An Exploratory Study for Seamless Overland Logistics Information Flows and Connection: An In-Depth Case Study of Korea

Jae Un Jung, Hyun Soo Kim, Doo Hwan Kim

Abstract**—**Quick and qualitative services are not new issues anymore in Logistics but those are still important problems along with cost-cutting. Related to the issues, though advanced information technologies are introduced unceasingly from laboratories, yet there is long way to go for smooth and seamless information flows on physical distribution processes in the industrial field. For the reason, the study aims to seek an advanced information delivery and management strategy through an in-depth case study of a Korea intermodal transportation company. It provides an industrial reference and a way to improve the endemic problems of logistics information systems.

Keywords**—**Exploratory Study, Overland Logistics, Information Flows, Seamless Connectivity.

I. Introduction

IN the latest development plan for Korea sustainable traffic and logistics [8], Korean government shows many interests in reducing carbon emissions, traffic congestions and cargo travel time by activating rail transportation. However rail freight basically needs to use a truck before and after a railway section for a complete transportation service as well known. On this account, overland intermodal transportation is more complicated and lower cost-effective than single mode by truck. To improve the problems, advanced and high-tech intermodal solutions such as a DMT (dual mode trailer) are introduced [1], [9] and Korean government also has interests in accepting them for high logistics productivity [6]. For the flexible intermodal transportation, basically logistic data transactions have to be handled with speed and accuracy. However, unfortunately, the data transactions are proportional to physical transfer numbers. Furthermore, most of logistics companies use different data types, forms, volume on the same freight. Related to the crux, IT researchers have studied at various viewpoints of data standardization, converting, DB (database) integration, XML (extensible mark-up language), ebXML (e-business XML), EDI (electronic data interchange), etc.[2], [3], [10]. However, the existing field problems on information delivery and management still remain difficult to be solved. For the reasons, the study aims to discuss an advanced system model after we analyzes non- or un-connected points on logistic information flows through an in-depth analysis targeted to a representative logistics company in Korea.

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II. Reviews of Industry & Literature

To remove obstacles that make overland logistics information not flow without reprocessing at each connection point, Korean government encourages and forces logistics companies to increase the level of information and usage of standard EDI systems. There are two major EDI service providers, KTNET and KL-Net [12], [13] in Korea. While KTNET's solutions service mostly for international trading works, KL-Net's solutions concentrate on the overland physical distribution in Korea.

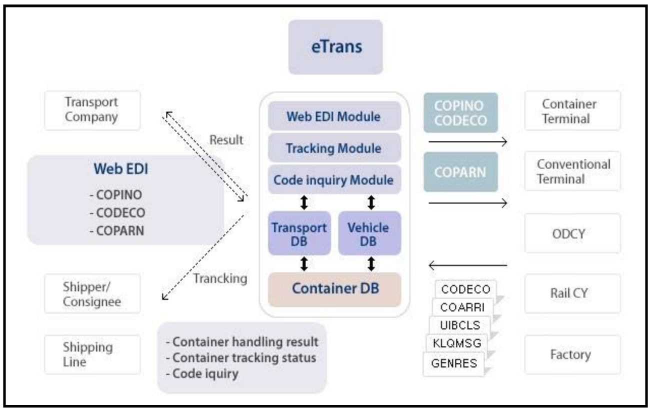

Fig. 1 EDI Architecture for Overland Transportation (Source: KL-Net)

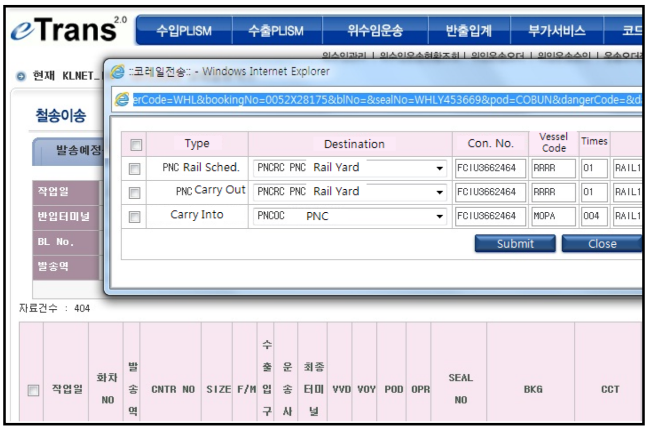

Fig. 2 User Interface of EDI System (Source: KORAILLOGIS, edited)

Fig. 1 shows architecture of eTrans that is an EDI system serviced by KL-Net and the EDI system is used at the overland transportation companies and port terminals for handling import and export freight. Fig. 2 is a user interface of the web-based EDI system, eTrans.

