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Warehouse Automation

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Abstract: ***This paper examines Warehouse Automations using RFID practices and their effects on operations. This study analyses the relationship between adoption of WMS to its impacts on business performance and competitive advantage of a regional distribution centre. In terms of business performance, the focus is placed on various competitive cores of distribution centre. WMS was found has a positive impact on companies' performance on operations management measures. To adopt the MIS, wireless barcode embedded WMS in specific, it is necessary to have corporate culture that supports complex operational activities. WMS implementation is crucial in bringing cost reduction in operational level, effective management in management level, as well as improvement of the company's competitiveness in strategic level. Companies that manage warehousing of their products are expected to implement WMS in order to maintain their competitive edge in the global market place.***
Keywords: RFID, Management Information System (MIS), Warehouse Management System (WMS), Logistics Information System, Barcode, Regional Distribution Centre

I. INTRODUCTION

Availability of information technology will enable accessibility of more efficient communication and control, which is essential to a competitive global logistics capability. The impetus for strategic use of Management Information System (MIS) has been highlighted as the world transits into a global village. There is growing research interest in the use of MIS as a strategic weapon by organisations. Globalisation and competitive pressures have heightened the impetus for strategic use of MIS. More specifically, Warehouse Management System (WMS) designed to introduce improvement into every aspect of a company's warehouse operations offers an organized approach to manage efficiency. Bar code data collection solutions for warehouse management system provides powerful and flexible automatic identification system that connects the shop floor to the enterprise software.

II. RELATED WORK/ LITERATURE REVIEW

Literature review reveals that organisations must be capable of fast, radical changes and those that aspire to be best must lead in changes. According to Oxley (1990) efficient management information system means (a) Quickly and fast response to change, (b) Accurately, (c) Minimum clerical effort, (d) Up-to-date, and (e) Available where and when needed. Orlikowski and Robey (1991) study systems development and the organisational consequences of using IT based on Gidden's theory of structuration. Powell and Dent-Micallef (1997) investigate linkages between IT and firm performance.

III. OBJECTIVES/ PURPOSE OF THE STUDY

Single-case study approach is applied in this study to understand the system being examined in the period of time available. The primary aim of this paper is to analyse indepth to provide description and interpretation of business performance improvement in multi-perspectives that is induced by implementation of warehouse management system. Evidence of data is collected from multiple sources including documentation, archival records and direct observation

IV. RESEARCH METHODOLOGY

The distribution centre of study's holding company, Sharp Corporation, has been involving in TV manufacturing for more than fifty years and pioneer in LCD technology for over thirty years. The key products of the company are LCD TV and solar cells. The primary business operation of the company in this study, a business unit level distribution centre, is procurement and distribution of service parts for both business and consumer electrical appliances. The distribution centre has been in business in operation of distributing electronics parts worldwide since 1995.

This business focuses on product quality and customer satisfaction. The business unit is among its counterparts. Value-added services of the distribution centre is to provide 'pick and pack', and individual packaging. Quality management improvement programme is implemented to aim for zero defect through 5S, QCC activities and ISO9001: 2000 Quality Management System. ABC Management is applied in Inventory Management.

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The distribution of electronics service parts revolves around a certain number of physical (materials) and informational (communication) flows that enable actor to source:

- The right parts: service parts having increasingly become an integral part of electrical modules
- In the right place: physical service parts of from manufacturers to dealers usually transit via distribution centre
- At the right time: a distinction is generally made between urgent deliveries and replenishment operations Logistics Management System, more fondly known as Warehouse Management System (WMS) is a MIS investment in a warehouse. SAP is the abbreviation of System for Application and Products. The distribution centre's Warehouse Management System (WMS) developed by a local software house. For information flow, customers place sales orders via the linked SAP system which in turn are passed on as outbound delivery actions. This delivery information is then processed by WMS and made available on each user's RF scanner. Orders are picked, boxed and printed despatch labels and routes for shipping. Completed delivery confirmation documents are then transmitted to the SAP server and from SAP to notify the customers.

A. Configurations

SAP and WMS are linked by lease line from the distribution centre office in Shah Alam and warehouse in Port Klang. The server that interfaces with WMS server is the Application Server known as of SAP R/3 system furnished with modules Sales and Distribution (SD) and Financial Management (FI). The WMS server hardware is HP server with Server / Client OS Windows NT server. The WMS is VB program with an MS SQL Database 2000 on a Windows NT operation system platforms using client/server network architecture that provides a standard suite of products. The Minimum hardware requirement is PC with LAN card (NIC – 10/100 mbps). They are over 70 endusers are linked to the WMS application. The mobile device is connected to the network using radio frequency (RF) standard of 802.11b (11 mbs) and will communicate using TCP/IP. The protocol used is TCP/IP. Through the adoption of these standards, the application has been made device independent, permitting the organisation use a wide variety of mobile devices. The Bar code printer manufacture is Sato, and the data input devices manufacturers are Denso (Batch Handy Terminal, BHT) and Fujitsu (Radio Frequency, RF terminals).

