Gaining Competitive Advantage through Innovation Strategies: An Application in Warehouse Management Processes

Asli Goksoy[1], Ozalp Vayvay[2] and Nilufer Ergeneli[3]

[1]*Department of Business, American University in Bulgaria, 1 Georgi Izmirliev Square, Blagoevgrad 2700, Bulgaria*
[2]*Department of Industrial Engineering, Faculty of Engineering, Marmara University Goztepe, Istanbul, Turkey*
[3]*Engineering Management, Bahcesehir University, Turkey*

In today's highly dynamic business environment, organizations need to develop new competitive advantages to keep up with the speed of change in technology, customer demands and global competition. In this difficult task, organizations can benefit from innovation strategies and tools more than ever, as it helps companies to optimize their competing power by increasing their performance and efficiency. One strategically effective way to use innovation for a company is to apply it in warehouse management. Warehousing is becoming more and more a critical activity in companies. Competition and high customer demands force companies hold less inventory, react faster to market changes and lead times and costs. As a result, new automatic processes may increase productivity noticeably and become a source of competitive advantage for companies. In this study our aim is to illustrate the innovation strategies role in improving warehouse operation efficiency, enhancing the utilization of warehouse capacity, increasing inventory accuracy and reducing customer complains significantly by explaining the old and new processes of warehouse management in a global company. This study will help managers and practitioners to understand the role of innovation management tools in structuring warehouse management and how to gain a competitive advantage through successfully planned and implemented innovation strategies.

Key Words: Innovation strategies, competitive advantage, warehouse management, inbound, outbound, return and customer claims

Introduction

Strategy scholars draw on various traditions in economics to develop theories of how managerial decisions lead to superior economic performance, often termed 'competitive advantage' (Grahovac & Miller, 2009). A firm has a competitive advantage "If it is able to create more economic value than the marginal (breakeven) competitor" (Peteraf & Barney, 2003, 314), and firms are positioned to sustain such an advantage when isolating mechanisms hinder rivals from acquiring key resources (Rumelt, 1984).

Competition among firms is getting harder day by day due to many organizational and environmental reasons such as globalization, deregulation, increasing global and domestic competition, and new technologies (Akman & Yilmaz, 2008). Innovation could be recognized as a key success factor in an increasingly competitiveness in this complex environment. The act of innovating can provide a firm with the capability to capture a substantial level of market share or create an entirely new market opportunity that enables a firm to reap supernormal profits. The slow response of competitors to such innovation strategies will yield competitive advantage to the firm (Lim, 2010).

Innovation strategy is that part of strategy which deals particularly with the growth of an organization through the development of new products, services, processes or business models. An innovation strategy then becomes a plan of how to use the development of new products, services, processes or business models to achieve certain objectives (Abbing, 2010). Most importantly, to create growth, to sustain performance and to develop performance in such a dynamic and changing environment, one way is to make innovations (Cottam et al., 2001). Innovation is a main strategic tool to have a competitive advantage in such complex environments (Gardaker et al., 1998).

Organizations need to differentiate themselves from other players in the market. In most cases, leading companies continuously use innovative strategies to create an edge over their competitors. One way is to update their warehouse management through innovation strategies. These strategies will help them to have less inventory, react faster to market changes and lead times and costs.

In the past few decades, warehouses have evolved from simple receiving, storage, and shipping facilities to full-scale, high-volume, flow-through distribution operations. Global competition has driven businesses to hold less inventory and to get their products to market both faster and with more precise timing than in the past. Competition has also driven local and global corporations to become leaner and more efficient and to react faster to both changes in the marketplace and in the

internal business environment. Constantly shifting business priorities, increasing seasonality of products, faster business cycles, and more frequent mergers and acquisitions are just some of the market conditions that lead to intense pressure on warehouses to increase efficiency while still providing flexibility to the business to allow it to react to changing demands (Carter et al., 2010).

In today's highly dynamic and competitive business environment, firms are exposed to strict challenges with meeting the ever-increasing market and customer needs and expectations, coping with sophisticated requirements, and facing technological obsolescence. In this regard, the concept of innovation is gaining prominent significance as a means of sustaining performance and growth. It has been an area of intense research and various conceptualizations have been put forward (Fartash & Davoudi, 2012). This study is both important and timely, because it represents a successful implementation of innovation strategies in a leading global supplier of technology and services in a highly competitive industry and provides detailed information about their strategies. Our aim is to contribute the existing literature and raise interest for further studies in this field.

Literature Review

The concept of competitive advantage is rooted in the logic of value creation and distribution. A firm is said to enjoy competitive advantage when the value that is created in an economic exchange in which the firm partakes is greater than the value that could be created were the firm not to participate in the exchange (Brandenburger & Stuart, 1996). In a highly competitive business world, it is vital for companies to operate efficiently. It involves reducing costs in all areas of the business. Some of the key areas where organizations are able to minimize costs are by saving time, space, effort and energy.

The competitive advantage means the enterprise's capability to offer superior products and services for consumers comparing with the products and services offered by the competitors. The higher competitiveness level comparing with the competitors is given by price, product's quality, post-selling services quality, the enterprise's capability to adapt the offer to the market demand and technical progress. In Michael Porter's vision, the enterprise's competitive advantage means to assure a reduced cost or to create a distinct product or service that is clearly different through its quality by the competition's offer (Lucia, 2012).

Literature, especially Logistics and Supply Chain Management indicates that customer service management has become a strategic issue for companies in the new millennium. By improving logistics performances, companies increase customer satisfaction and gain market shares. Customer service, hereafter understood to be the service performance perceived by customers as a result of logistics processes and activities, has been widely recognized as a mean to gain competitive advantage (Bottani & Rizzi, 2006).

How to achieve a sustained competitive advantage that ensures long-term survival is a major concern for managers everywhere, but even more so for those in smaller firms, which may have more difficulty surviving under hostile environmental conditions than larger organizations. Because innovation is a key driver of sustained competitive advantage and sustainable business growth, the management of innovation is a central concern for these firms (Igartua et al., 2010).

According to Prestwood and Schumann (2002), innovation is the means by which enterprises create wealth. Enterprises that learn how to integrate innovation into strategy, and strategy into the process of innovation, will gain a competitive advantage and optimize the enterprise's creation of wealth. Additionally, Pratali (2003) explains that managing innovation involves two simultaneous, interrelated fundamental objectives of competitiveness: improving product quality (a prerequisite to success), and improving the company's overall technological quality (a prerequisite to lasting success).

Innovation must be understood in the largest possible sense of the notion: the new products manufacture, the new production technologies, the new equipment acquisitions, the improved management or financing methods, the improved performance and qualification of the labor force, the improved informational system and so on. In the strategic enterprise's option must be inserted the innovation implementation methodology that is the main source and tool to gain the competitive advantage (Lucia, 2012). Firms are conceived as bounded rational agents that explore complex product technologies in order to improve their fitness in relation to the selection environment (i.e. the consumers' evaluation of the characteristics of the final good) (Ciarli et al., 2007).

Hitt and his colleagues (2001, 484) state that innovation is critical to enable firms to compete in domestic and global markets. The importance of innovation for firms and start-up is encapsulated by Lee et al. (2001) when they state that: 'head-to-head competition with established players is bound to result in failure due to resource shortcomings, scale diseconomies, and questionable reputation'. They state that innovation is the key to competition as competitors cannot easily mimic innovativeness.

Competitive pressures and resource constrains of today's operating environment have elevated warehouse management to an important strategic level within many companies. Innovation can ultimately upgrade the efficiency of the whole warehousing cycle. A warehouse management

system is a critical component of an effective overall supply chain management and plays a critical role in assuring high levels of customer service and overall logistics performance. Today it even incorporates tasks such as light manufacturing, transportation management, order management, and entire accounting systems.

According to Emmett (2005), warehouse management involves deciding on the location of the warehouse with the lowest cost that will provide easy access to its customers and suppliers. In addition, it involves planning of methodologies used for easy material flow in the warehouse, and management of the cycle lead time flow for products in the warehouse.

The main warehousing operations consist of inventory storage, order product mixing, cross docking and customer service (Coyle et al., 2003). Warehouse management includes two main activities: inventory management and order management. Among all activities, order picking is the most labor-intensive operation in warehouses with manual systems (Koster et al., 2007) and normally accounts for 55% of warehouse operating expenses (Tompkins et al., 1996). In addition, the service level at a warehouse is also directly relevant to the operation of order picking. These activities include control of available internal resources and to supply resources to the shop floor (Heizer & Render, 2004). Thus the management process is in charge of (a) reception and inventory management (inbound of products in the warehouse), (b) replenishment of (dynamic) picking zones, (c) inventory allocation: assign stock to orders, (d) order assignment: assign orders to resources or work stations, (e) load balancing and control of picking posts and/or order picking resources and (f) consolidation and dispatch labeling. The warehouse management requires high degree of flexibility, adaptability and velocity to cover the customer requirements in competitive markets. In this way, the warehouse can be configurable and optimized according to the changes of the market (Ruiz et al, 2011).