For the last years, the government has built portal sites [14], [15] to promote gathering and integrating separated logistics information on the web like Fig. 3.

Fig. 3 Korea Logistics Information Portals (Source: Ministry of Land, Infrastructure and Transport, edited)

However, the government's efforts are not expected to make a large-effect because most of overland logistic data and information are generated and managed in the private sectors and they are closely connected with secured sales and profits information of private companies. So, government-driven solutions are not big concerns of the logistics companies as yet. In computer and information science, although as aforementioned, so many studies have been conducted from basic theories to applications - on data conversion, transmission, database and UI (user interface) integration, security, sensor, network, information management, etc. [4], [5], [7]. However they have difficulty to approach to the logistics application problems. There are two reasons that, one is that logistics information is limited to access by closed industrial culture and the other is that the industry is slower of acquisition of new technologies because most of overland transportation companies are small to consider the whole of information flows and to invest their information assets. For these reasons, usual logistic information solutions do not perfectly compete to the needs of industry. As of now, most of logistics information systems are serviced by a few of logistic Sis (System Integrators) and ASPs (application service providers).

III. In-Depth Interview & System Analysis

To analyze practical logistics information flows, a representative logistic company (called K in this paper) was observed with systems analysis that it services overland intermodal transportation in Korea.

A. Overland Logistics Process & Data Flow

For the convenient explanation of overland transportation processes, Busan (the largest port, new name of Pusan) and Uiwang (the largest inland container depot) section is used as a representative case that the section treats the most of intermodal transportation traffic for import and export containers in Korea.

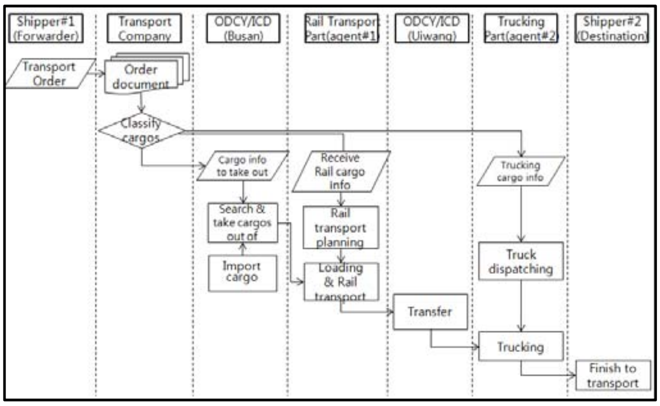

Fig. 4 Overland Logistics Process

Fig. 4 shows overland import processes from a port terminal in Busan to a final destination via Uiwang ICD (inland container depot).

First, Shipper#1 at the departure (normally port terminal in Busan) sends a transportation order to the company K that is a 3PL(3rd party logistics) agency.

Second, an operator (order handler) who received the order checks documents and relevant information for the order, and then s/he allocates the order freight (that is a generally container type) to a proper mode, train or truck. If a train mode is selected, intermodal transportation is considered with number of containers and vehicles (trucks and railcars), vehicle capacity (20fts, 40fts), transfer point, transportation time, delay time, cost, etc.

Third, how to transport is determined, instructions for carrying out freight are delivered to the truck and train planners (schedulers) as well as a port terminal and ODCY (off-dock container yard that is located out of a port terminal) in Busan.

Fourth, a planner of trains or trucks decides proper time, route, driver, loaded location of freight, etc. after s/he takes the classified order over from the operator who is a pre-planner.

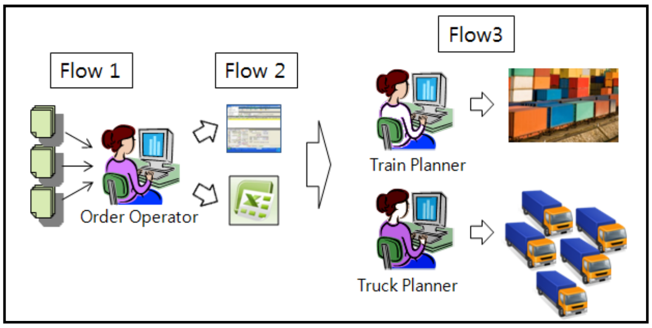

Fig. 5 Overland Logistics Information Flows

Lastly, a train or truck driver transports the freight from an ODCY or port terminal in Busan to the Uiwang ICD or a final destination indicated on the printed invoice. Fig. 5 describes logistics information flows at the point of the K Company.

