Development of the Freight Forwarder Information System adopting RIA

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Abstract

In the case of international trade, the role of 3PL (third-party logistics) providers, in recent years, has drawn more attention. At the same time, computers have become faster, cheaper, and more widely available. Thus, information systems have become commonplace to freight forwarders and the increased efficiencies to be gained in improving logistics has pushed managers to explorer a number of new ideas, technologies and methods of information management and automation. However, many companies are encountering difficulties to choose an information system flexible and satisfying all needs carrying on business. In this study RIA (rich internet application) technology based on Java Swing was introduced to the freight forwarder information systems to provide richer user interfaces and a flexible web-based application. Also considered giving stakeholders in charge of logistics especially in SMEs (Small and Medium Enterprises) cost-effective and performance-effective solutions with good accessibility of internet for smooth operations of their businesses.

Keywords:

3PL (third-party logistics), Information system, Freight forwarder, RIA (rich internet application)

Introduction

In 2007, "the growth" is the core of global companies. Many CEOs of global companies concern with the growth of companies that will guarantee the future of the companies in a fast-changing business environment (SERI, 2007). Aggressive-growth strategy has a connection with increasing investment in plant and equipment, M&A, and strategic partnerships that dominates market. The tide of aggressive-growth strategy is leading companies to global oligopoly strategy. As the business operations like procurement, producing, and selling are becoming global, business strategies and transaction patterns are becoming more important than before. In the past, international trade had long been considered only applicable to some multinational companies, but, in the present, that was generalized into many companies including SMEs (small and medium companies). In the future, magnifying of integration of market, and progressing of information and communication technology will accelerate these phenomena and so on.

Since companies start to enhance outsourcing to concentrate on their core competences, the necessity of SCM is becoming essential more and more. If do not manage supply chain well, it is hard to produce products of good quality, and the costs of end products will be risen up. While information systems for SCM are being propagated through many companies, distribution process itself is being the keyword to compete with other competitors. Especially in the commoditized market, the price of products has the greater value, and then, companies are got sharpen to reduce the price of products in distribution costs. Furthermore, distribution industry is also on the increase now. The world class airline Boeing said the air cargo freight market will have grown by an annual average of 6.4% by 2020, to the size of 58.5 billion dollars. Among them, the express cargo market will have maintained the average growth of 13% over the next 20 years. And they prospected that the portion of Asia of freight cargo will have the highest rate of 8.6% in the world (Boeing, 2006). And also, the world air cargo freight volume will have increased by an annual average of 6.0% by 2010 (ICAO, 2001). World seaborne trade volume of major commodities has been showed increments since 1984 (UN, 2007). Another example of the world economic growth is showing the high rate of 5.1% in 2006 (IMF, 2006).

Modern freight forwarders charged in logistics of the vast amount of materials have been pushed managers to explorer a number of new ideas, technologies and methods of information management and automation to support

business strategies and basic operations as well. After all, the ultimate pursuit of forwarders is to meet the need of consignor; quick, accurate, and secure delivery. However, most existing systems are not enough to satisfying all the needs of them in the view of low costs with high performance.

METHODS

To begin with, sought to understand the business process of 3PL (third-party logistics) by examining the related literature and interviewing staffs working in that industry. And the captured business knowledge is modeled by UN/CEFACT's Modeling Methodology, commonly known as UMM, so that prescribes a standardized way to perform business process and information modeling with UML (unified modeling language) for specification of object modeling as language was used. And then, compared between international freight forward information systems in terms of their merits, demerits, and perspectives on additional updates and barriers. To increase the speed of development and be agile in respond to the needs of perspective users, prototypes were made consistently all through the development that we could communicate smoothly with stakeholders face-to-face.

