A Study on the Military Logistics System in Ubiquitous Environment

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Abstract The U.S. Army, the forerunner of the military distribution system that utilizes high-technology, has presented visions of "ARMY 21" and "Army After Next," made plans in detail by predicting the operation of the army according to varied military campaigns, making all out efforts to prepare for the future. During the war in Iraq, the U.S. had to open up 30,000 containers to verify their contents. Some of them are completely lost. The military distribution system may have an advantage of responding each situation but also causes waste of time and a budget. To address the problem this document took a look at the logistics system using RFID technology. But the document has its limitations, for use of RFID in a logistics system has yet to be developed and there're not sufficient data to prove the effect of the system.

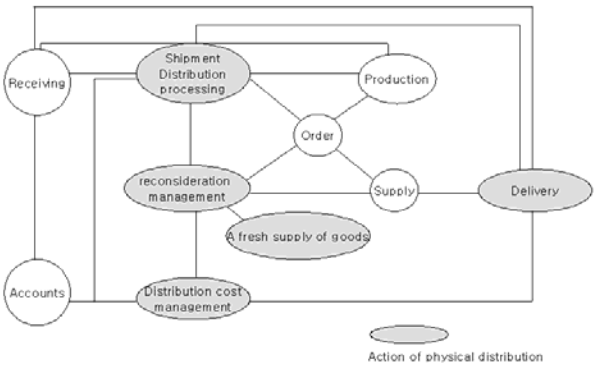
Keyword: Logistics, RFID, Distribution

1. Introduction

The distribution system of enterprises based on the Internet service today has allowed e-commerce to take root and automatic transportation system utilizing intellectual traffic control as well as trace technology has been applied to the system. Along with the development, the distribution system of the army has adopted cutting-edge tech-neologies. The U.S. Army, the forerunner of the military distribution system that utilizes high-technology, has presented visions of "ARMY 21" and "Army After Next," made plans in detail by predicting the operation of the army according to varied military campaigns, making all out efforts to prepare for the future. In order to achieve its vision, the U.S. Army is promoting "Army Logistics Innovation (2001-2007)"which enhances the current logistics supply systems, shortens the time needed for the supply by reorganizing the logistics supply complexes, improves the efficiency of the supply system, and reduces the costs. "There's no innovation in the army without logistics innovation," comments General Shinseki, the Chief of the General Staff, placing a top priority on logistics innovation. Considering the Republic of Korea Army (ROKA), when there is the need for supplies, the request is sent to the army division after passing through 5 steps, and again 3-step processing procedures. The supplies are finally delivered to the soldiers after 7-step distribution procedures. That is, the military supplies go through 71-72 steps to be delivered from the division to the soldiers. In addition, though the division promises to secure required supplies when they are not in stock, the request in not made in an automatic manner. So the supplies appear to be depleted until the officials in charge of distribution check out them. Unlike officials in the higher divisions, the military units do not know about the schedule that the supplies are delivered. Because there is no automatic system among a division, a logistics supply command, and a logistics command, it is hard to receive needed supplies even when they are in stock. To solve the problem this document analyzes the ubiquitous military distribution system using an RFID tag.

2. Related Research

The manufacturing industry is an activity of procuring materials, making goods, and selling them to earn profits. While activities are laid on people, goods, and money at each stage, production is the outcome of the activity laid on goods, where physical distribution occurs. And the logistics information system supports such an activity. Physical distribution has to do with all the activities of an enterprise.



(Fig.1) The relationship of logistics information with activities of an enterprise

That is, logistics information system is a system that utilizes all the information regarding distribution and processes/delivers the information in order to facilitate every function of physical distribution. Logistics information is divided into the information arising from distribution activities and that arising from other activities but still influencing physical distribution. Figure.1 depicts the relationship of logistics information with activities of an enterprise.

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Since logistics information system of small- and medium-sized enterprises is closely related to non-distribution activities also, they should not only deal with distribution activity but also production activity, promoting a system integrated with all other the activities of supply [1].

