A Study on Information System Improvement for Air Logistics SCM*

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Abstract

Compared with land logistics and sea logistics, air logistics takes not only less transportation time, but also makes just-in-time delivery possible. Because of this, in spite of high freight rates, many shippers make good use of airlines. To cope with borderless competition in this global age, most shippers using air logistics want to receive diverse information including just-in-time cargo delivery and dangerous situation as well as convenience and speed in job handling. Nevertheless, most domestic forwarders, who perform many kinds of important businesses for air logistics, mainly put emphasis on demanding information from overseas partners through their business agreements, that is, focusing on horizontal integration, instead of sharing information or improving job performance among air logistics participants. As a result, it is almost impossible to satisfy the needs of shippers.

Airline users want to remove the uncertainties over their cargo movement. And in time of emergency, they want to take immediate measures through speedy information sharing and decision-making. In order to satisfy shipper's needs, all the organizations participating in the air logistics supply chain - cargo senders, cargo receivers, forwarders, transporters, licensed customs brokers, airlines as well as foreign partners - have to set up a vertical cooperation system.

For effective air logistics SCM, it is very important to remove overlapping jobs, strengthen the efficiency of job handling, and provide online monitoring on cargo information in order to support decision-making. To this end, this paper has applied the concept of RTE (Real Time Enterprise), a new business management system, which tries to maximize competitiveness by removing many hindrance factors on an ongoing basis in managing and fulfilling core business processes based on up-to-the-minute information.

In order to realize RTE-based information system for air logistics SCM, this paper has analyzed the information required by business process and by air logistics participant, and suggested the method for information sharing, point of time for information input and output, and its means.

Keywords: Airfreight Logistics, RTE, SCM

1. Introduction

The rapid development of information technology including Internet has stepped up the globalization of world economy, bringing fierce and borderless competition, consequently requiring speedier and safer transportation to quickly respond to the customer's demand. Because of this, in spite of higher logistics cost, air logistics is preferred. Air transportation takes short delivery time, makes possible just-in-time delivery, and reduces the cargo damage by outside impact and the change of product's quality coming from long-term delivery period, so that suppliers may safely and timely deliver products to the customers. According to U.S. Boeing's report, the air transport market of the world has grown by 15-20% every year in the past 10 years [1].

To keep up with the rapidly growing market and to take the lead in the air transportation market, large-scale logistics companies are pushing forward the establishment of information system for the sake of global transport SCM, seeking the vertical integration among air logistics supply chain participants and also the horizontal integration with overseas partners by means of a strategic alliance. On the other hand, domestic forwarders are running a small-scale business, not sharing information and making no efforts for job efficiency, but only demanding necessary information among overseas business partners. They are making use of information only for inside job handling. As a result, along with frequent distortion and discontinuation of information, they are losing competitiveness in the global air transport market.

For the realization of an optimal information system, this study is based on the efficient business process design and information sharing, while considering shipper's diverse requirements, global logistics firms' strategies, and the situation and problems of current air logistics SCM.

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Also this study has suggested the key factors that make it possible to apply both SCM and RTE techniques to the information system.

SCM technique has been used in order to build both vertical and horizontal cooperation system among air logistics participants including a cargo sender, cargo receiver, forwarder, transporter, licensed customs broker, airlines, and overseas partner. Also, in order to remove the uncertainties over air cargo transport and to take immediate follow-up measures by means of information sharing and speedy decision-making at the time of emergency situation, the RTE technique has been applied.

In addition, this study has analyzed the role of a forwarder, its operation situation and problems through preceding literatures. Those key factors for SCM and RTE – shipper's necessary information, air logistics supply chain business processes and exchange information in the processes, information for supply chain participants' business fulfillment and their decision-making – has been defined. Also, speedy job handling, monitoring, information sharing pattern, means for information provision, and the point of time for data input and output have been analyzed.

2. Studies on Preceding Literatures

2.1. Real Time Enterprise

Business management continues to meet with various kinds of unexpected environmental changes in the process of its growth and profit making. RTE focuses on how enterprises respond to these environmental changes speedily and on a real-time basis. The drastic environmental changes brought by Internet, web, and ubiquitous technology have provided us with technical infrastructure, but RTE is bringing us gradual business environment changes instead of technical innovation.