Literature review

Refined network system as a competitive advantage
To increase efficiency of freight forwarding business, many studies have been progressed. In the early 1990's, EDI was introduced to freight forwarder systems to automate operations of creating, transmitting, and receiving documents. At that time, a group of truckload general freight carries, as well as a group of shippers who use these carriers was surveyed to assess selecting EDI (Murphy et al., 1988). It was found that the most important EDI benefits included "better communications", "quick access to information", and "improved billing" among the carriers. And their most significant obstacles to EDI were "lack of standard formats" and "incompatibility of hardware/software". For shippers, "quick access to information" and "improved tracing and expediting" were the most important EDI benefits; alternatively, key barriers to EDI included "lack of awareness of EDI benefits", "customer education/training", and "lack of customer sophistication".

In recent years, global logistics companies are proceeding to providing integrated services from simple delivery services. For examples, Deutsche Post (German post, logistics, and courier) provides delivery services across the entire mail value chain, including production facilities at central hubs, sales offices and production centers on four continents, as well as direct connections to more than 200 countries. UPS Inc., the world's largest parcel delivery company, is delivering more than 14 million packages a day to more than 200 countries and territories around the world. It has recently expanded its business to include logistics and

other transportation-related areas. Also, entered the heavy freight business with the purchase of Menlo Worldwide Forwarding, a former subsidiary of Menlo Worldwide, and rebranding it as UPS Supply Chain Solutions. In the given complex situation, these are satisfying customers with delivery in designated time, together, response to security problems from RTE (Real-Time Enterprise) systems, enterprise-wide network including SCM, and even cargo tracking. As we have seen, a well-refined information system could be a source of competitive advantages and support firms for achieving low operation costs with high performance.

RIAs (Rich Internet Applications)
The web is already the platform for doing business efficiently and quickly and web technologies continue to evolve to deliver new user experiences and increased application utility. With the result that RIAs are designed to combine the full "content rich" experience of a desktop application with "broad reach" of a website, as shown in Figure 1.
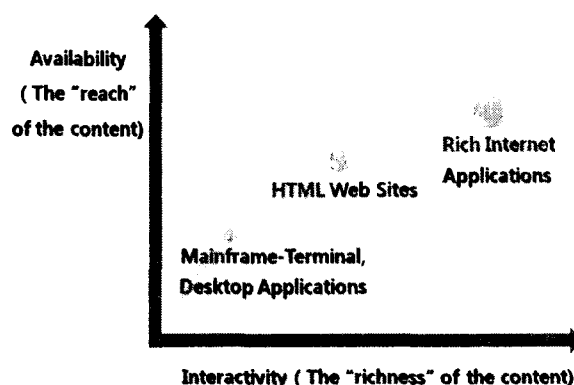

Figure 1 - RIAs' availability and interactivity

It is originally coined by Macromedia in a 2002 white paper, after that, RIA have grown into a widely accepted technology and the direction of choice for many new web development projects. According to Gartner Research, nearly 60 percent of all new application developments will include RIA technology by 2010 (Gartner Research, 2006). For marketing agencies, the RIA sector is one of significant growth. ZapThink, a leading IT advisory and analysis firm, predicts that the RIA space will grow to become a $3 billion market by 2011 (ZapThink Research, 2005).

The RIA reflects the gradual but inevitable transition of web applications from the simple thin-client model of a traditional web browser to a richer distributed-function model that behaves more like the desktop in a CS model. Today these richer user experiences are being implemented with technologies such as AJAX, Flash, and Java, using standard internet and web protocols. However, as shown in Table 1, there is no distinct winner among RIA technologies yet. Each technology excels over the other on certain parameters.

Table 1 - platform comparisons (source: UWEBC)

	AJAX	Macromedia Flash	Java
Graphical Richness	Average (Same as HTML)	Very Rich	Rich
Container/Engine Footprint	Very light (browser built-in)	Light	Heavy
Application Download	Free	Slow	Slow
Audio/Video Support	Poor (unless use ActiveX)	Excellent	OK
Consistency on Different Computing Environments	Varies	Very consistent	Relatively consistent
Server Requirements	None or very minimal (TIBCO General Interest)	Yes (Flex or Open Laszlo)	Yes or No (Nexaweb, Java Web Start)
Plug-in/Runtime Requirement on Client	No	Flash Player	Java Runtime / JRE
Development Challenge	Very complex without tools such as TIBCO and high skills required (JavaScript, CSS, XML, XSLT, DOM, ActiveX...)	Relatively easy with tools such as Flex or Open Laszlo (XML, DOM, JavaScript, Flash, ActionScript)	Relatively easy with tools such as Nexaweb (XML, JavaScript, Java)
Security Concerns	JavaScript codes are open to public. Everybody can see source codes if desire	Flash files (compressed binary) are created. Flash Player becomes a sandbox	Class/Jar compressed, binary files are created. JVM (Java Runtime) becomes a sandbox
Cost	Custom Build - Free TIBCO - Unknown	Open Laszlo - Free Flex - $15,000 per CPU	Java Web Start - Free Nexaweb - Unknown