2.1 Purpose of Logistics Information System

Plans of 'logistics information system' aims at enhancing the customer service and reducing the distribution costs. The two purposes conflict with each other. That is, they are in the trade-off relationship. Customer service includes factors of commercial distribution service and those of physical distribution service. Of course, they are closely related with each other to some measure. And this is the reason why their trade-off relation can matter.

Still, let's take commercial distribution service for example. Keeping an assortment of goods based on the product line, designing pricing system according to the classes of customers, providing information on a product, and promoting products with various means evidently belong to the service with the nature of marketing. Though sometimes it is hard to tell some factors of the commercial distribution services from those of physical distribution, this document will exclude customer services considered belonging to original commercial distribution or marketing services but will include physical distribution services. Meanwhile, sales distribution is the flow of goods that starts with the contract of orders (a verbal or written contract). It begins with understanding the contents of an order and ends with delivering the goods to the right place [2].

2.2 The Role of RFID

During the war in Iraq, the U.S. had to open up 30,000 containers to verify their contents. Some of them are completely lost. The paper explaining the items was attached to the outside of the containers but it was destroyed by water or sand. Now smart labels are in use, solving the problem. Use of the label is being promoted in the FMCG supply chain also. So RFID technology and wireless barcode are drawing lots of attention, for they reduce costs in many areas such as distribution chain management and air/postal distribution [3], [4].

3. Logistics Management of ROKA

3.1 Classification of Military Supplies

Classification by Kinds: Military supplies are classified according to the number of pieces, nature (expendables and non-expendables), unit prices (high and low), and so on. Of the various standards, classification based on their kinds is used most common. So let's take a close look at the way supplies are classified into Class Ⅰ-Class Ⅹ according to their usage and nature. Class I is mainly food such as the staple/subsidiary food. Items of Class I include polished rice and barely. Class II is equipment such as clothing and individual outfits. Items of Class II include combat uniform, combat shoes, an entrenching tool, a bombproof helmet, etc. Class III is fuel such as light oil and gasoline. Class IV is construction materials including timber, cement, plywood, paint, a nail, etc. Class V is munitions such as gun cartridge and a cannon ball. Class VI is individual stuffs like a cigarette and they are provided now by Army Welfare Support Group. Class VII is represented by finished combat equipment including a rifle, a tank, and a vehicle. Class VIII is medical supplies such as various medicines and equipment. Parts of equipment belong to Class IX including a bolt, a nut, an engine, and a tire. Finally, the rest that belongs to none of the above-mentioned classes is Class X and equipment for public welfare service (a farming tool) is included in this category.

Classification by Functions: Military supplies are also divided by their functions such as fire power, movement, special weaponry, telecommunication and electronics, aviation and shipping, general equipment, supplies, munitions, and medical supplies (9 categories in total). Fire power involves firing equipment, a monitor, measuring devices for artillery. Movement has to do with various vehicles and parts needed to repair them. Anti-aircraft guns and missiles, an antitank guided weapon, and a ground-to-ground weapon belong to special weaponry. Telecommunication and electronics include wired/wireless telecommunications/detection (radar)/photograph devices. An airplane, a ship, and their parts belong to aviation and shipping category. General equipment means construction/power supply/river-crossing/service (laundry and bath trucks) equipment. Some of the articles not included in Class 5, 7, 8, and 9 are food, clothing, and stationery, which belong to supplies category. Various munitions, explosives, and their accessories come into the munitions category [5], [6].

3.2 Analysis of Classification by Kinds

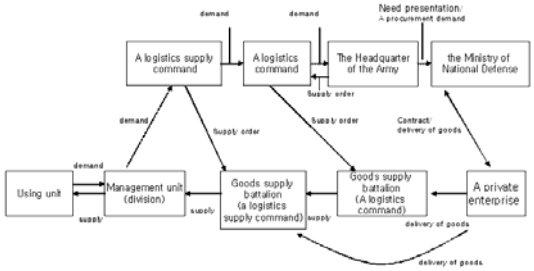
The supply chain of ROKA is based on classification by kinds. Thus, supplies of similar treatment/distribution methods belong to the same supply chain. First of all, the information flow (request) of Class 1 is "a formation-a division of a repair battalion-a food service unit- a farm storehouse," which is a single system. However, the flow of supplies is "a farm storehouse-a division of a repair battalion/ food service unit- a formation" or "a farm storehouse- a formation," showing the flow of information and that of supplies are not consistent.