The two core factors for the realization of RTE environment are real-time recognition and quick response [2]. Therefore, what matters in the RTE is to monitor current events and to convey information in order to respond quickly to the situation instead of paying attention to the existing business pattern and knowledge.

Gartner Group has suggested the key factors for the realization of RTE as follows. The first is BAM (Business Activity Monitoring), which shows us business performance indexes on a real-time basis, thus enhancing the speed and efficiency of business performance. The second is wireless and mobile technology by which the service level for our business is immensely being improved. The third is RFID (Radio Frequency Identification) technology, which provides us with fast recognition, precise and accurate recognition, and enormous storage capacity by using the tag with a built-in microchip. The fourth is BPM (Business Process Management), which brings an optimum management system to the company by defining and analyzing existing business processes on an ongoing basis. The final one is a web service technology that leads business management into SOA (Service-Oriented Architecture), thus enabling the integration of both inside and outside partners and information sharing under Internet environment.

The above five key factors of RTE suggested by Gartner includes IT core technologies and management strategies for the solution of complicated issues surrounding today's business management. In this respect, RTE concept is applicable to the air logistics SCM. To this end, we need to analyze all kinds of information required by air logistics participants, and also define the point of time for information input/output, the means and ways of conveying information. These studies will be of great help to the development of information system, thus providing the function of monitoring the flow of logistics, cargo movement, and customs clearance.

2.2. SCM

Lee Jong-Man, Jang Ju-Byeong, Park Jong-Hyeon, and Kim Byeong-Cho (2000) have defined e-SCM as follows. E-SCM aims to manage all the materials, information, and funds in the supply chain from the whole point of view by using digital technology, trying to satisfy the diverse needs of company itself, suppliers, and customers. To sum up, it is a strategic technique to maximize the efficiency of business under e-business environment. Their study says that e-SCM is an effective strategy to satisfy customers in the Internet environment and that e-SCM will ultimately develop into a complete cyber enterprise through technical and organizational integration among companies [3].

Yun Hyeok-Gwon (2001) has analyzed the problems that are likely to occur in the supply chain formation. So, as a way of solving these problems, he has emphasized the importance of sharing information, danger, and profit. He has stressed that success depends only on equal partnership among companies [4].

Likewise, in the air logistics SCM all the participants will be able to integrate their business, thus building up a portal site-type cyber enterprise, so that it may effectively respond to many shippers' request for cargo shipment.

3. Air Logistics Situation and Its Problems

3.1. Shipper's and Logistics Company's Management Strategy Change

The global companies, the principal shippers in the air logistics, which have a wide range of both production and sales network all over the world, are positively conducting global SCM strategies in order to satisfy customer's diverse needs, trying to introduce flexible production system, reducing their lead time, and shortening delivery time [5]. These global companies are based on air logistics although its logistics cost is much higher than the other ones. This is because air logistics takes little transportation time and

makes possible just-in-time delivery without damaging cargo by outside impact, while reducing the possibility of quality change coming from long-term delivery period.

Recently these global companies are joining hands with other large-scale airlines or logistics companies with similar logistics strategies in order to establish a global scale of logistics network. As shown in the Table1, they are seeking a vertical integration among air logistics participants, while making a horizontal integration through strategic alliances with overseas partners. In other words, they are actively pushing ahead with the establishment of information system for global SCM [6].

Table 1. Large-Scale Logistics Companies' Merger & Acquisition Activities

Company	Year	Mergers and Acquisitions
Exel(UK)	2002	Airfreight Forwarder ACL(Austria) United States Consolidation Ltd(U.S.A)
	2004	Fujitsu Logistics(Japan) Tibett & Britten
DHL	2003	DHL & Danzas & Deutsche Post Euro Express AirBorne
UPS	2001	Fritz Menlo Worldwide Forwarding Inc.
TPG Group	2004	Wilson Logistics Croup

3.2. Current Operation Situation of Domestic Forwarders

Air logistics are composed of the supply chain participants such as forwarders, airlines, transporters, and licensed customs brokers in order to provide logistics service to the shippers. In particular, a forwarder is performing a central role in the air logistics services.

Now let's take a look at the relationship among air logistics supply chain participants, their business process, and information system situation.