In fact, RIAs are still in the early stages of development and user adoption.

Requirements and analysis

Freight forwarding process
The freight forwarding industry is made up of thousands of operators around the world that in the range of billions of dollars companies. Figure 2, UML collaboration diagram tells about the main actors involved in the air freight forwarding industry.
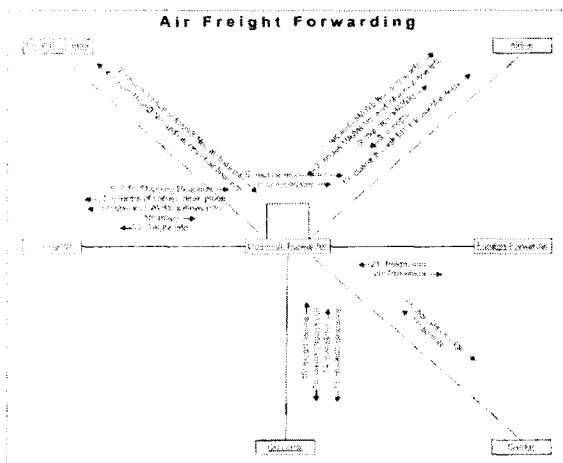

Figure 2 - air freight forwarding process

In the air freight forwarding process, firstly, Consignor consigns its rights and cargo to Domestic Forwarder. After contract is made with Consignor that called booking, Domestic Forwarder confirms reservation with airline and carrier. Then forwarder arranges space for dispatching shipment via airlines that called consolidation (in this diagram, Small Forwarder was expressed as a firm wanting capability of consolidation and demanding other forwarder to fulfill its work). In the mean time, forwarder is claiming through EDI to Customs for obtaining permission of export. If the progress were favorably done, information about cargo will be notified to foreign forwarder in charge of importing shipment about obtaining license from its province customs and delivering to end recipient.
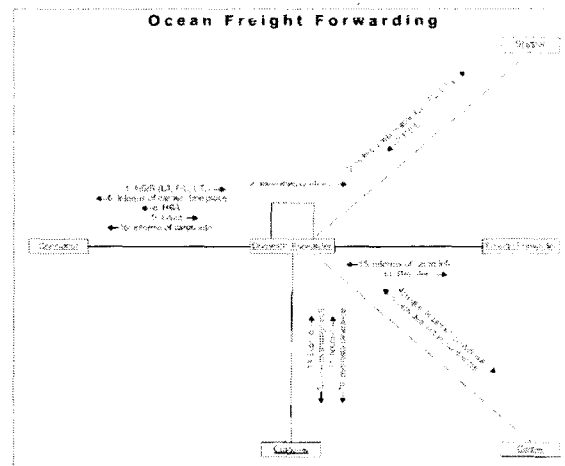Figure 3, tells about the ocean freight forwarding process.

Figure 3 - ocean freight forwarding process

There are not big differences between air and ocean freight forwarding in forwarder's view. Rather, it is simpler since making documents like a MBL (master of bill of lading) and consolidation in most cases are handled by Shipper instead of Domestic Forwarder.