The major functions of a warehouse are to store products in order to make an assortment for customers, to assemble customer orders, sometimes to add value to the orders by customization activities, organize transport to the customers, and ship orders timely, in the way desired by the customer. Warehouse performance therefore, has multiple dimensions. Often, performance is measured in terms of ratios of output and input factors. Output factors include production (shipped orders, lines and units), quality (for example, order completeness, error-free and on-time delivery), flexibility (possibility to cope with changes in customer demand), agility (process adaptation to changed environment), and innovativeness (use of new supply-chain concepts yielding competitive advantage). Inputs are the resources used to achieve the outputs. These include the number of full-time

equivalents (work hours used per year), investment in systems, buildings and IT infrastructure, process organization (i.e. the management), or the assortment carried (Koster, 2008).

A warehouse management system also tracks products during the production process and is closely related with the manufacturing system management. The delivery date of production orders are closely related to the process or material assignment managed by the warehouse. Thus, the order assignment is the key activity that influences the manufacturing system behavior. Moreover, warehouse management system applies inventory models to get material when there is not enough material to cover the demand of the manufacturing system (Ruiz et al., 2011).

Methodology

Based on the above research motives and relevant references in the literature, the research framework is an attempt to investigate the effect of innovation strategies in warehouse management in a global company. The information given here has been obtained from the interviews conducted with the company personnel. The figures and all tables presented in this study were created by the authors based on the materials provided to them. The name of the company will not be denounced because of privacy issues.

Company Information

Company

The company was set up first in 1886. Today, the company group is a leading global supplier of technology and services with 285,000 employees in over 60 countries. Research and development is a core value. The special ownership structure of the company guarantees the entrepreneurial freedom of the group, making it possible for the company to plan over the long term and to undertake significant up-front investments in the safeguarding of its future. The innovative strength of the group will continue to be a decisive asset in the future. The group employs thousands of people in more than 60 countries. For over a century the company name has been associated with forward-looking technology and trailblazing inventions that have made history. It does business all over the world and is active in the most wide-ranging sectors. The company has been present in Turkey since 1910 in the guise of different entities; today it comprises 7 different companies. The company in Istanbul manages three sales organizations and four distribution channels. They have one common storage location for three distribution channels but one more for second distribution channel in one sales organization. Current situation with SAP structure is shown in Figure 1.

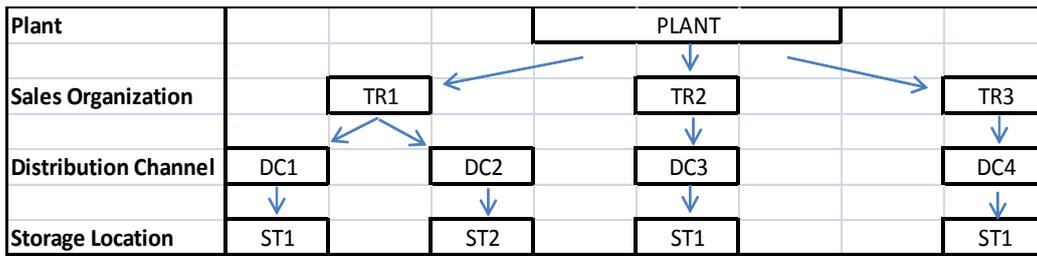| Plant				PLANT		
Sales Organization		TR1		TR2		TR3
Distribution Channel	DC1		DC2	DC3		DC4
Storage Location	ST1		ST2	ST1		ST1

Figure 1. Company structure

They have third-party logistics logic; one external logistics service provider for warehousing and one more external logistics service provider for transport. LSP for warehousing uses his own warehouse management system linked to the SAP system. Each distribution channel has their own team for sales and management. Their warehouse stores all materials of four channels in one area and has a chaotic structure. Warehouse handles around 250,000 numbers of stock keeping units (SKU).

With the upcoming two projects for SAP and one sub-project for WMS; each sales organization will be consolidated to one common SAP structure used by many countries in the world. Warehouse management system will be changed to the company standard WMS and used by again their external service provider. Each sales organization will have its own characteristics. WMS will differentiate these structures with two plants. Two sales organizations TR1 and TR3 will be combined and create TR4; TR2 will stay the same. Distribution Channel 5 is created with the combination of DC1 and DC4. At the end, there will be just one storage location for all sales channels. Proposed structure is shown in Figure 2.

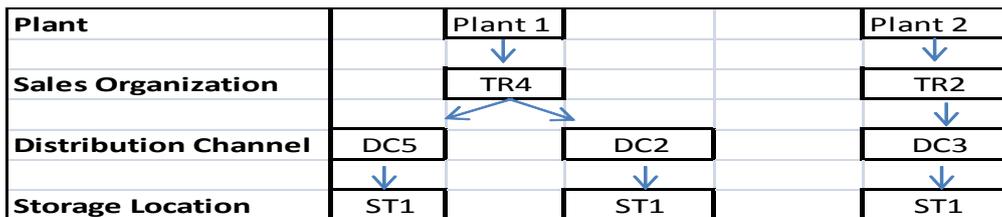| Plant		Plant 1			Plant 2
Sales Organization		TR4			TR2
Distribution Channel	DC5		DC2		DC3
Storage Location	ST1		ST1		ST1

Figure 2. Proposed structure.

Using company standard WMS will bring many advantages to the ongoing processes and increase productivity. But there are of course some problems to apply a standardized system to a location when a company is in a non-EU country. All the processes in the warehouse will be handled; advantages and challenges will be discussed in two steps; with current and proposed structures. Current structures show the on-going processes in the warehouse. Proposed structures show the up-coming processes that will be coming with the new project to the warehouse.

Warehouse Processes

Warehouse processes such as inbound, outbound, return and customer claim will be discussed in detail with current and proposed structures.
Inbound

Most of the goods of four distribution channels are coming from general distribution center which is located out of Turkey to their local distribution center warehouse in Turkey. In some distribution channels, they have external suppliers that they import their goods and sell to domestic customers. Some of the goods that are produced in their factory here in Turkey and all the advertising materials that are bought from external vendors are supplied locally.

Import

Coming goods which arrived by ship are customs cleared directly at the harbor. Also coming goods by air freight are customs cleared directly at the airport. So the goods entry of the products which are supplied locally or customs cleared out of their warehouse customs clearance area; can be done in the warehouse at once without storing them in the customs area.
Coming goods which arrived by truck are first stored in the customs area which is located in the warehouse. At this point, the goods are not booked in any system. That means that in SAP or WMS,

there is no information available about goods; if the goods are still in transit or if the goods are already in the customs area in the warehouse. The goods are put in an empty storage bin in the customs area. There is also no system support available for this process. The identification of the goods is made with the invoice number, which is manually written on the parcels or pallets. Additional customs document is attached to parcels or pallets. The TSE (Turkish Standards Institution) has the right to get some samples for a technical reason or even to destroy the check. In most cases, the samples taken away are not given back to the warehouse. The company responsible for customs does the necessary work with the export-import department.

After they finalize the custom process and the goods are customs-cleared; the broker sends an e-mail to warehouse and export-import department to inform that the customs is cleared and that the goods can be booked in goods entry. It is also possible that the customs release is only for some parts of an invoice or even parts of a position; because some of them were taken by TSE previously and have not been returned. The goods which are not released must stay in the customs area. Based on previous experience, some parts have been staying in this area approximately for one year. On the invoice, the delivery date and the date when the goods are released by the customs are documented manually by the blue collar workers (Ergeneli, 2012).

Goods entry

Current process

In the goods entry, the invoice number of the supplier is checked, the material quantities are counted and the articles are stored in an empty storage location in the warehouse areas (A, B or C). The bin locations were not provided by the WMS; instead the workers make their own decision without consulting to any manager. In other words, they choose the area and the bin location the goods are stored, they complete the information on the invoice and sent it to the office. There are white collar workers in the office that are responsible for the management of warehouse. In the office, the goods entry data is entered manually in the WMS. Over and under deliveries should also be booked with care. When a sample is taken by TSE, TSE booking should be done. After the invoice booking is finalized, the invoice is closed for goods entry process in WMS and data is sent to SAP. Afterwards no further corrections are possible. Only TSE return booking is possible. Inbound work flow table is shown in Figure 3.