3.2.1. Air Logistics Supply Chain Participants and Business Process Domestic air logistics supply chain is composed of cargo senders, airlines, transporter, licensed customs broker and overseas forwarder with a forwarder at the center stage. All the work of participants starts with a shipper's request for cargo shipment, and all of them are making use of only one-way information. As shown in the Figure1, the air logistics business process of a forwarder starts with securing a MAWB No from the airlines, followed by booking process, transportation process, customs clearance process, and the process of sending Pre Alert to the overseas partner forwarder.

3.2.2. Information System for Air Logistics SCM The information system for a forwarder has begun to develop on a full-scale basis from the wide spread of the window system in 2000. Especially, the multi-tasking ability of the window system has brought sweeping changes on the information management [7]. Based on the client/server method

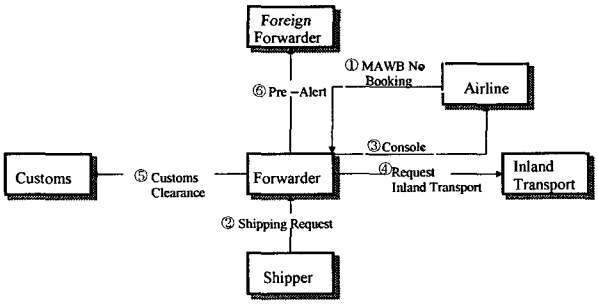

Figure 1. Export process in the air logistics

of the window system, forwarders can make a connection to the central server of the system provider through Internet. The domestic air logistics information system market is being dominated by top three companies - A, B, and C that had been developing export-import logistics software from before. However, most domestic forwarders could not afford to invest in developing their information system, and even worse competition has deepened due to increasing number of small companies. As a result, global companies that provide information on the customer's cargo condition and global positioning based on its global network are encroaching on the domestic air logistics information system market.

Domestic developers are saying, "It is possible to establish the information system network including airlines, licensed customs broker, transporter, and shipper." But as a matter of fact, all the related participants have to use the same network in order to share information, but it is far from reality. As of now, what services are provided or not provided by the top-three companies is as shown in the following Table2.

Table 2. Top-three companies' forwarder information system comparison

Main Function	A	B	C
Online Shipping Request	x	x	x
Search Airline Schedule	x	x	x
Export/Import AWB Management	o	o	o
MANIFEST Management	o	o	o
CONSOLE Management	o	o	o
Demand Charge &	o	o	o
Sales Result Management	o	o	o
Partner Account Management	o	o	o
Cargo Information Sharing	x	x	x
Customs Agency Information Linking	x	x	x
Customs Management	o	x	x
Inland Transport Information Linking	x	x	x
Inland Transport Management	o	o	o
Shipper Service	o	x	x
Cargo Tracking Service	x	x	x
Account Management	o	o	o
System Code Management	o	o	o

This study can point out the following problems in the domestic forwarder-centered air logistics supply chain. In order to remove the uncertainties over cargo movement, shippers demand an effective system that makes it possible to take immediate actions through speedy information sharing and decision-making at the time of emergency. However, in order to satisfy these kinds of shipper's requirements, it is absolutely necessary to establish a vertical cooperation system among all air logistic participants including not only overseas partners but also cargo senders, cargo receivers, forwarders, transporters, licensed customs brokers, and airlines. As mentioned above, global logistics companies are pushing ahead with both vertical and horizontal integration with related participants, thus taking the lead in establishing information system.

On the other hand, in case of most domestic forwarders of a small scale, they are not in a position to share information among air logistics participants. They are demanding only necessary information from overseas partners, while using information system only for job handling. As a result, frequent distortion and discontinuation of information is taking place, consequently losing its competitiveness in the global air logistics market. In the air logistics market, in addition to the price competition, time and cost are also critical factors. For this reason, both computerization and an information system as a means of communication among participants are absolutely important. But unfortunately each domestic air logistics participant has a different system in terms of its use and type. For example, the connection between the national information network for export- import and airlines' system has not been made until now. Accordingly, a lot of time and energy are being consumed to obtain necessary information.

4. Analysis of Required Information for Air Logistics SCM

In order to satisfy the shipper's requirements, the information system has to provide an airline schedule on an online basis, giving the function of supporting the shipment application and shipment change, and informing customers of the cargo position and cargo condition on an real-time basis. But this kind of information system can be established by sharing information through cooperation among air logistics participants including forwarders, airlines, transporters, licensed customs brokers and overseas forwarders.