Requirements review
Except for large enterprises, SMEs which incompetent to develop their own customized information systems are mainly using softwares provided by ASPs (application service providers). However these on-demand softwares are usually not suitable to forwarders' purpose, because those are originally constructed for multipurpose, not only for forwarders' purpose. For that, some of these have malfunctions, unnecessary functions and bad interfaces not customized by and large. Particularly in Korea, some applications having wrong behaviors making forwarder business process disorder with high rental and limited power are being in the long run. But, there is a lock-in problem for the reason why most forwarders cannot change their systems to brand news. In this work, pursued to develop the information system that reflects the needs caught from interviewing with forwarders and using softwares in person. The principal requirements were *improving performance of refreshing screen, supporting shortcut including multitasking interfaces in web-based information systems*. And in mainframe-terminal or desktop application based systems, high maintenance costs, and

difficulty of installation and accessibility are indicated. In common, the softwares are not customized well to do compatible with the business model of forwarder that make people do same work over again, except for few foreign ones.

Design and Development

Java-based RIA as a architecture
There are AJAX that fits the most into the Web 2.0 umbrella and has struck a chord with the public, and Flex is growing fast with sophisticated UI (user interface) using Flash. In this study, Swing is sued that is one part of the JFC (java foundation classes) that provides GUI (graphical user interface) widgets such as text boxes, buttons, split-panes, and tables. For avoiding the complexity of developing massive applications in JavaScript and Flex's heterogeneity between MXML, ActionScript, and other programming languages. Next, Swing widgets provide more sophisticated GUI components than the earlier AWT (abstract window toolkit) version, since they are written in pure Java. As it is agreed to Java can be useful when the system have to be extended to WMS (warehouse management system) using mobile/PDA computing. Figure 4 MDI (Multiple Document Interface) sample shows registering manifest in our system.
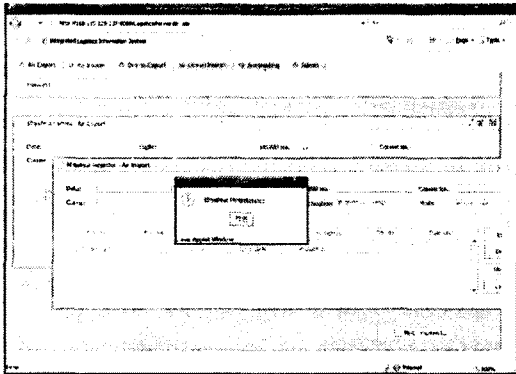

Figure 4 – the look and feel of Java Swing

Traditional web applications centered activities around a CS (client-server) architecture with a thin client. Under this system all processing is done on the server, and the client is only used to display static content (in this case HTML). The biggest drawback with this system is that all interaction with the application must pass through the server, which requires data to be sent to the server to request and respond, and the page to be reloaded on the client with the response.

Internet standards have evolved slowly and continually over time to make up for the weak, so it is hard to draw a strict line between what constitutes an RIA and what does not. But all RIAs share one characteristic: they introduce an intermediate layer of code, often called a client engine, between the user and the server. This client engine is usually downloaded at the beginning of the application, and may be supplemented by further code downloads as the

application progresses. The client engine acts as an extension of the browser, and usually takes over responsibility for rendering the application's user interface and for server communication, these are shown in Figure 5 (source: UWEBC).
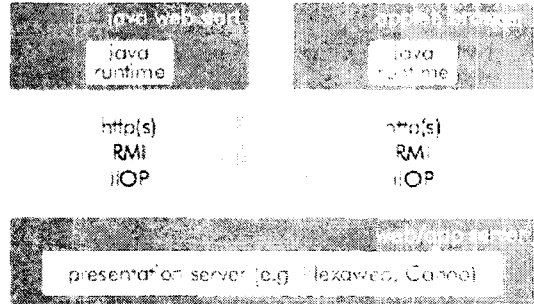

Figure 5 - typical Java-based RIA architecture

From adopting this architecture, we could develop a lower maintenance cost system with mightier power from CS balanced resource sharing, asynchronous communication, and reduced network traffic. Additionally, made user-interface more responsive and sophisticate.

Implementation
In studying them, we used IDE (integrated development environment) from JBuilder 2007, which runs on Eclipse platform to develop the application over all. By default, a computer for developing was Sun Fire X4200 Server using Sun Solaris 10 as a operating system and a web server was Solaris Apache/1.3.26 for UNIX and Oracle Database 10g Release 2 (10.2.0.2) was used for DBMS (database management system).

