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Model and Implementation of a Financially Converged Transportation Management System

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Abstract
With 160,000 companies employing a total of approximately 550,000 people, South Korea's logistics industry was the country's 9th-largest GDP contributor in 2012. The Ministry of Land, Infrastructure and Transport (MOLIT) has made various efforts to accelerate the further development of the logistics industry, which have included implementing a green logistics company campaign and a system to certify excellent companies. However, Information Communication Technology (ICT) has not been applied in a way that reflects the rising importance of the logistics industry. This paper proposes basic data structures that will resolve the freight payment delays and vulnerability to non-payment of the conventional transportation management system (TMS), presents the design of a financially converged transportation management system (FTMS) model, and shows the results of its actual application in a logistics company after the system development. The result shows that the average freight collection term from freight delivery was reduced from 42 days to 3.4 days. This is a reduction to approximately 1/12 the previous period thanks to the application of the financial converged transportation management system.

Keywords: Financial converged transportation management system, Collection terms, Financial VAN service

1 Introduction

Economic globalization has accelerated the overseas expansion and market growth of businesses. As a result, there has been a continuous demand for global logistics, and a need for related IT services. The global logistics market has seen remarkable growth, from 2.9 trillion US dollars in 2008 to 3.3 trillion dollars in 2013. This is about three times the size of South Korea's GDP in 2010 and is more than 10 times the size of the global market for semiconductors. In order to take a stake in the global market, it is very important to achieve the rapid and significant growth of the domestic logistics market. In addition, we need to increase market share and competitiveness in this explosively growing logistics market. However, logistics companies that plan to or are already engaged in overseas business are suffering from various difficulties including a lack of local information, such as on local systems and procedures, financials, TMS, professionals, lower market awareness and poor competitiveness as a global logistics company. The main cause is Korea's lack of a standardized domestic transportation system in. Therefore, the most important action plan for an overseas logistics business is to adopt standard transportation information systems, implement a converged transport management system with the financial system to address the conventional problems and secure a competitive advantage in the offshore market [1][9].

2 Related Works

One definition of the logistics business is delivering the right product in the right quantity, at the right time, to the right place, at the right price, in the right condition and to the right customer [8]. To enhance their competitiveness in the market, logistics companies focus on cost saving to improve logistics expenditure efficiency, fixed cost saving, and productivity improvement [3]. The major role of a distribution logistics company is the delivery of finished products to customers. This consists of order processing, warehousing and transportation. Distribution logistics is necessary because the time, the place and the quantity of production differ from those of consumption. To accomplish this, logistics companies use information systems, such as order management system (OMS), warehouse management system (WMS) and transportation management system (TMS) [7]. The transportation management system (TMS), which is operated via the internet, handles freight orders from the shipper and allocates vehicles using a digital logistics information system. Through global position system (GPS) using an artificial satellite and wireless communication network, it is possible to figure out the position of the vehicle in real time so that a

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logistics company is able to get the transportation information it needs at any time during the vehicle and freight movement [2]. Along with an analysis of the existing conventional transportation management system (TMS) and a clarification of the freight logistics process, this paper proposes the new model for TMS to address the existing process issues. We implement the designed financially converged transportation management system (FTMS) model in logistics companies to prove the performance of the algorithm.

The basic process of Cargo logistics is that logistics companies receive freight transportation orders from shippers, and allocate orders to vehicle owners through a transportation management system (TMS). In this process, all kinds of possible information communication methods can be used, both online and wireless, including telephone, walkie-talkie and smart phones. Figure 1 shows the entire logistics procedure, from shipper's order call to physical freight delivery to consignee and freight payment and collection. Vehicle owner picks up freight as per the instruction given by the logistics company through the transportation management system, and transports it to the consignee. For the purpose of confirming the cargo hand-over and delivery, the vehicle owner issues an underwriting paper to the shipper when picking up the cargo, and with the delivery of cargo to the designated deport, vehicle owners get the consignee's confirmation on the underwriting paper as evidence of shipping and delivery.