In order to establish a RTE-based information system for air logistics SCM, this chapter has analyzed exchange information by business process in the air logistics supply chain, and information required by air logistics participant. As shown in the Figure2, the business processes in air logistics supply chain are composed of shipment application, transportation, customs clearance, business relation with overseas partners, and settlement. And the exchange information by business process is as follows.

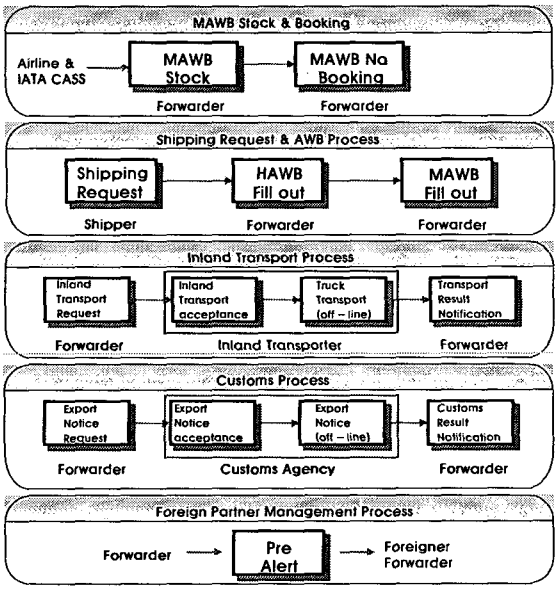

Figure 2. Export process in the air logistics

As shown in the Table3, to check out what information is required by each air logistics participant for his job performance and decision-making, and when or how this information should be given to each of them, this study has conducted an interview with each one of them. As shown in the Table4, the following table represents a result of these interviews. The information required by a shipper is about airline schedule, cargo location and customs clearance, and danger forecasting, which should be given on a real-time basis. The information required by a forwarder is about business progress situation of all air logistics participants so that he may provide this information to the shippers. The transporter and licensed customs broker have wanted to receive cargo shipment-related documents on an online basis.

Table 3. Exchange information by business process in the air logistics

Business Process	Exchanged Information	Data Input Member
MAWB Stock & Booking	Airline, Air flight, Airplane Schedule, Forwarder and so on	Airline, Forwarder
Shipping Request & AWB Fill out	Shipping Request , HAWB Fill out, Airfreight Console , MAWB Fill out, Airfreight Charge	Shipper, Forwarder
Inland Transport	Inland Transport Request, Inland Transport Result Notify, Cargo Tracing	Forwarder, Trucker
Customs	Customs Request, Customs Result Notify	Forwarder, Customs Agency
Foreign Partner	Cargo Manifest	Forwarder

Table 4. Information required by each air logistics participant for his job performance and decision-making

Member	Business Process	Required Information	Data Input Member
Shipper	MAWB Stock & Booking	Flight Schedule	Airline
	Shipping Request & AWB Fill out	Booking Settlement approval or disapproval , Transport Charge	Forwarder
	Inland Transport	Real-time Cargo Tracing, Custody status	Forwarder
	Customs	Customs Clearance Progress Status	Forwarder
	Pre-alert to Foreign Partner	Real-time Cargo Tracing, Custody status, Customs Clearance Progress Status	-
Forwarder	MAWB Stock & Booking	MAWB No., Airline, Airplane, Flight Schedule	Airline
	Shipping Request & AWB Fill out	Commercial Invoice & Packing List, Shipper, Console, MAWB	Shipper, Forwarder
	Inland Transport	Real-time Cargo Tracing, Custody status, Transport Charge(Fee)	Inland Trucker
	Customs	Customs Clearance Progress Status, The charge for Customs Clearance	Customs Agency
	Pre-alert to Foreign Partner	Real-time Cargo Tracing, Custody status, Customs Clearance Progress Status	Foreign Partner
Inland Transport	Inland Transport	Request inland transport, The paper to be submitted to Airline	Forwarder, Shipper
Customs Agency	Customs	Customs Clearance Request, The paper to be submitted to Customs	Forwarder, Shipper
Foreign Partner Forwarder	Inland Transport	Real-time Cargo Tracing, Custody status	Forwarder
	Customs	Customs Clearance Progress Status	Forwarder
	Pre-alert to Foreign Partner	Pre-Alert	Forwarder

5. Attribute of Information for RTE-based Air Logistics SCM

Considering the five key factors for the realization of RTE suggested by Gartner Group, this chapter has defined the information user, information provider, the point of time for information input-output, and its means and ways. Also, this chapter has suggested the attribute by required information for the information system of air logistics SCM.