B. Host Interfaces Interface Features

Interfaces easily with host-based systems • Real time and /or batch host integration • Inventory interfaces • Order interfaces Delivery data will update stock and the order data files. Receiving order receipts will update stock, and the order data files. The dispatch records will be used to update picking lists with the confirmed quantities. If there is a discrepancy in the stock, the 'amend dispatch quantities' option can be used to reduce the picking list quantity. Hence, these interface data enable the distribution centre to manage effectively the coordination of information including demand, capacity, inventory and scheduling,

C. Inbound Logistics

The inbound processes use Batch Handy Terminal (BHT). Inbound System Features are: • Receipts immediately visible and tracked from arrival • Receipts referenced by PO • Directed Put Away • Location verification to ensure correct placement • Pre-receiving via manual entry or electronic data interchange (EDI) • On-line validation against PO information • Receiving Discrepancies Report • Cycle counting for partial inventory checking • Verification of physical counts and storage accuracy • Cycle count post or reissue • Adjusts warehouse and SAP inventories

D. Outbound Logistics

The outbound processes use Radio Frequency (RF) terminal. Outbound System Features are: • Orders accepted from any host systems • System directed pick and real-time verification • Packing Lists • Track and process customer orders • Supports prioritising orders • Weight capture at picking • Pick to Pack • Picks confirmed through shipping process • Interfaces to SAP to confirm the shipment orders

E. Inventory Management

Inventory Management Features are (a) real-time storage usage, and (b) security through user passwords and access authority levels. Stock take will be performed for the entire warehouse. The scanner will allow entry of a location reference via the scanner. Bar codes would then be scanned and either a quantity entered or further bar codes scanned.

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F. Management Reporting

The Reporting Features are: • View storage utilisation in real-time • Ad hoc query function • Export to text, Excel and CSV text files • Detailed Item (SKU) Report • Detailed Locations Report • Receiving order status • Shipping order status

V. HARDWARE AND SOFTWARE REQUIREMENTS

1) SAP
2) ERP
3) Handheld Mobile Computer
4) PC with LAN Card
5) TCP IP Router
6) Barcode Printer

A. Major Software Required

SAP and WMS are linked by lease line from the distribution centre office in Shah Alam and warehouse in Port Klang. The server that interfaces with WMS server is the Application Server known as of SAP R/3 system furnished with modules Sales and Distribution (SD) and Financial Management (FI). The WMS server hardware is HP server with Server / Client OS Windows NT server. The WMS is VB program with an MS SQL Database 2000 on a Windows NT operation system platforms using client/server network architecture that provides a standard suite of products. The Minimum hardware requirement is PC with LAN card (NIC – 10/100 mbps). They are over 70 endusers are linked to the WMS application. The mobile device is connected to the network using radio frequency (RF) standard of 802.11b (11 mbs) and will communicate using TCP/IP. The protocol used is TCP/IP. Through the adoption of these standards, the application has been made device independent, permitting the organisation use a wide variety of mobile devices. The Bar code printer manufacture is Sato, and the data input devices

VI. DATA ANALYSIS & INTERPRETATION

Radio Frequency WMS that utilises bar code technology have many advantages. The following is a list of the most common benefits that directly result from implementing a WMS. Leveraging RF-based bar coding technologies and seamless integrating with order entry, WMS tightly orchestrates these activities. WMS provided better workload control for view of completed and upcoming activities. While checking in received good, it is prepared for shipping directly to the awaiting customer if the item is needed to fulfil a customer backorder, while eliminating the introduction of transcription errors. It reduces labour costs and increases productivity. In average incoming cycle has been reduced from average 3.71 days to 1.02 days. It was observed that the lead-time has been reduced by 73% in the period. The final phase of receipt and put-away processing is the automated update of purchase orders and inventory information into SAP that eliminates manual intervention and errors, while providing accurate and up-to-date inventory control. It reduces safety stock, stock shrinkage and spoilage. Administrative is improved because the work of printing and distributing picking lists or labels is contained, as is the task of keying in picking confirmations and picking amendments. WMS offers a streamlined shipping solution that produces shipping labels, picking slips, carton content labels and advanced shipping notices eliminating errors in transcription from customer order. The Outbound lead-time for air freight (AF) for subsidiaries has been reduced from 9.94 days to 4.29 days, which is a reduction of 57%. The WMS provides a fast order handling process to keep distribution costs to a minimum. WMS reducing human errors inherent in manual and paper based systems. Inventory Accuracy improved from 98.34% to 99.52%. It was reported that 43% of the customer complaints was due to warehouse operation mistakes before. Nevertheless, the operation accuracy has been improved to just 11% of complaints after implementation.

WMS also provides detailed audit trail that measures performance levels objectively, ensures employee accountability and allows material flow to be easily traced. In order to encourage the staff to further embrace to new warehouse management system, long-term on-going training is essential, the system must be designed with regular programme enhancement to create awareness of the gains of using technologies.

VII. SCOPE OF THE STUDY

The case study is limited to a selected electronics parts regional distribution centre. The flows analysed are the physical (stock management and movements) and informational flows that are associated with the service parts distribution activities. Future studies may explore on variety of industries to capture distinction in experience, by focusing on consumer market based electrical appliances or perishable fast movement consumer goods (FMCG). Comparative studies can be conducted across industries, and then the similarities and differences observed. Alternately, measurement of intangible benefit can also be tested in Malaysian industries.