Regarding Class 2, which includes clothing, individual equipment, and maintenance supplies, shows various frequency of demands/prices/ importance and uncertainty of demands. Items of Class 2 are supplied by the contract between companies and procurement department of the Defense Ministry. Oil of Class 3, which is consumable and supplied in bulk, has high frequency of demand. Since there are wild fluctuations in the prices, the contract is made with a single provider. The fuel in Class 3 is supplied by nationwide networks of a single provider according to its kind. In structural terms, the information flow is 5 step, "a formation- division of a repair battalion-a logistics supply command/an oil company- a logistics command –an enterprise," "an enterprise-an oil company-a division of a repair battalion-a formation," "an enterprise-a division of a repair battalion-a formation," or "an enterprise-a formation." In particular, when there is a great amount of oil needed, enterprises deliver the oil to a military unit if it has a storehouse available. Thus, the oil is delivered through a simple channel but the administrative procedures are done based on the information flow, causing waste of time. Class 4, construction materials, is divided into operation materials and construction ones. First, operation materials are supplied by logistics command and thus shows the supply chain similar to that of Class 2, maintenance materials, which is highly

consumable and has high frequency demand. Its information flow is “a formation-a division of a repair battalion-a logistics supply command- a logistics command –an enterprise” but the flow of supplies is “an enterprise- a supply office-a supply battalion-a division of a repair battalion-a formation,” “a formation-a supply battalion-a division of a repair battalion-a formation,” or” an enterprise- a division of a repair battalion-a formation,” showing inconsistency of information and supplies flows. Unlike operation materials, a military engineer plays an important role in the supply chain of construction materials. This is because the demand of construction materials is determined by approval of construction, which is given by the channel of military engineers. Concerning construction materials, the flow of supplies is the same as operation materials but the information flow is not. Moreover, the role of a supply battalion and a division of a repair battalion is storage or inspection rather than supply and control. Class 5, munitions, is the most important items along with oil, and thus supported by a munitions battalion as well as a munitions supply command. Munitions, of great importance, are expendables and kept for a long time. Based on such characters, the supply of munitions is done by the channels of both supply and command. And the 1st/3rd field army and 2nd field army have different chains of supply. As mentioned above, munitions are items of the greatest importance and must be supplied promptly with a short chain of supply, as well as requiring stored goods in order to respond to the needs swiftly. Therefore, munitions are managed by the same 4-step flow of information and materials. Class 7, equipment, is an important and high-priced article so it is supplied by definite plans. Hence, if it’s not a matter of urgency, a report of the current equipment on a regular basis replaces requests for the supplies. As regards distribution, which military unit needs which equipment is already determined and a company directly supplies what is needed to the unit. And the channel of logistics supply collects the reports of equipment every quarter of a year. Concerning the flow of supplies, they are directly delivered to a unit but a support unit deals with the administrative procedures, causing inconsistency of distribution on the document with the actual supplies. Class 8, medical supplies, means medicines and medical equipment/devices. They have high uncertainty of demand and tend to be limited by the shelf life. The supply channel of Class 8 includes both a logistics supply command-a logistics command. Class 9, accessories/parts for repair, has lots of different characteristics such as various frequency demand/unit prices, expendables/non-expendables, degree of importance, uncertainty of demand, etc. The information flow is 『a formation-a division of maintenance battalion-a logistics supply command-a logistics command- an enterprise. But the flow of supplies goes through varied channels according to weight/use/number of pieces [6], [7], [8].