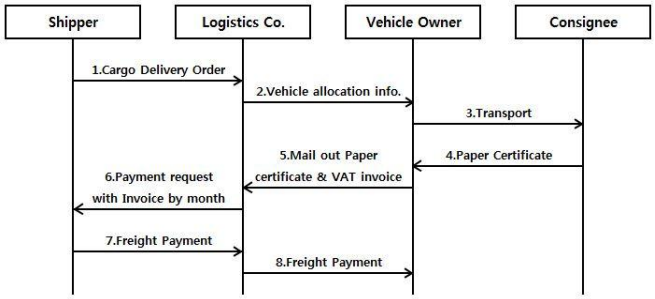

Fig 1. Flowchart of conventional logistics transaction process

After the completion of physical delivery, the vehicle owner sends the underwriting paper and simple tax invoice to the logistics company by registered mail for the purpose of delivery order completion, and receives the payment. On receiving the vehicle owner's simple tax invoice and underwriting paper documents by registered mail, logistics companies check out them manually and post the amount to the accounting system. In turn, the logistics company invoices the transportation charges to the shipper each month and receives the payment on a monthly invoice basis as well. With the shipper's payment, the logistics company executes payment to the vehicle owner for clearing freight. This is a well-known conventional cargo logistics process [3]. This means that the vehicle owner cannot get paid until the logistics company makes payment after collection from shippers, because the logistics company is not willing to be responsible for the payment and wants to take responsibility only for freight order allocation, simply passing the shipper's payment to the vehicle owner. This is a long-standing custom in leading logistics companies. In fact, there is an oversupply of vehicles compared to the market size, because the vehicle growth rate has been much bigger than market growth for the last decade. On average, a vehicle owner is unable to collect one freight charge out of ten freight transportations; in other words, approximately 10 percent of receivables were ultimately not collectable due to financial problems of the logistics company, or sometimes, of the shipper or consignee. Accounts receivable collection days, days sales outstanding (DSO), is longer than 40 days. Even though the logistics company makes payment within 40 days after invoicing, payment to vehicle owners was made with a 30 days promissory note, a local payment method, causing further delay of cash payment by the 30 days specified in the note. As a result, actual DSO becomes around 70 days.

3 Financially Converged Transportation Management System (FTMS) Model and Implementation

3.1 Issues and concerns raised by stakeholders

By analyzing the transactions among stakeholders in the logistics business process such as shipper, logistics company, vehicle owner and consignee and researching the conventional cargo logistics process, this paper identifies the unnecessary processes and inefficient practices of the existing transportation management system(TMS). For the vehicle owner, the greatest concern is uncollectable accounts receivable (A/R), high days sales outstanding (DSO) and the work of manually preparing and mailing out documentation to the logistics company. For the logistics company, the issues relate to manual documentation and call center (computer telephony integration center) maintenance, which involve high expenses. The shipper needs to know the location of transporting cargo and the freight details, by container or by freight, in real time, and also has concerns that it must check out and maintain paper documentation such as the underwriting certificate issued by vehicle owner with cargo pick-up and delivery to consignee. The consignee wants to know the position and the details of the cargo item transported, as well as the estimated arrival time, and also has concerns about unnecessary documentation.

The study shows that the greatest percentage of stakeholder concerns involve freight collection related issues, followed by paper documentation such as simple tax invoice related ones. Freight collection and day's sales outstanding are the most crucial factors to the income of the vehicle owner, and significantly affect the shipper's transport vehicle securing procedures, thus requiring urgent improvement. To solve these problems, we designed a new flow of the logistics process by taking advantage of the existing financial value added network (VAN)[4] and added a financial company (credit card company) to the existing process between logistics company and vehicle owner.

3.2 Financial value added network (VAN)

The financial institute, a credit card company, is added to the existing logistics process to solve the payment-related concerns of logistics business stakeholders. With financial

VAN, logistics business parties have only physical transportation transactions with the vehicle owner. As such, there is no more financial transaction between a logistics company and the vehicle owner, but between the logistics company and the credit card company. Figure 2 and Figure 3 show the details of the transactions among the three parties.