Following Figure 6 is the homepage of our work named ILIS (Integrated Logistics Information System). In this page, users can sign in and check notices and implemented by JSP (JavaServer Pages) due to consideration for each differently customized application loading.
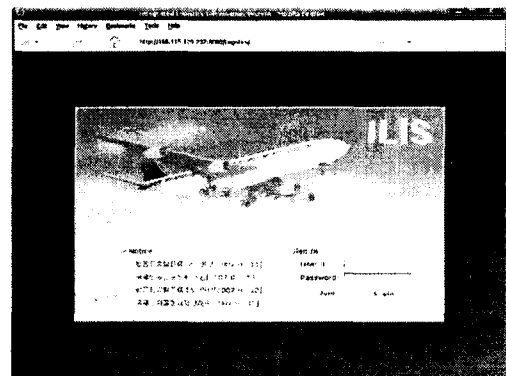

Figure 6 - the homepage of ILIS

Here is Figure 7 which shows booking scene in forwarder from consignor. The data can be inputted into cells like using spreadsheet program in desktop. After filling out the

form, it can be transformed to MAWB with just a clicking MAWB button. Similarly, other documents also can be easily filled out and transformed to manifest, MBL, HBL and then can be searched, updated and deleted readily in Air Export, Air Import, Ocean Export and Ocean Import menu.
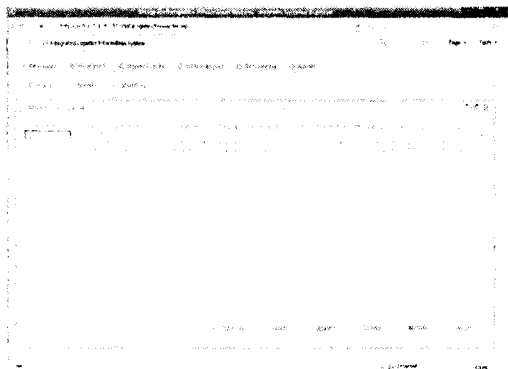

Figure 7 - booking work like using spreadsheet

And the documents shown in Figure 8 came from booking stage without additional work. It can be possible in but the streamlined process, because much information about documents using comes from consignors.
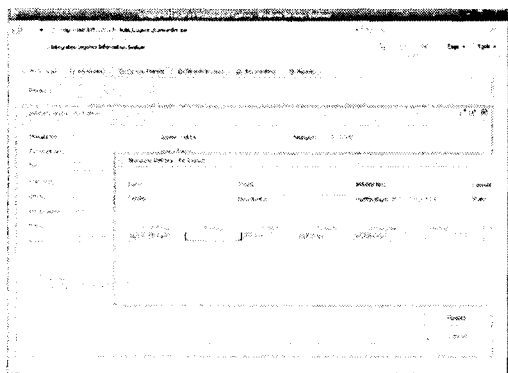

Figure 8 - dealing with multiple documents at once

Additionally, we tried to integrate accounting information generated during transaction to Accounting menu for supporting enterprise administration. In result, basic bookkeeping and bill collecting functions could be implemented. And some values like client names managed in Admin menu can be put into cells automatically.
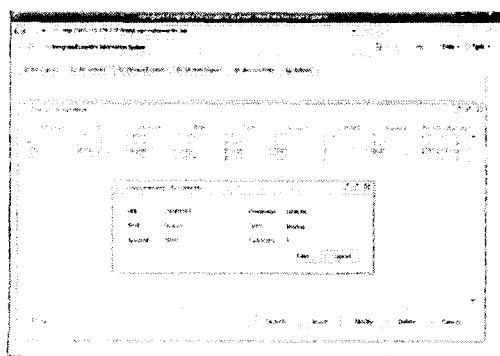