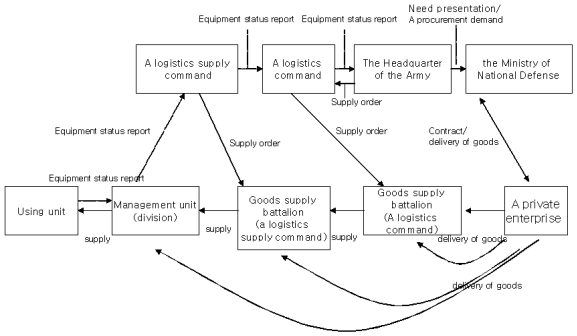
4. Army Logistics System

ROKA logistics system is divided by the enterprises’ delivery types. First, supplies could be directly sent to both a supply unit and a military unit that needs the articles. Or they could be delivered to a logistics supply command and then to a military unit which needs the articles. With respect to expendables, a unit can make a request for them while it reports the status of non-expendables every quarter to expect the demand. Figure 2 depicts the logistics system that supplies are delivered to a logistics supply command.



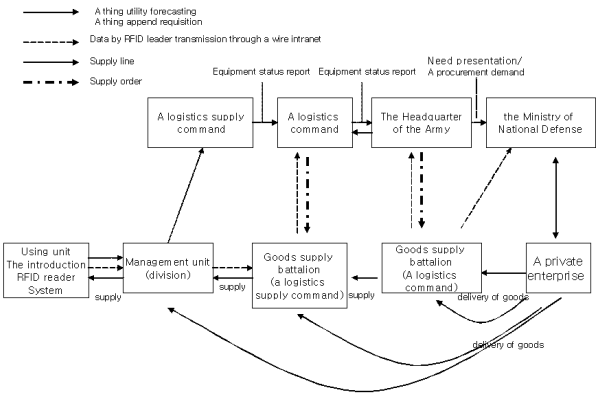
(Fig.2) Distribution System by a Logistics Supply Command

Such system may require longer time, for the logistics supply command takes charge of the distribution but allows accuracy of an itemized statement and real-time service. Figure 3 describes the logistics system that supplies are directly sent to both a supply unit and a military unit that needs the articles.



(Fig.3) Logistics System by Enterprises

In the above mentioned logistics system a quarterly report replaces a request and a channel of logistics supply collects the reports. The flow of supplies is direct delivery from an enterprise to a unit but administrative procedures are done by a support unit, creating inconsistency. And supplies are divided by their use and kinds in the system.



(Fig.4) Logistics System by RFID Technology

Introduction of RFID technology to the logistics system as depicted in Figure 4 can prevent waste of a budget and other resources by prompt delivery and accurate management of supplies. In addition, though a division promises to offer required supplies when they are not in

stock, the request in not made in an automatic manner so that the supplies appear to be depleted unless the official in charge of logistics system ask for the articles. Unlike officials in higher divisions, military units do not know about the schedule when the supplies are delivered. Because there's no automatic system among a division, a logistics supply command, and a logistics command, it's hard to receive needed supplies even when they are in stock. But the introduction of RFID technology can solve the problem, providing a network for the Ministry of National Defense, the Logistics Command, and a logistics supply command.

5. Conclusion

The distribution system of enterprises based on the Internet service today has allowed e-commerce to take root and automatic transportation system utilizing intellectual traffic control as well as trace technology has been applied to the system. Along with the development, the distribution system of the army has adopted cutting-edge technologies. The logistics system of ROKA is divided by the way of delivery: direct delivery from an enterprise to both a support unit and a unit that needs supplies and the deliver to a logistics supply command which sends the supplies to a military unit. Concerning expendables, a unit can make a request, but it makes a report of non-expendables to expect the demand. The logistics system may have an advantage of responding each situation but also causes waste of time and a budget.

To address the problem this document took a look at the logistics system using RFID technology. But the document has its limitations, for use of RFID in a logistics system has yet to be developed and there're not sufficient data to prove the effect of the system. Though large-scale logistics companies are active in adopting RFID system, the analysis of the effect should be done in the near future.

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