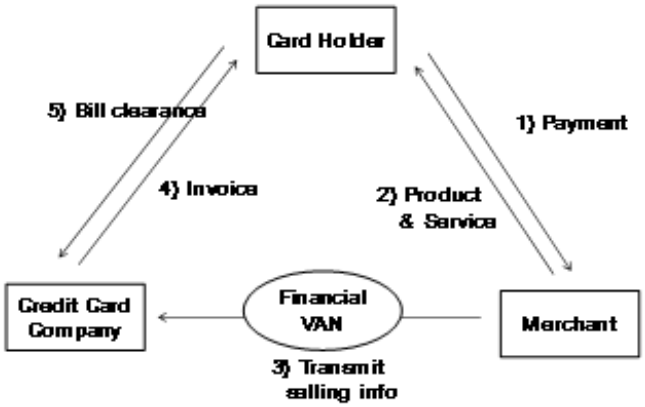

Fig 2. Credit card transaction and bill clearance diagram

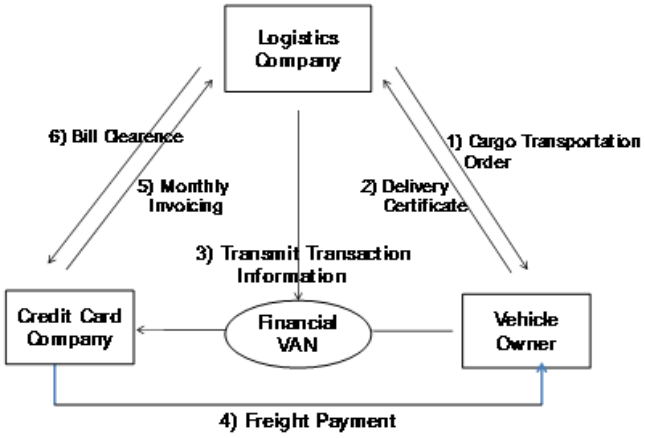

Fig 3. Financial value added network transaction diagram3.3 Improved Process

Figure 4 is a flow chart of improved process. The freight is paid by the credit card company, not by the logistics company, and the credit card company will charge the logistics company on a monthly basis, and in turn the logistics company will pay off the balance on a monthly basis to the credit card company using its bank account. As a result, vehicle owners no longer need to worry about non-payment, payment delays and long outstanding sales.

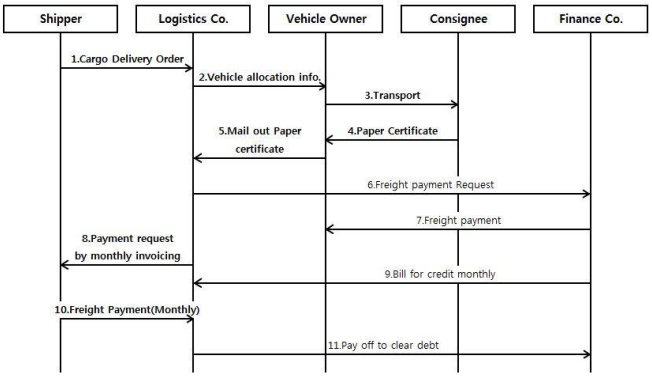

Fig 4. Improved logistics transaction process flow chart

4 Implementation and verification

4.1 Improvement of freight payment process

With the aim of addressing the logistics industry's payment problems, including under-payment, payment delay, partial payment, etc., this study proposes a converged solution between a financial company and a logistics business through the development of a specialized API [5] module and this was implemented in a real company.

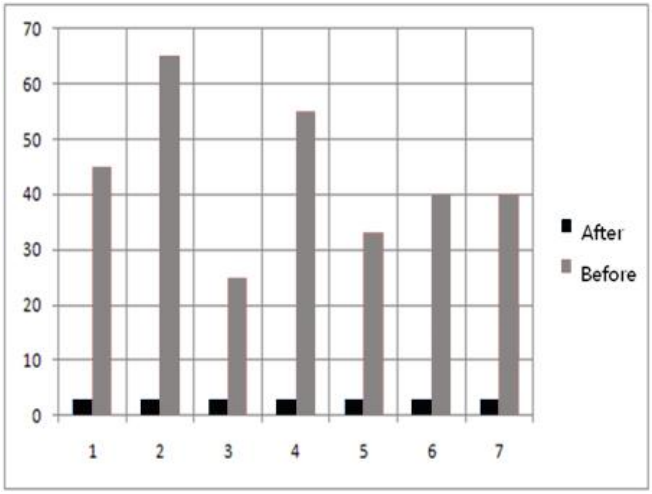

Fig 5. Comparison of freight payment period

Figure 5 shows the result of the comparison of freight payment term before and after applying a financial specialized API module to the transportation management system (TMS). Before applying a financial converged API module, average payment period was 43.2 days, and this was shortened to 3.4 days by applying the financial API. We can see the freight payment period has been reduced to 1/12 the previous period. In addition, the credit card merchant system, which is applied to the financially converged logistics process and the TMS, automatically reports the transactions to the National Tax Administration (Internal Revenue Service) thanks to the credit card process. Therefore, for the purpose of tax returns, vehicle owners no longer need to submit simple tax invoices to their accounting firm or send registered mail to the logistics company, eliminating some unnecessary procedures. As well,

the logistics company does not need to manually input simple tax invoices into its accounting system.

5 Conclusions

For logistics companies to enhance their competitiveness while promoting the efficiency of freight cost reduction and transport management, the importance of the transportation management system (TMS) has been highlighted. For this reason, many companies have been introducing commercial TMS packages or attempting to develop such systems in-house. This study analyzes the transport management process issues in the existing TMS, and presents how these can be solved based on an actually implemented case. In particular, this report proposes and implements a converged financial transportation management system (e-FTMS), enabling efficient transport management and fund management [6]. This study aims to present a model for financially converged logistics processes in order to solve the biggest problems of freight-related issues and suggest an actual alternative in the form of a specialized API module. Future research into the use of the electronic document system is required to replace the paper transaction issue.

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