B. Order Operating System

As mentioned in section 3.1, the first information delivery occurs between shipper#1 and an order operator in the K Company. Then, order information is sent by EDI system, external LIS (logistics information system), paper, file attachment of email, fax, instant messenger, even hand delivery.

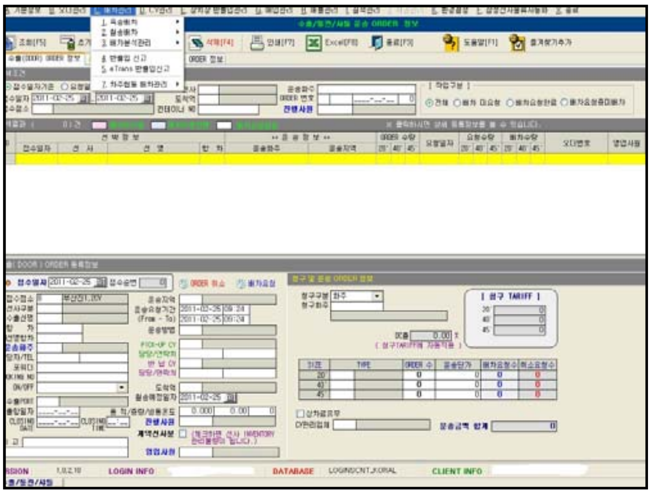

Fig. 6 Operating & Planning Systems (Source: CHUNIL I&C)

In this transaction, about 60% of orders are delivered through online system like LIS, EDI system including fax. The other is sent by staff, motorcycle courier or postal mail. For the offline information delivery system, another operator has to spend about 2 hours a day to take over and to hand over daily order documents. On average, it takes about 30 minutes from the first step to the third in section 3.1 that one operator finishes handling an order with collecting order information on/offline and converting the received original form to a fixed form of the K company. If an error is found during the works, it takes longer than the average time. Fig. 6 shows a user interface of online information systems serviced.

IV. Experiential Solutions & Evolution

A. Integration & Automation

Even when the case study was started in 2011, automation of handling a transportation order seemed to be most important for smooth logistic information flows. Therefore, a simple strategy with two steps was considered first. One was to change offline documents to online information and the other was to standardize the existing forms to a few of forms to be managed in the integrated database. However shippers who handed over their orders could not be controlled because they also had reasons to keep their own information system. In addition, most information systems of the K Company were provided by ASPs and the others were OA (office automation) systems like spreadsheet, word processors, etc. That meant that there was no chance to implement the second strategy because there was no DB except file folders to redesign or to modify in the K Company.

Thereafter, another model was designed as a new integrated system linked with the existing ASP systems. Fig. 7 shows another logistics information system that contains a new integrated DB. If the K Company's own DB can manage all of freight and vehicle operation, operator's order data handling time can be saved from 30minutes to a few minutes at least. At the same time, the integrated DB can service planner's intelligence for vehicle scheduling.

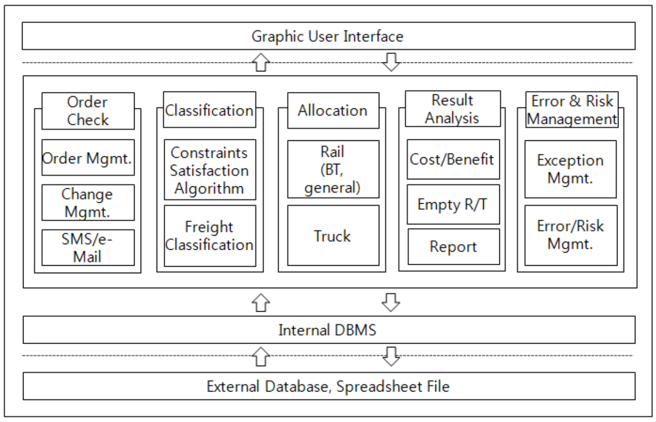

Fig. 7 Advanced Integrated LIS

Regarding the advantages, the integrated logistic information system extended coverage to the planner's work as shown in Fig. 7. The system contains several automation algorithms and rules for rail and truck scheduling as well as modules for handling transportation orders. The composition of the system was expected to save more time on the overall processes to the brink of vehicle (train) departures and arrivals.