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VIII. CONCLUSION

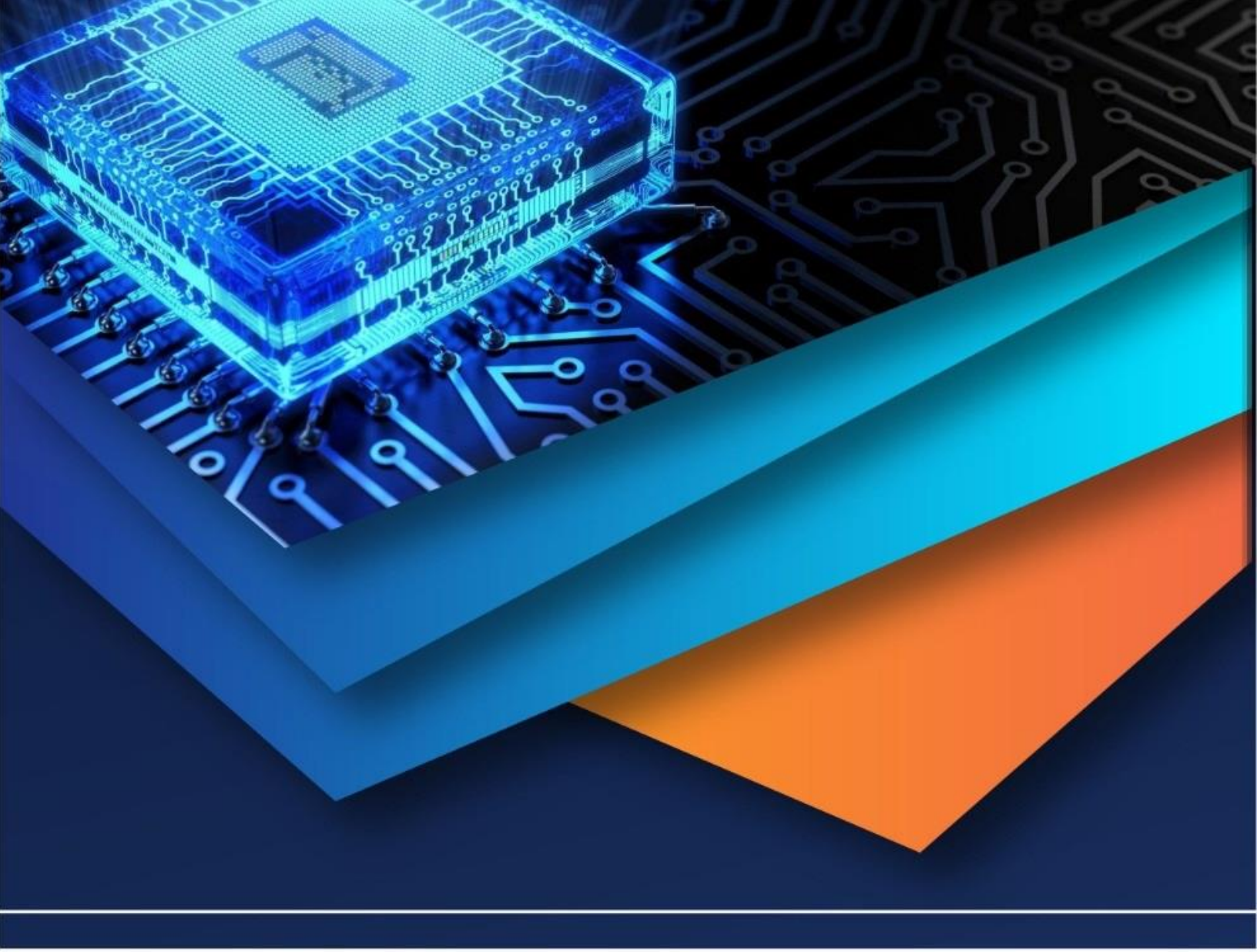
To maintain competitiveness, customer requirements are met consistently, which are achieved by, among others, enabling of more flexible processes with deployment of radio-frequency technology, improved scope of delivery with provision of same day delivery services, shorter delivery lead time especially airfreight mode, increased customer satisfaction with less complaints, inventory visibility with higher inventory accuracy and cost efficiencies with higher labour productivity while minimising inventory investment which includes inventory handling. Procedures have been established to monitor and measure WMS activities

It is concluded that WMS has a positive impact on operations measures. Investments in WMS enable the distribution centre to compete successfully against other rivals in the market. To adopt the MIS, wireless barcode embedded WMS in specific, it is necessary to have corporate culture that supports complex operational activities. BPR has to be enacted as such that the WMS and associated physical operations are well integrated. WMS implementation was crucial in bringing about reduction of cost in operational level, and effective management in management level, as well as improvement of the company's competitiveness in strategic level. Companies that manage warehousing of their products are expected to implement WMS in order to maintain their competitive edge in the global market place.

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