There is some extra work for some materials during goods entry. A barcode is stuck on each battery and scanned by an external system that is different from the WMS. This helps the workers to track each battery. Then unpackaged ones are stretched with plastic by a stretching machine to keep them clean. On the other hand, warranty card is stuck to all materials during goods entry. They prefer to do it during this stage, because the volume is more manageable, during outbound the volume is high.
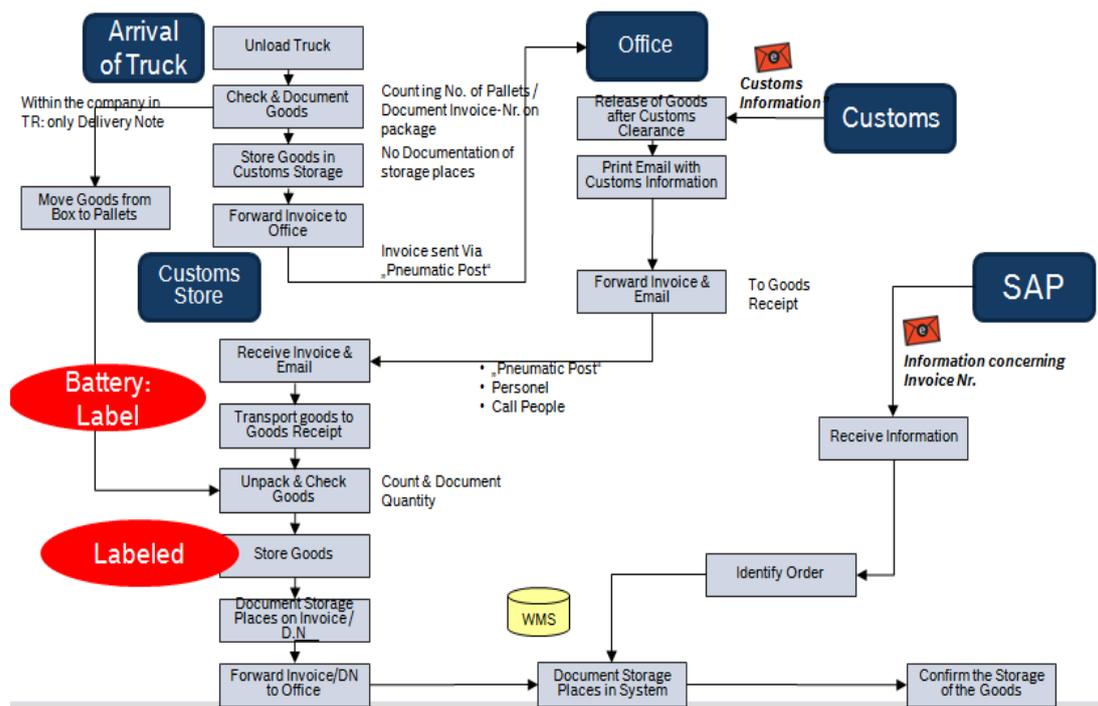

Figure 3: Inbound work flow

They have target times for inbound process to measure the performance of the logistics service provider. Target times are monitored and reports are prepared manually. Target times after customs clearance are shown in Table 1.

Table 1: Target times

Type	Target (Hour)
Airfreight	12
Truck	36
Local Purchase	18

Proposed process

Manual process in customs clearing can stay the same. No support by new warehouse management system for storing goods in customs clearing area is needed. When goods are invoiced to their company, inbound delivery should be created. If the goods are coming from company plant abroad, delivery should be created automatically by the system with the idoc transfer. If there is no communication between two companies; it means there is an external supplier and inbound delivery is created manually.

Inbound delivery (ASN) data will be sent to WMS. When the goods leave the customs area, transit booking will be done by the blue collar workers. This booking will be done without counting the goods. Booking will contain all materials with the whole amount on the invoice but not available stock in blocked stock. This will be the first time stamp for calculating the inbound performance.

Quality management process will be implemented in the warehouse for the goods that are coming from an external supplier. This process will be in goods entry process; after transit booking and before goods entry to the available stock. Quality management process overview is shown in Figure 4.

After transit booking, an inspection lot will be sent to the WMS. This inspection lot size will change based on the history of quality checks and statistical calculations. Quality checks will be done and usage decision will be given according to the results. There will be an employee who will be specifically responsible for the quality issues and control the goods, at the same time choose the proper post process. Figure 5 shows the steps of the quality process.
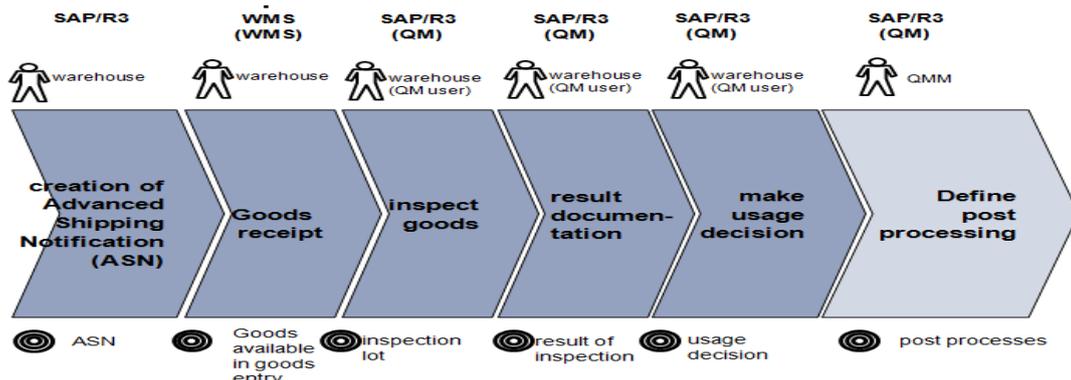

Figure 4: Quality management process overview.

There are some actions needs to be taken after the decision of reject and release. When the Quality management employee chooses to release, all goods will be sent to the goods entry area. These materials

will be booked to the available stock with the other materials on the invoice. Figure 6 shows the release option.
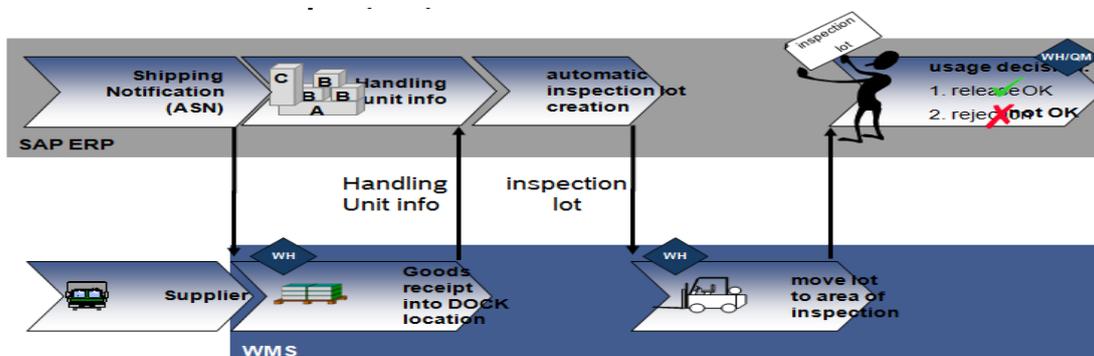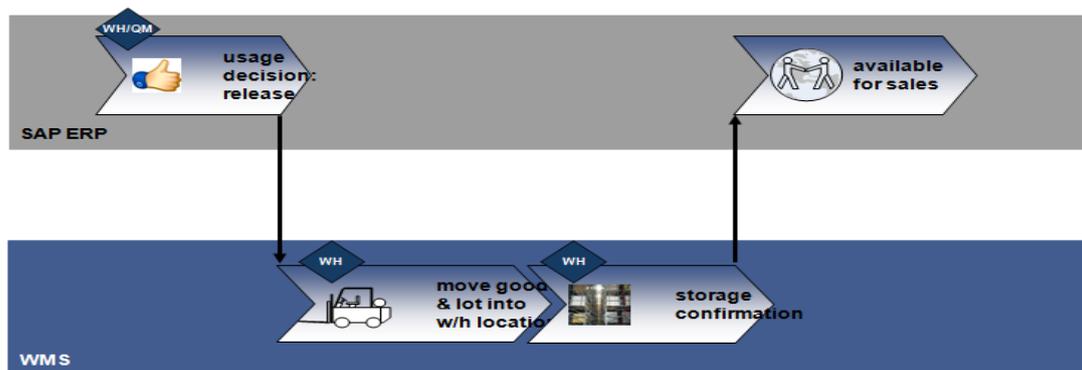

Figure 5: Quality process

Figure 6: Option "Release"

Another selection criterion for the quality employee is to choose the "reject" option. After selection of reject, some measures or technical problems should be noted. Claim manager will collect these claims. According to the measures or necessary checks, employee will have 4 options to choose from; release to available stock, return to vendor, re-work on the material or create a scrap order. Figure 7 shows the reject option detailed.