B. Focus on Seamless Link

For its feasibility and validity, significant two events should be considered that coincided to change environments of logistics and IT.

One was the movement of Busan Port (or North Busan Port) to the Busan Newport by Busan urban redevelopment policy. (There are two major ports in Busan, the North Port and the Newport.) Because of the policy, lots of shippers with import and export containers moved to the Busan Newport that railroads were well-developed than the North Port. The other was that truck drivers had a strike with great logistic disturbance in 2012. These two big events raised overland intermodal transportation traffic including rail freight and complexity of the K company as much as the planning algorithms could not generate a qualitative result to meet the planner's satisfaction

It implied that the study should focus on links of information not intelligence for smooth information flows.

C. Shift onto the Web & Service Evolution

During the last decade, logistics information systems have been developed along with evolution of web applications. Most of recent logistics information systems are serviced on the web as seen in Fig. 8. Web-based information systems are easily linked and extended to other websites. In addition, the web systems can be implemented on single integrated window.

Fig. 8 Web Services of LISs (Source: KL-Net)

Around the end of 2012, a new e-marketplace only for domestic truck transportation [11] was open after years of collaborative development with shippers, transportation brokers (3PLs), telecommunication companies and SIs.

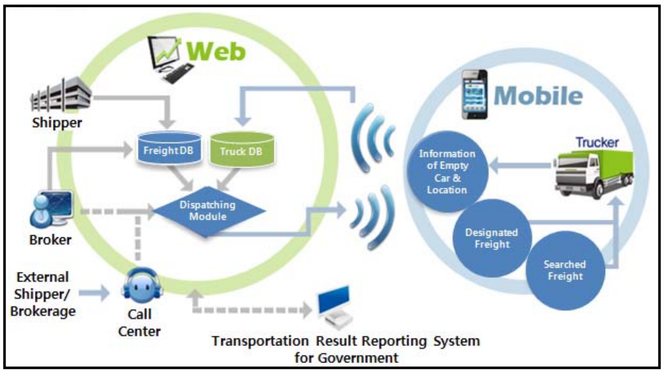

Fig. 9 e-Marketplace of Overland Transportation (Source: e-TruckBank, edited)

The case provides a hint on how to make logistics information flows flexible and smooth on different devices and O/S platforms even though there is a barrier between each system window. The hint is related to cloud computing technologies. Not perfect yet but those are growing up steadily at the viewpoints of devices, network (speed, mobility), security, applications called Apps, etc. And both of logistics information and cloud computing follow the same concept eventually that the information is anytime and anyplace available on the net as well as ubiquitous computing. If the ideal logistics information delivery and management system can be realized under the cloud and ubiquitous computing technologies, logistics information can flows on any device, any platform in real time with no conflict, no severance and no delay as the logistics industry hopes.

If the study can propose a functional application for security and identification between each different logistics information system, flexible links and an integrated DB are available with an indirectly connection method by cloud service providers. It is because the direct connection method is practically not recommended by security though the connection is positively needed.

In addition to the idea, if all of logistics cloud services can decrease information transaction costs including time and quality than now, the ways of offline transaction can be changed with respect to the online services as Google cloud services.

These ideas are never from new concepts that they already exist in computer science and business as the key technologies and strategies. However, applying the concepts into the logistics, it can be a new and meaningful solution as a logistics cloud service to promote flexible and smooth information flows in the industry.

V. Conclusion

The study analyzed the current logistics information flows with physical distribution processes through a case company of Korea. Most of overland transportation companies are small to keep their own information system except file systems. In the situation, Korean government forced the companies to use EDI systems for the smooth logistics information flows. However the existing EDI services provided by a few of ASPs were not enough to make the logistics information transaction efficient. For such reasons, we discussed and proposed the appropriate solutions with our researchers' experiential trials and IT trends.

Proposed ideas do not provide a detail technical result but these are meaningful to show a strategic implemental direction to improve the logistics information flows with cloud computing technologies. Logistics cloud services such as data form converting, advanced EDI, security, etc. that perform on any devices and platforms are expected to improve acquisition and maintenance of information system (e.g. establishment cost, time, etc.) as well as logistics productivity, information transaction and flows (e.g. data forms integration and converting, system links, etc.). The next study will develop a logistics cloud service through the follow-up researches on the basis of these analysis results.

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