5.1. Definition of Attribute

5.1.1. Point of Time for Information Input and Output Input and output point of time for required information has been grouped into three according to the usage type of an information user. The table5 represent. [Table5].

5.1.2. Information Handling Method Information handling method can be divided in two: automatic and manual. This division is based on the means of information input-output and information user's opinion. [Table6].

Table 5. Point of Time Input/output of information

Division		Characteristic
Output/input	Point of Time	
Output	Simultaneously with input	. Provide the information to another end user, consumer (forwarder) when one member (shipper) input a data the first stage at the process of Airfreight supply chain. . require real-time information for supporting decision-making and planning in advance
	to be requested by other member	. provide an information when the end-user want to know about certain status (ex: progress of Transport) . member can make monitoring progress(of airfreight business activity) when shipper want to know about progress
Input	Promptly when new information occurred at business process	. End user input a data promptly when it is occurred one business activity at the process of Airfreight Logistics . Utilize the information for decision-making when another member request business in Airfreight Supply chain
	commit work to be requested by another member	. input additional information for general business activity(information provider) . when request confirmation contract to each other before the business which is related to carriage charge and insurance progress next stage
	member save business data	. Utilize the reference to commit their business and Save the information to integrated Database to eliminate the duplicated(repeated) business activity . Additional information or a paper which is submitted to Customs, Airlines

Table 6. The Method of Data Transmission

Division	Description	Data Transmission Method	
		Input	Output
Automati cally	. Progress Business activity(data transmission) without intention of the member of Airfreight Logistics	RFID/ Connect to System	Web Browser Alert/ Mobile
Manually	. Progress Business activity by the member of Airfreight Logistics activity	Manually (telephon e, Fax, e-mail)	Search in person/ PKI Reserve/ telephone, fax e-Mail

5.2. Attribute by Required Information for RTE-based Air Logistics SCM

The attribute by required information for RTE-based air logistics SCM is shown in the following Table7 and Table8.

Table 7. The method of data handling for each business process (Input)

Business Process	Required Information	Input		
		Information Provider	The point of time	Processing Method
MAWB No. Booking	Flight Schedule	Airline, Forwarder	commit work to be requested by another member	Automatically, Connect to System
	Booking Settlement Approval or Disapproval	Forwarder	Promptly when new information occurred at business process	Manually, Input data in person
	MAWB Stock	Forwarder	commit work to be requested by another member	Manually, Input data in person
	Airline, Airplane	Airline	member save business data	Automatically, Connect to System
Booking	Carriage Charge	Forwarder	Promptly when new information occurred at business process	Manually, Input data in person
	Shipping Request	Shipper	commit work to be requested by another member	Automatically or Manually, Connect to System or Input data in person
	Shipper	Shipper	member save business data	Manually, Input data in person
	Request Console	Forwarder	Promptly when new information occurred at business process	Manually, Input data in person
	MAWB Information	(Console) Forwarder	commit work to be requested by another member	Manually, Input data in person
Inland Transport	Real-time Cargo Tracing	Inland Transport Company	commit work to be requested by another member	Manually(Automatically), Input data in person (Mobile, RFID)
	Custody Status	Inland Transport Company	commit work to be requested by another member	Manually, Input data in person
	Carriage Charge	Inland Transport Company	commit work to be requested by another member	Manually, Input data in person
	Request Inland Transport	Forwarder	commit work to be requested by another member	Manually, Input data in person
	Document to be submitted to Airline	Shipper	commit work to be requested by another member	Manually, Input data in person
Customs	Customs Clearance Progress	Customs Agency	commit work to be requested by another member	Manually, Input data in person
	Charge of Customs Agency	Customs Agency	commit work to be requested by another member	Manually, Input data in person
	Request Customs Clearance	Forwarder	commit work to be requested by another member	Manually, Input data in person
	Document required to Customs Clearance	Forwarder	commit work to be requested by another member	Manually, Input data in person

