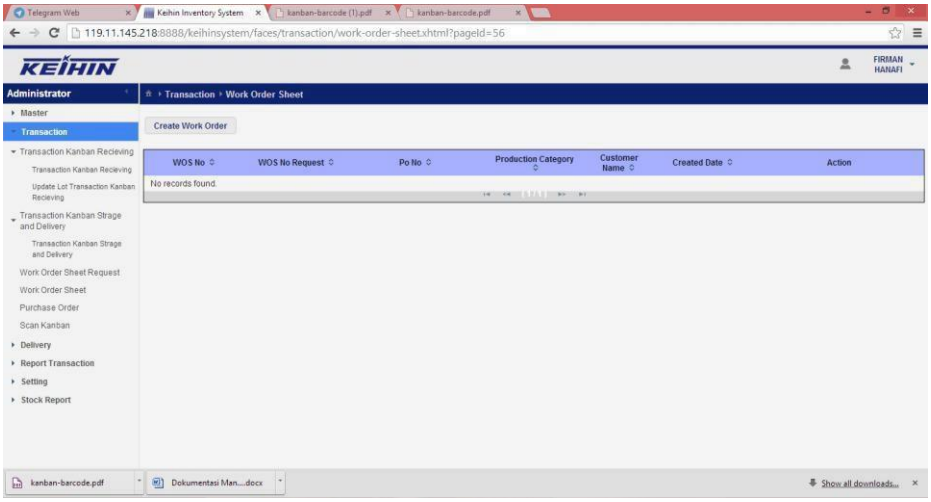

Figure 5. Work Order Sheet

4. Conclusion

The designed system of application warehouse logistics web and android based refers to the process of warehouse logistics that exists in three different factories companies, two automotive factories and one food factory (candy) and the authors conclude core of system requirement are:

1. Mapping of each location / area. Facilitated by: Master data area
2. Mapping of proses repackaging of each product. Facilitated by: Master packaging with parenting system (Parent-child packaging)
3. Systematic recording of the movement products, from where to where. Facilitated by: Android application to scan barcode of product ; scan barcode area before – scan barcode product – forwarding product – scan barcode area destination.

The application has been successfully created and implemented in one of the automotive parts industry company.

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