When there is a quality issue such as damaged goods in the warehouse or shelf life expiration, quality management process will be activated and the declared options can be chosen. With or without Quality management process, when the materials are ready in goods entry place, they will be counted by the blue collar workers. They will book the quantity they physically see and touch.
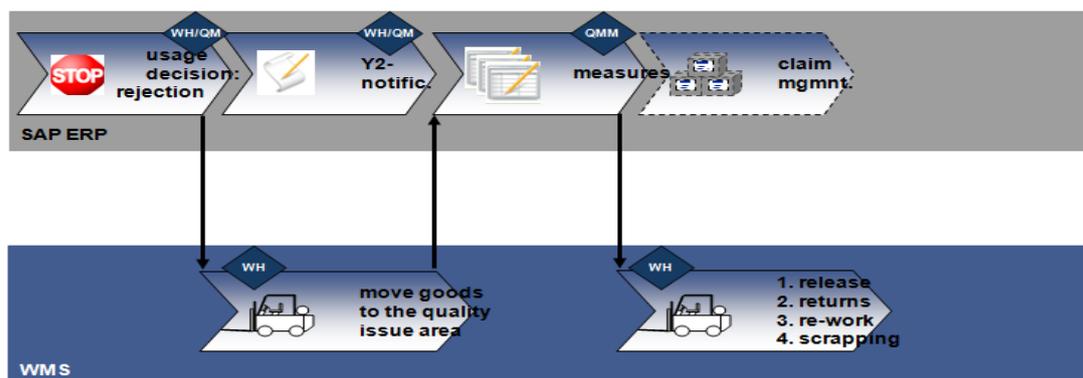

Figure 7: Option "Reject"

There can be three cases:
   i.   Complete quantity - Blue collar will book all of them.
   ii.   Over delivery - Blue collar will book all of them; automatically over delivery bookings will be done on SAP side.
   iii. Under delivery - Blue collar will book the physical amount and the rest of the bookings will be done in the office. They should check if the materials were taken by TSE or really under delivered.

After the blue collar has booked the existing quantity, system will ask for the production date of the material. If the inbound delivery is created automatically, production date will be put in from the respective system. On the other hand, if the inbound has been created manually, then the production date should also be entered manually. If

it is not known, date of entry will be entered. After all the information for goods entry request is entered, system will check for the most suitable shelf to put the goods. Before go-live all the shelf dimensions will be entered to the system. System will calculate the volume of the goods and empty shelf volumes to find the optimum usage. Using history of sold parts from last year as a base for ABC classification, WMS will give the proper shelf number. After deciding the break points between A-B, and B-C lengths of stay, the number of locations needed for the storage of each class of items is determined. The A items receive the best locations. FIFO logic can be set into the system for quarterly, semiannually or yearly. This means a person put the same materials to the same bin location, when goods entry time varies 5 months, if the FIFO logic is set according to yearly (Askin & Standridge, 1993). As

each goods entry will have one production date data, if there is any expiration, all shelf will be blocked. Blue collar worker should check for all materials; reject the expired ones, and release the rest of the shelf.

After system finds a place for the goods, put - away labels will be printed in the warehouse. This label contains the material number, shelf number and barcode of the shelf.
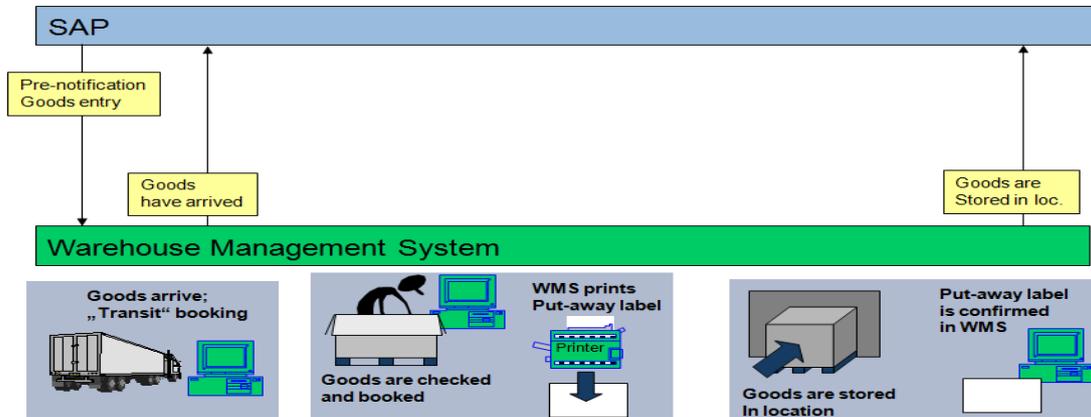

Figure 8: Communication between SAP and WMS in goods entry process

Goods will be stored in the place that is written on the put – away label. RF scanners will be used in the warehouse by the blue collar workers. When he scans the barcode of the shelf; the single SKU will be in available stock, ready for the sales department to sell. Figure 8 shows the goods entry process.

Outbound

Current process

Orders coming from customers via telephone or email can be entered in their system manually by the sales representatives or can come with EDI connection from multiples and create the respective order automatically. After order entry in SAP, outbound delivery; so called picking list for each order is created in SAP manually again by the sales team. There is generally one to one relationship between order and the outbound delivery. When the delivery is created; SAP checks the credit limit of the customer. If there is a risk of sending goods, delivery is blocked by the credit limit check. "Red slip" shows the financial status of the customer in SAP and is analyzed by the sales managers and the customer accounting person. If there is a risk, delivery stays blocked until the payment of the customer is done, but if there is no risk, sales

manager signs the paper and allows customer accounting person to release the block. After the release of the block, pick list data is sent from SAP to the warehouse management system via idoc transfer.

In the warehouse management system, the deliveries are categorized by inland customer delivery, export customer delivery, pick up delivery and return delivery. Each criteria is split into rush and standard deliveries. Warehouse cannot understand which delivery belongs to which sales organization. So the priority is given by the type of the delivery; rush or standard. For example, when the order comes as a rush order and the customer is in Istanbul; delivery can be created until 11:00 am. Delivery should be picked, packed and invoiced until 13:00 pm; so it can be transported to the customer the same day. Standard orders can come during the day and the sales representatives can create the delivery until 17:00 pm. Warehouse should complete the delivery until 19:00 pm and give it to the forwarder. They also have target times for the transport of the forwarder. If the customer is in less than 600 km away from the warehouse; then the delivery will be on the next day. If the customer is 600 km and further away from the warehouse; then the delivery will be after 2 days. Table 2 shows the summary of the service concept.

Table 2: Service concept

Delivery Type	Last Delivery	Last Invoice	Pick and Pack	İstanbul	<600 km	>600 km
Rush	11:00	13:00	0	0	NA	NA
Standard	17:00	19:00	0	1	1	2

In the warehouse management system, picking lists are released and content of the pick list is printed and distributed in the office. On the picking list, barcodes with bin location, material number and quantity can be found for each position of the delivery. Each paper has 5 positions on it. The picking lists are handed over to the warehouse and the workers start with the picking of the goods in the warehouse; there is no any route determination for picking.

Their warehouse has three sections. A, B and C sections are mixed with all the materials of the four distribution channels. One blue collar worker starts from section A and consolidate in packing area in section B. Another blue collar worker goes to the section B and consolidates in section B next to the ones from section A. Last worker goes to the section C to pick the last ones and consolidate in section B again. Consequently, all delivery positions are collected in the area B for the packaging.

The packaging process is completely manual without any system support. On each parcel 2 employees work together for cross-check. One blue collar worker reads the picking list content and the other one person checks and puts the materials in the parcel. After the packaging of each parcel or pallet, the last 6 digits of the picking lists are manually written on the parcel in order to find which delivery it belongs. If there are several parcels for one delivery, the parcels are numbered manually with the parcel number. The numbers are encircled.

