

INCREASING EFFICIENCY IN INVENTORY SYSTEM BY BARCODE TECHNOLOGY IN SPORTSWEAR TAILORING FACTORY

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Introduction

Textiles and Garment industry has vital importance in the economy, and is considered a necessity for human survival. It also relates for many industries with raw materials such as industrial buttons, zippers, labels, weaving, knitting, dyeing, processing and garment. Such role provides massive contribution to economy by providing employment and income to a country. Applying scientific management concept of value creation in the textile and apparel industry can increase value for the investors by elevating the business from upstream to downstream in the supply chain system. This paper considers value creation in the industry by implementing demand forecasting methods and introducing diversification of products to meet consumer preference. Authors speculates that by implementing of such strategies, it will result in economies of scale and further returns for the industry.

The case study factory produces a variety of series, types and size of sportswear. Furthermore, the productions are mainly made to stock and sometimes made to order. The finished goods are stocked in warehouse. Then, the sportswear are transferred to packaging department and prepared for distribution. To check the quality per customer requirements, the manual process is done by operators. This affects in error in process and non-conformed product for customer. Thus, these effect customer unsatisfactory. Penalty and re-shipment increase manufacturing cost.

This paper aims to apply the technology to reduce error. The example are RFID and Barcode that are widely-known technology. Therefore, this paper analyses the processes by using value chain management concept with application of information technology. There are five sections in this paper. The existing literatures review on value chain management and information technology are reviewed in section 2. The methodology are presented in section 3. Additionally, this section will present the technology development for improving efficiency. The results are later discussed in section 4. And finally, section 5 are conclusion and discussion.

Literature Review

This paper considered the issues relating to the concept of value chain approached in the textiles and information technology.

Value Chain Management (VCM)

The concept of competitive advantage and how firms can manipulate management activities was introduced by Porter (Michael, 1985). Manufacturing companies can create value by acquiring raw materials and processing them to more valuable products. Retailers bring together a range of products and present them in a way that's convenient to customers, sometimes supported by services such as fitting rooms or personal shopper advice (Céline, 2006). The operation strategy of value chain in clothing has been development in design process to be applied in textile and garment industry to

develop and improve the efficiency that brings benefits for wide range of producers and consumers (Patricia, 2006) and improve demand management in highly diverse textile (Margaret *et al.*, 2004].

Information Technology Applied in Inventory System

Barcode technology have been widely applied in automatic identification and tracking throughout the textiles and fashion supply chain (Vassiliki *et al.*, 2001). The sportswear tailoring factory is highly diverse and heterogeneous definition. Many type of raw material and finished good are involved. Barcode technology works by scanning print barcode label with barcode reader (Wong, 2014). Nowadays RFID is deployed mainly to support the following operations (Siu *et al.*, 2009): the handling process; tracking work-in-progress; receiving operations; shipping operations; tracking products; tracking inventories; monitoring and sorting of merchandise; counting stock and picking merchandise; tracking containers; shipping; locating products; and store management (Hau-Ling *et al.*, 2012). However, a cost–benefit for RFID tags is still an open issue (Ngai, 2012). In general, literature on an analytical assessment of the RFID technology is fairly limited, mainly focusing on the inventory function and the effect of inventory discrepancy. The inventory ratio was stood out as the indicator (Kok *et al.*, 2008) showed contradictory outcome. Suggestion from many earlier researcher were given on return of investment (ROI) (Korrakot *et al.*, 2007).

The literature review shows that the value chain activities discussed the problem by each activity. The barcode technology is applied in the process of inventory for development and implementation of a system is presented. Finally the barcode technology can support completely and the technology has become increasingly the system in the factory.

Methodology

This section presents research methodology to implement technology for improving efficiency of the case study factory. There are three steps comprising of (1) Identifying and understanding the activities, (2) Suggesting the solutions by applying technology and (3) Developing and implementing the technology.

Step 1: Studying Process Activities by Using Value Chain Management.

This step describes how to study process of the case study factory by using value chain management. Value chain management can help understand the roles of supply chain activities in the organizations. There are two main business activities comprising of primary activities and support activities. Firstly, primary activities consist of five activities that are inbound logistics, operations, outbound logistics, marketing and sales, and services. These activities relate with main activities to transform inputs into outputs for customer. On the other hand, support activities are firm infrastructure, human resource management, procurement and technology development. The problems of this case study factory are error in processes and non-conforming products that need to identify key activities for process improvement.

Step 2: Design an Application by Applying Information Technology Concept.

The problems are identify with in key activities of business processes. Then this step attempts to find improvement solutions. To reduce error, an application is designed, applying information technology concept. MS Excel software is easy to use and application to other application.

Step 3: Implementation

The application is used with barcode. It can reduce error in focused activities. Then, the previous results and the implemented results are compared to measure efficiency of the implementation. Examples of measurement are process times, manufacturing costs and numbers of error.

Result and Discussion

This section presents the results and discussion. For primary results, the process activities of the case study are studied. The company receives purchase orders from customer that are called "Picking Note". Then, operators arrange products from warehouse following picking note. Next, the products are packaged with ID codes to identify products. After that, the products are checked again with picking note by operators to confirm product. Finally, the products are delivered to customer. Process flow of the case study is shown in Figure 1. The case study factory is suggested that the main problem is error from operators in packaging department.

To find solution for process improvement, an application is designed by applying technology to check the accuracy of the product. MS Excel software is used to design barcode system. The structure of the application process consists of three parts that are input process, processing and output process.