Foreign Partner	Real-time Cargo Tracing	Inland Transport Company	commit work to be requested by another member	Manually, Input data in person
	Custody Status	Inland Transport Company	commit work to be requested by another member	Manually, Input data in person
	Customs Clearance Progress	Customs Agency	commit work to be requested by another member	Manually, Input data in person
	Pre-Alert	Forwarder	commit work to be requested by another member	Automatically, Connect to System

Table 8. The method of data handling for each business process (Output)

Business Process	Required Information	Output		
		Information Demander	The point of time	Processing Method
MAWB No. Booking	Flight Schedule	Shipper	to be requested by other member	Manually, Search information in person
	Booking Settlement Approval or Disapproval	Shipper	Simultaneously with input	Mobile, Web Browser Alert
	MAWB Stock	Forwarder	to be requested by other member	Manually, Search information in person
	Airline, Airplane	Forwarder, Shipper	to be requested by other member	Manually, Search information in person
Booking	Carriage Charge	Shipper	to be requested by other member	Manually, Search information in person
	Shipping Request	Forwarder	Simultaneously with input	Automatically Mobile, Web Browser Alert
	Shipper	Forwarder	to be requested by other member	Manually, Search information in person
	Request Console	(Console) Forwarder	Simultaneously with input	Automatically, Web Browser Alert
	MAWB Information	Forwarder	Simultaneously with input	Automatically, mobile, Web Browser Alert
Inland Transport	Real-time Cargo Tracing	Shipper, Forwarder, Foreign Partner	to be requested by other member	Manually, Search information in person
	Custody Status	Shipper, Forwarder, Foreign Partner	to be requested by other member	Manually, Search information in person
	Carriage Charge	Forwarder	to be requested by other member	Manually, Search information in person
	Request Inland Transport	Inland Transport	Simultaneously with input	Automatically Mobile, Web Browser Alert
	Document to be submitted to Airline	Inland Transport, Airline	to be requested by other member	Manually, Delivery in person
Customs	Customs Clearance Progress	Shipper, Forwarder, Foreign Partner	to be requested by other member	Manually, Search information in person
	Charge of Customs Agency	Forwarder	to be requested by other member	Manually, Search information in person
	Request Customs Clearance	Customs Agency	Simultaneously with input	Automatically, Mobile, Web Browser Alert
	Document required to Customs Clearance	Customs Agency	to be requested by other member	Manually, Search information in person
Foreign Partner	Real-time Cargo Tracing	Foreign Partner	to be requested by other member	Manually, Search information in person
	Custody Status	Foreign Partner	to be requested by other member	Manually, Search information in person
	Customs Clearance Progress	Foreign Partner	to be requested by other member	Manually, Search information in person
	Pre-Alert	Foreign Partner	Simultaneously with input	Automatically, Web Browser Alert

6. Conclusion

In an effort to develop RTE-based air logistics SCM technique, this study has analyzed the characteristics of air logistics, customer's requirements, and the information required by air logistics participant. Also, this paper has defined the information user, information provider, point of time for information input-output, and its means and ways in terms of the business process of air logistics supply chain, also considering the five key factors for the realization of RTE suggested by Gartner Group.

This study has tried to develop the information system for RTE-based air logistics SCM. To this end, this study has made a survey of what kind of information is required by air logistics participant, and when and how this information is being used. However, this study has not included the difference between two business environments before and after the introduction of the new information system developed for RTE-based air logistics SCM. Therefore, from now on, more study on two different systems and their performance analysis should be made for more reliable and effective information system for RTE-based air logistics SCM.

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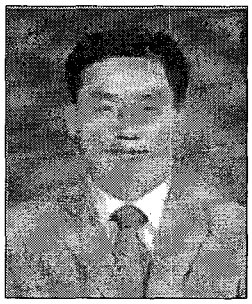

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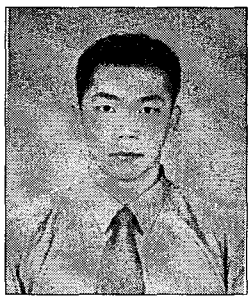

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