In the packaging area there are 4 pack places with a small scale each. Additionally a pallet scale is available. The parcels are weighted and the value is noted for each parcel manually on the picking list. Afterwards the parcels and pallets are transported to the dispatch area in area A. Labels or any of the delivery documents are not printed in the warehouse. Figure 9 shows delivery management and Figure 10 shows the workflow of pick and consolidates.
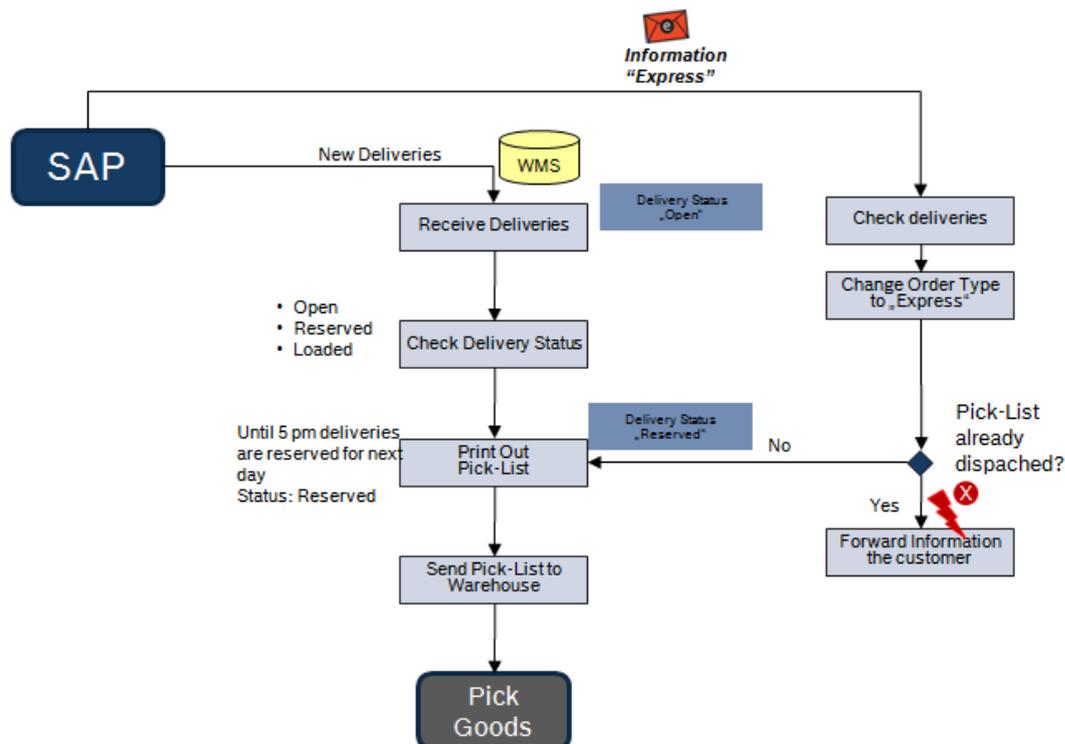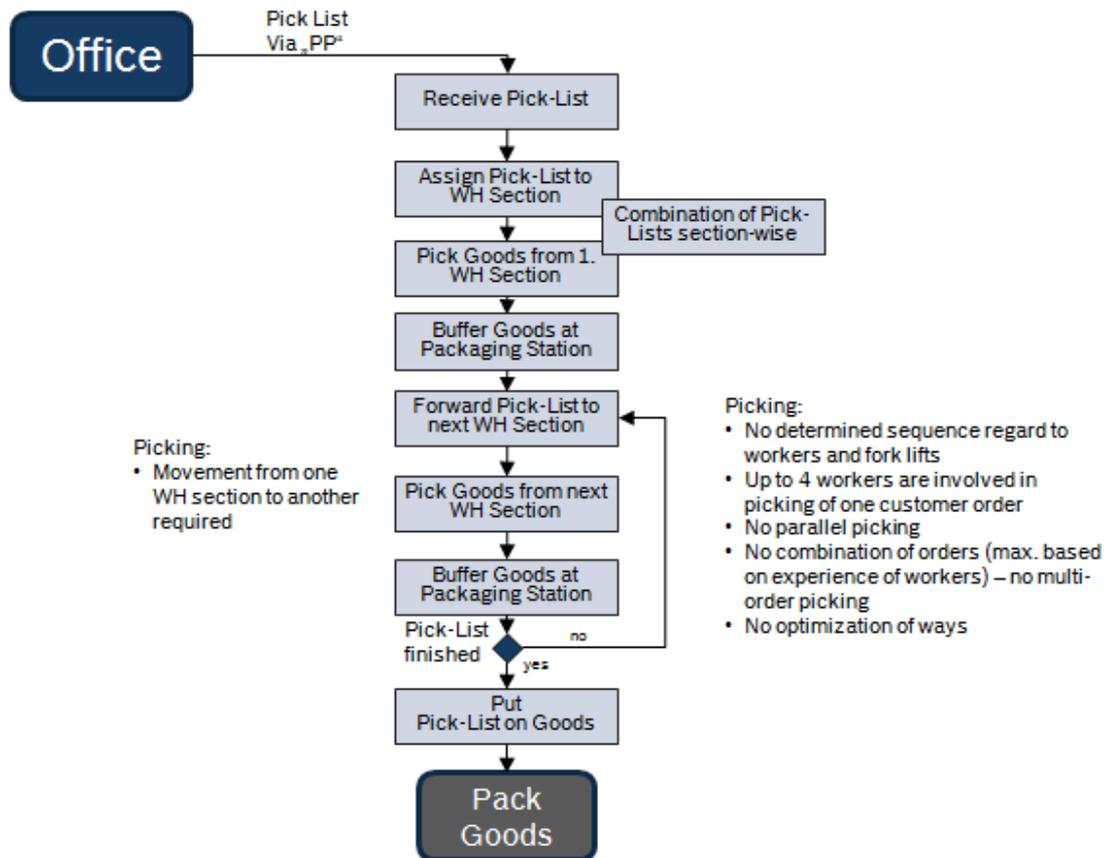

Figure 9: Delivery management

Figure 10: Pick and consolidate

The picking lists are sent to the office where the necessary data are entered in the warehouse management system. For each picking list, the parcels are entered and the positions for this parcel number are scanned and the weight is entered manually in the system. Therefore the information in the picking list is important for the office worker. When everything is finished, the delivery data is sent to SAP and the related delivery documents are printed from SAP in the warehouse office. Parcel labels are printed for each handling unit. Also, delivery content list is printed. This list shows the details of the handling units. In the office; three needle printers are available; for delivery note, invoice and the combined document. Delivery note and the invoice have to distinguish two business cases: When ship to party and payer are identical, then only one combined document for delivery note and invoice is printed. This document goes to the customer with the goods. When ship to party and payer are different, then delivery note and invoice

are printed separately on 2 printers. Invoice goes to the customer by post; the delivery note goes with the goods attached to the parcels.

When all the documents are printed; they are sent to the blue collar workers in the dispatch area. Labels are stuck to the parcels. Delivery content list is attached to the delivery note or combined document. These documents are attached to the one handling unit of the outbound delivery. Figure 11 shows the processes of packing and the dispatch of one delivery.

After all deliveries are picked, packed and ready for dispatch; a loading list is printed in the office. It contains all the delivery numbers and respective handling unit numbers. With this document, deliveries are given to Forwarder Company. Company checks and counts the delivery numbers and handling unit numbers. If everything is mistake free, they sign the document and give it back to the warehouse employees.
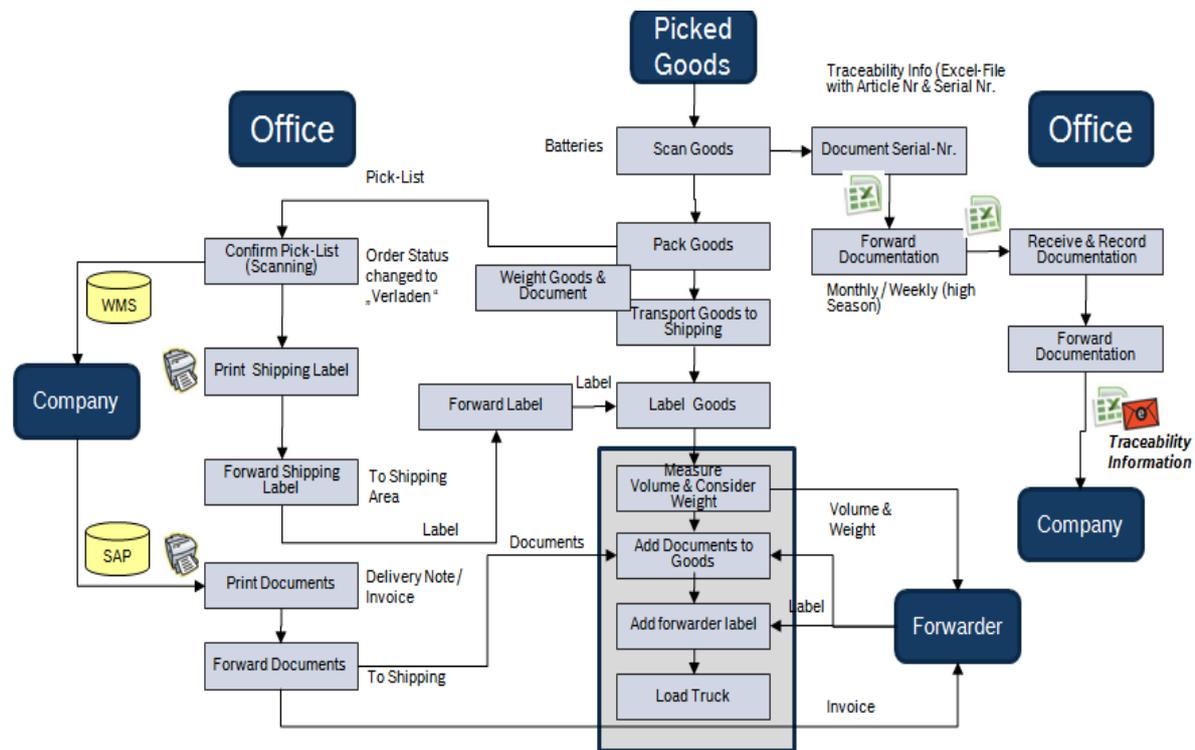
Figure 11: Pack and ship goods