Flow Process Chart

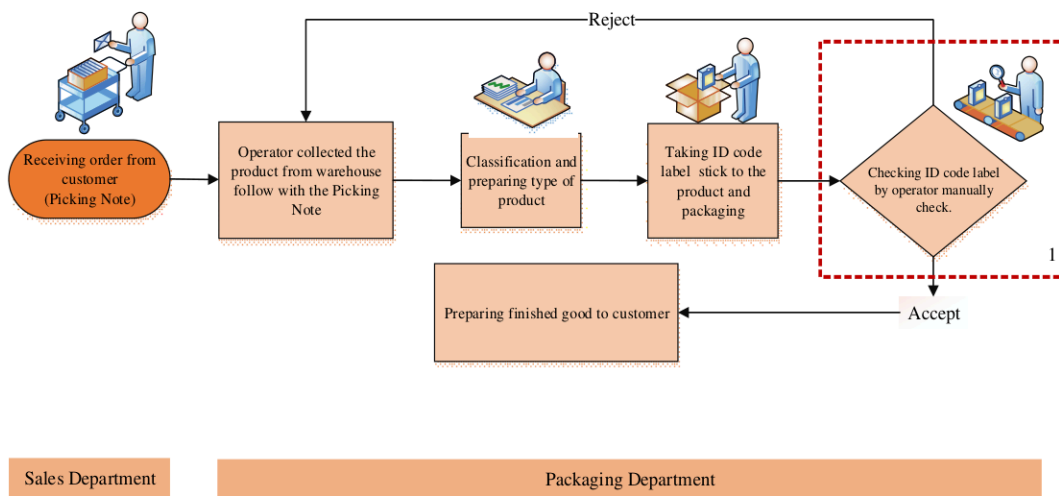


Figure 1: The flow chart of operations operator before improvement.

Input process concerns ID-card data of picking note that are types of product and barcode, then related with data analysis to confirm products with picking note and packing list. The output process shows the results of the check. There are seven status of check comprising of not sufficient, shortage, over picking, product is over, correct and completely, product is completed and wrong picking product as shown in Fig.2 then display of application shows the details of products.

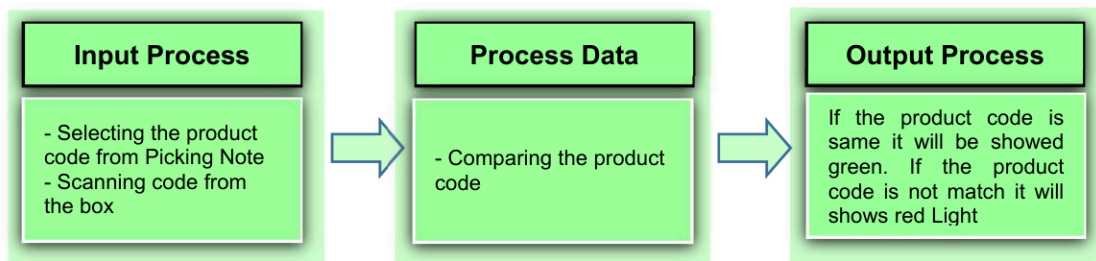


Figure 2: The structure of program.

Program will check the accuracy of product as following, the symbol is shown in table 1 as following,

Figure	>>Short<<	-1	<<Over>>	1	Complete	✓ 0	Pick !!
Description	Status shows that item required is not sufficient	Status shows that product is shortage	Status shows that product is over picking	Status shows that product is over	Status shows that product is correct and completely	Status shows that product is completed	Status shows wrong picking product

Table 1: Symbols of product status

Displays of the application shows the detailed of products and the result as shown in Fig 3. The application of barcode scanner and barcode sticker label are essential equipment.

1								
2	Picking Note No.	9185602/000				4/8/2015		
3	Customer Code :	NPSAT-WT	Ship to :	AARHUS				
4	Box Size :	57x50x28				SAVE		
5								
6	Ln	EAN Code	Item Code	Qty	P Qty	BOX	Scan barcode	ผล
7	1	881285923815	WNNSUD787001048	1	✓ 0	1	WNNSUD787001048	Complete
8	2	881285923822	WNNSUD787001050	1	✓ 0	1	WNNSUD787001050	Complete
9	3	881285923839	WNNSUD787001052	2	-1	1	WNNSUD787001052	>>Short<<
10	4	881285923846	WNNSUD787001054	2	✓ 0	1	WNNSUD787001054	Complete
11	5	881285923884	WNNSUD787001102	2	1	1	WNNSUD787001054	Complete

Figure 3: Display of the program

After implementation, error products and error processed are reduced while the application can check the ID number and correct products before shipping. The result found that time to check products, mistake of shipment and cost of damage delivery are reduced. Table 2 shows comparative results between before and after implementation. The application can work with 100% accuracy.

List	Before	After	% Improvement
1. Time to check product (Minutes/order)	30.15	18.25	39.49%
2. Mistake of shipment (Times)	4	0	100%
3. The damage delivery (Baht/Month)	36,000	0	100%

Table 2: Comparing before and after improvement list

The detailed of barcode sticker label is shown in Fig. 4 and Fig. 5.

Here, the factory will benefit from the barcode technology. The program works with great efficiency. It can check the product correctly. It can reduce errors by 100%.



Figure 4: Barcode scanner and barcode sticker label.



Figure 5: Product are ready to delivery to customer.

Conclusion and Discussion

This paper discussed an application of information technology, i.e., barcode technology. It can be applied to the small industry. This application can check the products for increasing efficiency in inventory system.

The result of this case study factory is the application of barcode technology to verify the finished goods that are delivered from factory to customer. The application detects faulty goods before delivery to customers. It saves 432,000 Thai baht/year. Moreover, time is reduced by 39.49%, shipment of good are corrected by 100% and the damage delivery is reduced 100%.

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