Figure 9 - dealing with accounting information

In Admin menu, can manage information about branches, clients, users, exchange rate or so. It is supposed to utilize to manage about branches, clients, users, exchange rate and so forth, and reutilize to help filling cells in during working with documents.
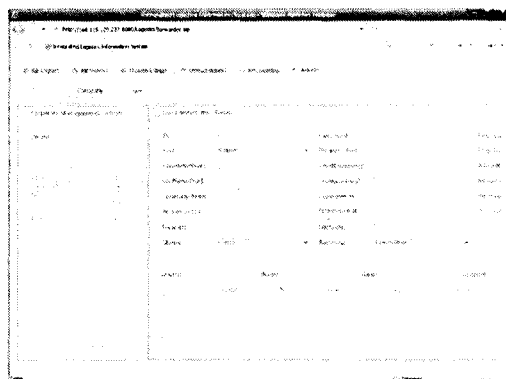

Figure 10 - administrator screen

To confirm if the desired behavior was implemented, unit, integration, and system testing were preceded.

Discussion

In this article, we would like to consider about introducing the integrated information system covering the entire logistics. As ever, each stakeholder in logistics is considering for streamlining business process and task in its own part, thus almost similar information is transferring in the hard way of telephone, fax, instant messenger and a variety of EDI with much paperwork each time freight forwarding is progressed. In our opinion, introducing the integrated information system that provides fixed document form with acceptable interfaces and flexible communication technologies could be a solution for the problem.

The streamlined business process is outstanding in compared with the common business restructuring executed in a piece in the whole logistics. Certainly, the entropy (complexity)[1] of the entire business process could be led to diminishing, and the understanding of business process could be easy. At the same time, SMEs are provided with excellent applications that make RTE possible with little cost and concern. Thus, national level construction for integrated information system covering consignors, forwarders, customs, shippers, airlines and carriers is could be the strategy for national competitive power also.

Nevertheless, there are many restrictions to realize between stakeholders. Firstly, companies would hesitate whether have to adopt the new system with adaptation pains leaving existing systems. Secondly, some excellent functions

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[1] In science, entropy is the thermodynamic homogeneity of a system, limiting the ability to extract mechanical work. But in information theory, that is a measure of the uncertainty associated with a random variable.

working well in existing systems would bring discredit on the new system. Thirdly, companies could expect that if they use the system, their company information could be used for competitor's analysis by integrated database. Fourthly, companies would like to be the second-mover rather than the first-mover, because they want to check whether it will be good or not. Finally, they have a great notion that that it will not so benefit to change their whole systems and business model, while they think it needs complete changes.

Conclusions

In the case of international trade, the role of 3PL providers, in recent years, has drawn more attention. At the same time, computers have become faster, cheaper, and more widely available. Thus, information systems have become commonplace to freight forwarders and the increased efficiencies to be gained in improving logistics has pushed managers to explorer a number of new ideas, technologies and methods of information management and automation. However, many companies are encountering difficulties to choose an information system flexible and satisfying all needs carrying on business. Particularly, small and medium freight forwarders which incompetent to develop their own customized information systems are provided with applications from ASPs. But these on-demand softwares are usually not suitable to forwarders' purpose, because it is originally constructed for multipurpose, not only for forwarders' purpose. For that, some of these have malfunctions, unnecessary functions, and bad interfaces not customized by and large.

In this study RIA (rich internet application) technology based on Java Swing was introduced to the freight forwarder information systems. From adopting RIA as a architecture, we could develop a lower maintenance cost system with improved accessibility from CS balanced resource sharing, asynchronous communication, and reduced network traffic. Additionally, made user-interface more responsive and sophisticate. Also we tried to streamline the process of freight forwarding for reducing unnecessary work.

Although, we had finished implementing the freight forwarder system of a 3-year-work, rather feel that it is not sufficient to meet the all needs of freight forwarders. There is still room for expanding accounting and administration functions to ERP system to integrate all data and process of an organization into a unified system. And some doubt remains about we did commercialize enough the system to utilize in practice. It should also be added to a further study for methodologies that integrate systems, revolutionize systems and utilize it as a competitive advantage in logistics. And dissolving the lacking of agencies accustomed to RIA technology and freight forwarders' understanding is another subject.

Acknowledgments

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