Forwarder has a small office in the warehouse. They accept the deliveries from the warehouse until 19:00 pm. Forwarder checks the volume and the weight of each handling unit in a delivery and adjudges on which price to invoice. They prepare their own delivery note and own label with their barcode for each delivery. They stick their labels to the parcels. After they enter the delivery information into their system, the company can track the parcels through forwarder's website with the delivery number. 1 or 2 days later, they can see the details of each delivery. Service level 3 is calculated by the forwarder and sent via email to logistics department monthly.

They have many types of packaging materials in the warehouse. 2 types of pallets, 30 types of carton parcels, filling materials and 2 types of bubble bags are used for packaging. They are defined in SAP and in WMS in order to see the used packaging material for each picking list. They have one more material defined; to use for shapeless things like long pipes, fair stands or door plates. When they have packed something that is shapeless, blue collar worker notes the dimensions of the product on the picking list. Later in the office, they write in WMS manually the dimensions of this package. Packer in the warehouse can use whatever he wants while packaging. There is no specific rule or procedure regarding to this matter in the company system.

In Turkey, The European Agreement concerning the International Carriage of Dangerous Goods by Road, commonly known as ADR regulation has not been applied yet. With this regulation, companies should be aware of their dangerous materials. It contains proper packaging, labeling and transport rules related with the type of dangerous material classes. The company doesn't have any solution in their existing system for defining and recognizing materials. But they will have solutions for this regulation in their new warehouse management system in the future.

There is one imaginary storage location in WMS and SAP that is called "axa". When a material cannot be found in the shelf, available stock is reduced and axa stock is increased in the same amount. This positive axa storage location is cleared at the end of the year and charged to the logistic service provider, because they are responsible from lost material. If there is any customer claim, axa storage location can also be used. First department has to accept the claim, and then the positive axa stock is charged to the department cost center.

From same perspective, when there is excess material on the shelf; available stock is increased and the axa stock is decreased in the same amount. Negative axa stock can be used for customer claim as well as positive axa stock. Negative axa stock is always cleared to the department cost center at the end of year because warehouse has no production possibility. Problem in the existing system is that same type of axa storage location is used for warehouse faults and department cost center; this causes lots of manual work behind the clearing.

During the picking process, picker may not find the material on the shelf that is written in the picking label. In this situation, it is his responsibility to find

the material and search the other shelves. After finding the material, he needs to write the right shelf number on the picking list manually. Later in the office, if they cannot find the material, axa bookings should be done.

Outbound deliveries can be canceled when goods issue is not done in the warehouse management system and SAP. After goods issue; it is not possible, because the invoice is triggered. Sales department informs logistic department when an outbound delivery should be canceled. They contact the warehouse and if the picking lists are not handled in the office; it can be canceled. Cancellation data is coming to SAP from WMS and then outbound delivery is canceled. If it is handled in the office, they should use return process instead.

Proposed process

Orders will be entered in the system manually or will come via EDI. With the new system, customer credit limit check will be done in the order level, not in the delivery. After orders are released and when the materials are available, deliveries can be handled. There will be automatic delivery jobs that will create one delivery with many orders to the same customer that has the same payment terms and customer delivery date. The main goal of creating automatic

delivery jobs is to consolidate many orders and decrease the logistic costs. There will be scheduled delivery creation job times for rush and standard order as shown in Table 3. Last order creation time for standard and rush order should be important for the sales department. After this time, orders will be scheduled for the next day.

Table 3: Delivery creation job times

Last Order	Delivery Types	
	Rush	Standard
	08:00	08:00
	09:00	none
	10:00	10:00
10:45	11:00	none
		12:00
		14:00
		16:00
16:45		17:00

Warehouse management system also will classify the deliveries according to their customer delivery target time data that is coming from SAP. Explanation of the logic delivery classification is shown in Figure 12.
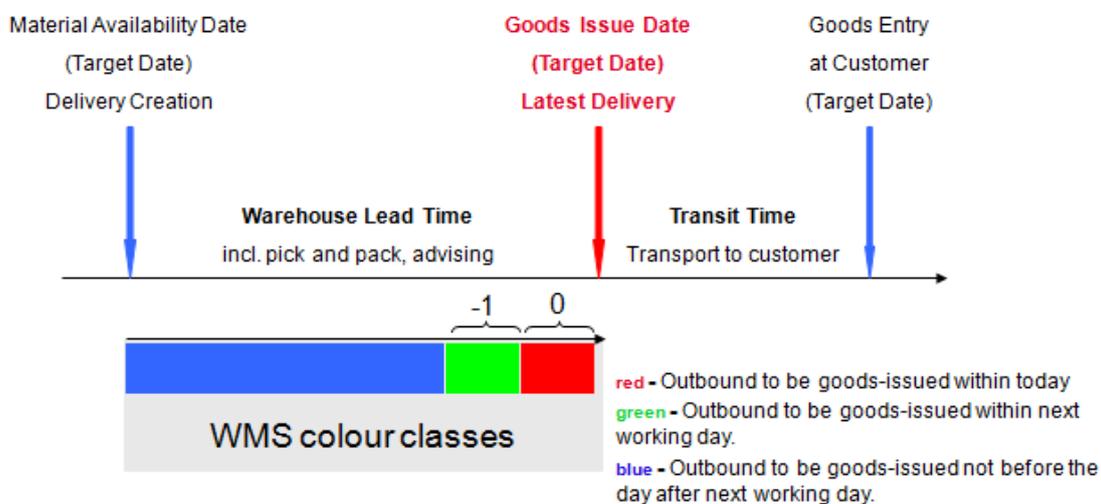

Figure 12: Delivery classification in WMS.

All outbound transmitted from SAP will wait for manual release before their further process in warehouse starts. As explained earlier, colors will show the priorities of the outbound. Outbound will be changed into warehouse relevant deliveries. It means that outbound will be translated into picking instructions for the warehouse employees.

Picking labels will be printed according to the picking route optimization. Parallel or serial picking can be selected, but serial picking is more appropriate. Parallel picking may cause chaos and buffers around packaging places. Type of picking method can be chosen from the system. Based on warehouse structure, s-shape and return method can be used. Picking label will contain the material

number, quantity, material barcode and consolidation place. Picked goods will be physically moved to this consolidation place and scanned. As soon as goods are complete, they can be physically moved to the packing station.

The packer gets all the necessary information that the goods are completely picked and ready for packing. Packing instructions will be on the picking label of each material that contains; allowed packaging materials, allowed filling materials, split instructions, quantity per parcel, extra information for labeling or warranty cards. At the of end-control stage, parcel will be combined with its contents such as item number, quantity, filling material, packaging material and a parcel number will be created. Additionally, check of weight and packaging instructions will be done. Blue collar worker will put the parcel onto scale. He will scan all picking labels or material barcodes belonging to the parcel. He will also scan packer id, filling material and parcel. After he enters the weight, the end control will be finished. Necessary document such as parcel content list and parcel labels will be printed. Parcel content list contains all the material numbers, descriptions and quantities in one parcel and will be put in each parcel by the worker. Customer address label will be also forwarder specific label that can be used for them via EDI connection. They will not need additional label anymore; only scan the label. This label will contain parcel number; range will be until 99. End controlled

shipping unit needs to be moved to correct tour lane and confirmation will be required. Tour lane will be printed on each address label and will be defined according to the service types and routes. In order to confirm the parcels onto tour lane, a hand scanner is required that communicates with WMS working station. WMS working station including the hand scanner should be close to the tour lanes. Blue collar worker will scan the barcode on the address label and parcels will be automatically assigned to the tour lanes.

Ready deliveries on each tour lane can be advised to the forwarder in the system. Advising process only possible in case of all deliveries of a tour is completely end controlled and confirmed onto tour lane. After advising, consolidation of several deliveries will be done to one transport.

Tours will be loaded to the trucks systematically. Plate number of the truck will be entered. Parcels will be physically loaded after tour closure, because the delivery documents should be stuck to the parcels.

With one transport number including several deliveries, tour will be closed. With last idoc coming to the SAP, necessary documents such as delivery note and invoice or combined document will be printed. Figure 13 shows all of the explained processes above. Communication between warehouse management system and SAP is shown in Figure 14

Figure 13: Outbound process flow in WMS

After all documents are printed in the warehouse area, not in the office anymore; office worker should separate the necessary layers of the document. These documents will be stuck to the parcels. Some layers of the documents will be archived in the office.

Forwarder will use their address label and scan it into their system. With EDI connection, information according to a single delivery will flow to their system and will print their documents and invoice automatically. This process can reduce the working people quantity for the forwarder. Maybe just the driver of the truck will handle this process, and may not need an office anymore in the

warehouse. This will also increase the space in the warehouse. Warehouse management system also will accept the data coming from the forwarder system; proof of delivery data. POD data will flow to the WMS and from WMS to SAP daily. Service level 3 measurements will be calculated automatically in SAP and can be cross checked with the measurement of the forwarder. POD data in SAP will also provide immediate information to the sales departments. They can reach the information whenever they want without waiting logistics department to give information.
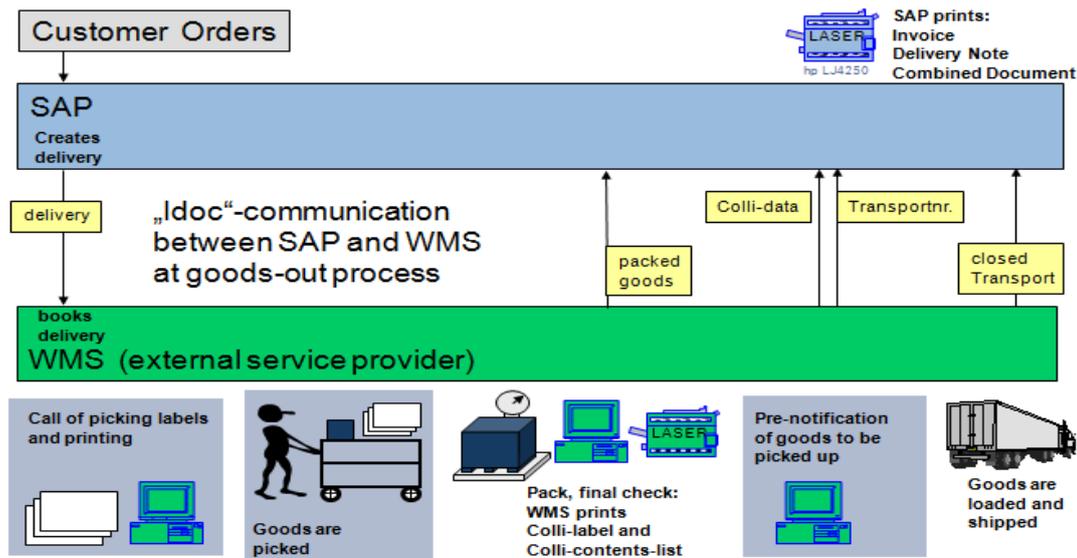
Figure 14: Warehouse management system and SAP communication

They will use the same packaging materials in the future. Some rules can be set in SAP side on customer or material base and these will flow to WMS. At the end control stage, packer is not allowed to scan a packaging material that is against the rules and a pop up message will occur on the screen to inform the blue collar worker. Changing the packaging material before end control is possible in order to obey the packaging rules and redo the end control for final step.

Some new special packaging materials will be defined in the system for dangerous materials. All the materials that are classified as dangerous goods will be marked in material master data in SAP. When an order is entered that contains both dangerous and not dangerous goods; during delivery creation automatically two deliveries will be created; one for dangerous and one for the other materials. The packer in the warehouse will be packing according to the instructions on the screen. He will use the permissible packaging material and label it according to the dangerous material classification. He will be aware of special documents that will be printed after confirmation of picking list and should be attached to the delivery documents.

With the new SAP and warehouse management system, they will have two separate axa storage locations. One will be for warehouse faults and one will be for the department cost center. It will be easy to track and clear these stocks to the account. During picking process, when a material is not be found on the shelf, blue collar can search for other locations on the screen and axa bookings will be done automatically. When there are materials on

other shelves, new picking labels will be printed. In case no further stock of this item exists, warehouse management system will reduce delivery quantity. In some cases, sales department could choose to complete the delivery choice. In case of complete delivery, whole outbound delivery will be canceled. When a request comes from the sales department to cancel an outbound delivery, cancellation request will be done first on SAP side. SAP will send the respective request to WMS and cancellation will be accepted as long as items are not yet end controlled. As long as no picking labels were created, cancellation will be done automatically. If picking labels were already created, the end control needs to be done first. Documents at end control station will get a cancellation message. With confirmation of end control, the necessary put away labels will be printed. After all the materials are put to the shelves that are written on the put away labels, cancellation confirmation data will flow to SAP. This new process will provide automatic solutions and prevent the possible errors that can occur from manual work.

Returns

Current process

Customers can request for return of some of the materials that they bought in the past. If sales departments allow returns, they create return order. After return order is created, return delivery can be created manually. Return authorization paper is printed and faxed to the customer. Customer should deliver the goods with this paper. When the material arrives to the warehouse, blue collar worker first

checks the return authorization paper. If they cannot find it, they ask the sales department to send this document to them. Arriving goods can be classified as; first quality, second quality (package damaged) or third quality (scrap). Blue collar worker notes the quality classification on the return authorization paper and sends this document to the sales

department. Sales department checks the document and sends it to the logistics department. Logistics department does the quality classification in the SAP system. Quality data is sent to WMS and after confirmation of the warehouse office worker, materials are available in stock. Return process work flow is shown in Figure 15.
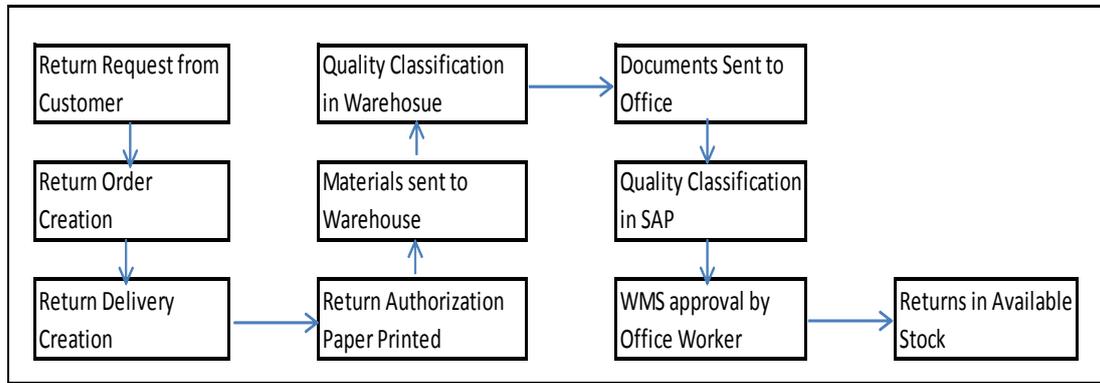
Figure 15: Current return process

Proposed process

After receiving the customer return request, sales office will create the return order. Return authorization paper will be sent to the customer via mail or fax. Customer will send the material with the invoice and the authorization paper. When the warehouse receives the goods and document, blue collar worker will check the material and classify the

quality of the materials in SAP. Documents will be sent to the sales office. If the material is first choice, it will go to the available stock after confirmation. If the material is classified as second or third choice; post process options will be considered such as scrap, back to vendor, back to customer or rework. After invoice control is done and block is released; the return process will be completed. Return process work flow is shown in Figure 16.
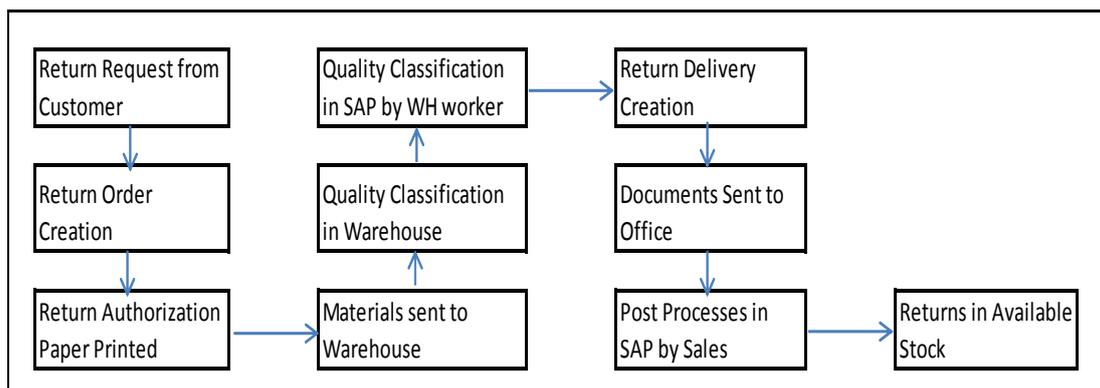
Figure 16: Proposed return process

Customer Claims

Current process

Delivery tracking form is customized, preprinted document that is used by customers for claims. Any customer can use it for under delivery, over delivery or damaged delivery. Customers are required to fax this document to the sales office. It is salesperson's

job to enter it into an intern system and also send the document to the warehouse. The warehouse personnel review the claim check and send their reply to logistics department via fax. They also need to put their reply into intern system. Under delivery work flow is shown in Figure 17 and over delivery is shown in Figure 18. In case of under and over deliveries, axa bookings and clears are done manually.
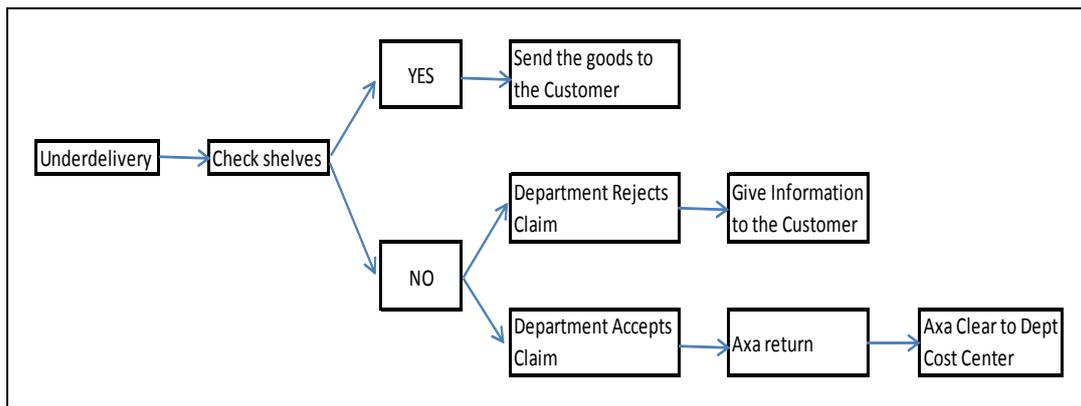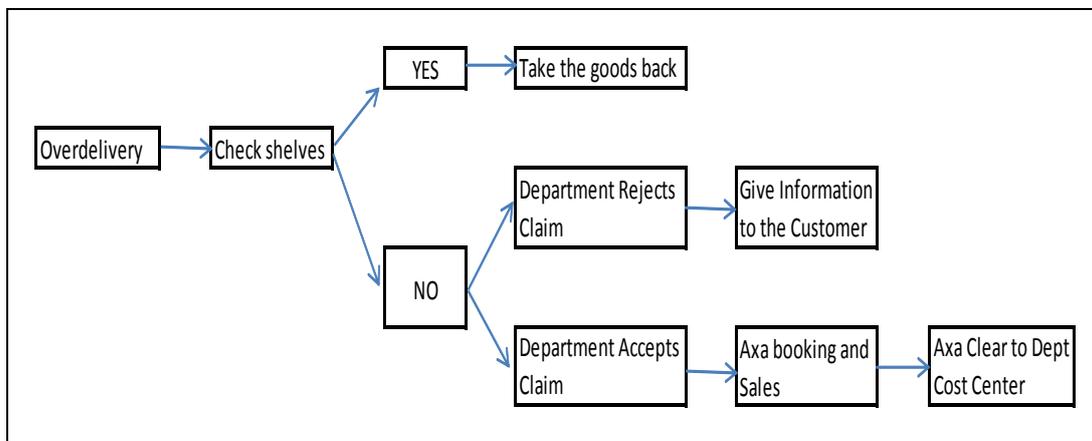
Figure 17: Under delivery

Figure 18: Over delivery

Proposed process

For customer claims, a specific program in SAP can be used. This program will provide an internal communication between sales, logistics and warehouse departments. Once the customer claim is received, salesperson will enter the claim to the program. Warehouse employee will see the claim alert and do the necessary checks. If the warehouse rejects the claim, information will go via e-mail to the sales department and they will inform the customer. If the claim is accepted, the necessary axa bookings will be done automatically in SAP. Warehouse should also do the necessary axa bookings manually in WMS and will flow to SAP. Sales department will see the result in the system and inform the customer immediately. Axa bookings can be cleared and corrections can be done within the system support. This new tool will create a loop between warehouse, sales and logistics and decrease the manual workload. Figure 19 shows the new customer claim process.
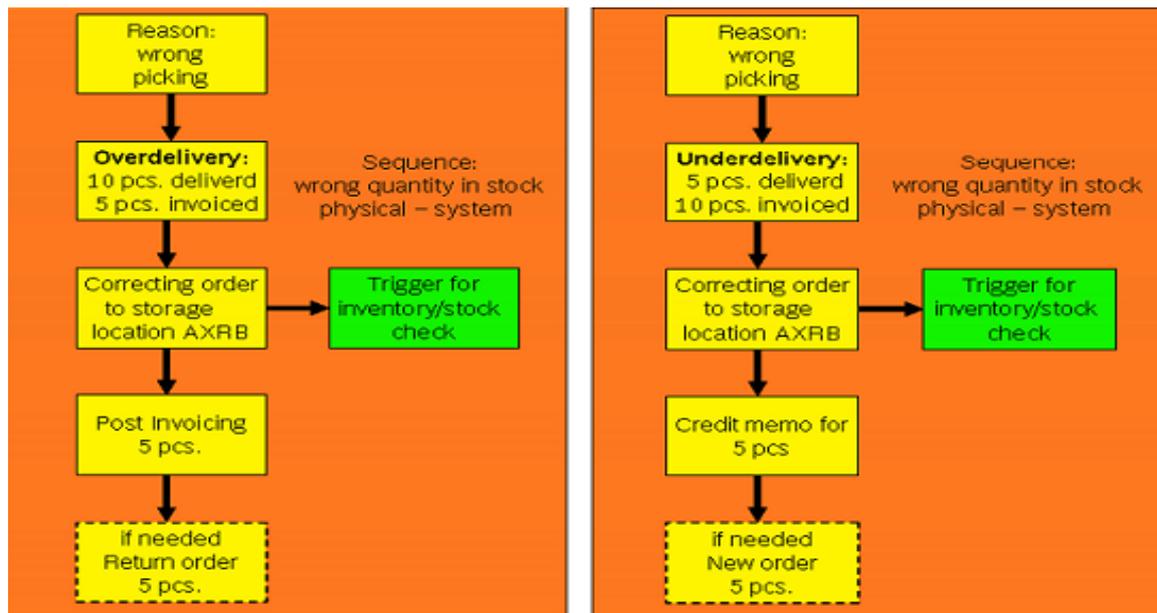
Figure 19: New customer claim process

Conclusion

Companies have their own way to operate their warehouses. Warehouse management systems are complicated, complex and data intensive applications. They require different resources and high skill labor to continue to run. In order to be effective and efficient, managers need to update their system, and one good way is to follow the trends of the new innovative strategies for the warehouse management systems. Today, technology is a great tool to control the flows and processes of any warehouse.

In this company, managers use the external service provider systems. Most of the work is done manually; therefore, warehouse operations are highly labor intensive. It causes some delays, difficulty in control systems, and waste of time. By using innovation tools, there are many alternative ways to increase their efficiency in operations. For example, during goods entry, shelf occupancy rate can be controlled. FIFO can be switched on and off. Shelf life process can be used. ABC analysis can be used in goods locations. RF scanners can be preferred, as it provides many benefits such as monitoring the amount of goods in available stock immediately. Performance of the warehouse will be measured better in this system and reported automatically.

During outbound processes, picking route optimization methods can be chosen. This will reduce picking time duration. During packing, scanners can be used to pack the goods. This will help to lower the customer claim percentage. All the necessary documents will be printed in the packing station. This action will speed up the time until dispatch. Forwarder specific label printing will be used and EDI connection is supported with forwarder system.

Innovation is being recognized as offering a competitive advantage, being one of the few sustainable advantages in today's economy. Next decade, it is clear that innovation will help the companies continually grow and differentiate from their competitors. Companies should create a continuous capability for innovation and modify their organizational cultures to embrace and support innovation, as innovation is rapidly becoming an enabler that strengthens and focuses the corporate strategies. Companies inventing and implementing of new thoughts, products or services will be leaders in their markets. This clearly shows that companies who values innovation will easily gain competitive advantage. Competitive advantage ensures companies to have sustainable success, a dominant position in their market.

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