

A preliminary study on a PDA query system of customs cargo inspection

Jung-Tsung Yang, Jia-Rong Wen, Rong-Jyue Fang, Li-Ling Hsu

Abstract—The development of and adoption rate of mobile technologies are increasing rapidly on a global scale. M-learning (mobile learning) can include a wide variety of applications and new teaching and learning techniques. Mobile devices can facilitate human interaction and access to information resources anytime and anywhere, such as cell phones and personal digital assistants (PDAs) are widely used in working for various purposes.

To enhance the competitiveness of industry, the government has been promoting to expedite clearance and simplify the standard operation procedure. Therefore, the anti-smuggling operation should be more flexible and active to control the information of customs clearance. To achieve this aim, a PDA online query system was suggested for the staff in quay and container yard. They can search for the newest information with PDA, such as dynamic materials of the container, procedure of Customs clearance of the container, and the name of the container, when they leave the office and find any suspicious container number, to advance the ability and performance of anti-smuggling operation.

This paper presents the preliminary study that had investigated the effects and the limitation of PDA online query system. It is intended to analyze the possibilities of mobile technology application from this study.

Keywords—Mobile learning (M-learning), PDA, Anti-smuggling operation, Waterfall Development Model

I. INTRODUCTION

THE internationalization and liberalization of trade advance the development of import and export trade. To enhance the country and industry's competitiveness, the Executive Yuan promoted the automation of cargo Customs clearance and constructed its information network (see Fig.1) to make Customs clearance convenient for its rapidly growing amount. After the automation was implemented, paper work has been gradually replaced by computer to expedite clearance. A flexible and

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active strategy of anti-smuggling operation should be adopted to control the process of Customs clearance.

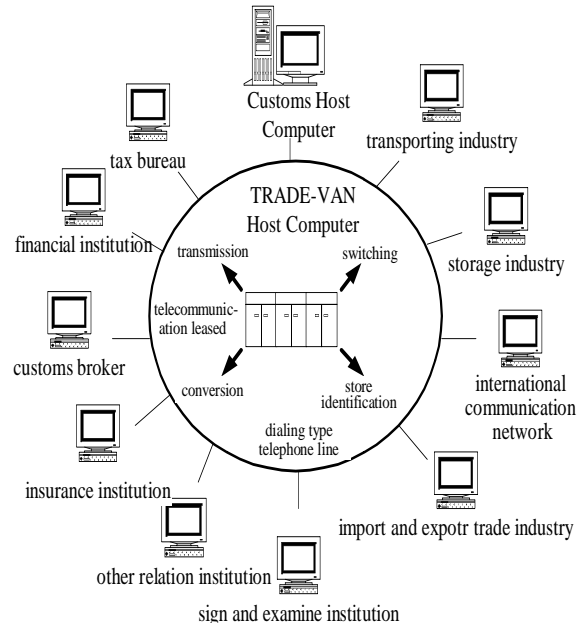


Fig.1 network of automatic cargo Customs clearance

The learning methods are diverse due to the advancement of communication technology. Mobile learning thus comes into existence combined with electronic training and mobile communication technology. With the development of mobile phone, PDA (Personal Digital Assistant) (see Fig.2) and broadband, a PDA online query system was designed to make inspection more active in quay and container yard (see Fig.3). Its convenience makes the inspection staff control the dynamic information without limitation of space and time.

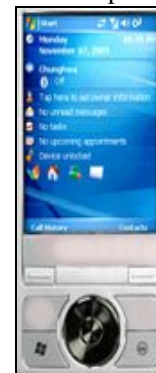


Fig.2 PDA



Fig.3 quay and container yard

II. MOBILE COMMUNICATION

M-learning is often defined as e-learning through mobile computational devices. In general by mobile device we mean PDAs and digital cell phone, but more generally we might think of any device that is small, autonomous and unobtrusive enough to accompany us in every moment in our every-day life, and that can be used for some form of learning [14]. It combines individualized (or personal) learning with anytime and anywhere learning[12].

M-learning has the potential to further expand where, how, and when we learn and perform in all the aspects of our life. One of the key benefits of m-learning is its potential for increasing productivity by making learning available anywhere and anytime, allowing learners to participate in educational activities without the restrictions of time and place [13].

Mobile technology will become inextricably part of the 'digital life' for many individuals around the world[2]. Handheld devices offer increased flexibility for students to access and use learning objects[4]. Mobile technology enrich learning possibilities even more and take it further. Mobile devices have the power to make learning even more widely available and accessible. Imagine the power of learning that is truly 'just-in-time', where you could actually access training at the precise place and time on the job that you need it [10].

Several commercial wireless service providers have started providing mobile data services. For instance, Verizon Wireless provides its subscribers with m-services which include local information, search engines, shopping, organizer functions and e-mail[6]. Zhang provides a mobile commerce framework for personalized and adaptive content delivery to tap into commercial m-services[15]. Wireless phones and Handheld devices can improve time-management efficiency by converting worker dead-time into a productive activity in the business world[3].

Mobile communication provides more mobility, flexibility and convenience. There are several benefits in m-learning implementations. One of most significant benefits is reduces the cost of training. In addition to cost benefits, organizations prefer m-learning for its promises to: rapidly develop, deploy and update course; provide effective training, available anytime and anywhere; boost worker productivity; broaden training

opportunities; stay competitive.

III. SYSTEMS DEVELOPMENT

PDA on-line query system adapted Waterfall Development Model. The development Model sees Fig.4.

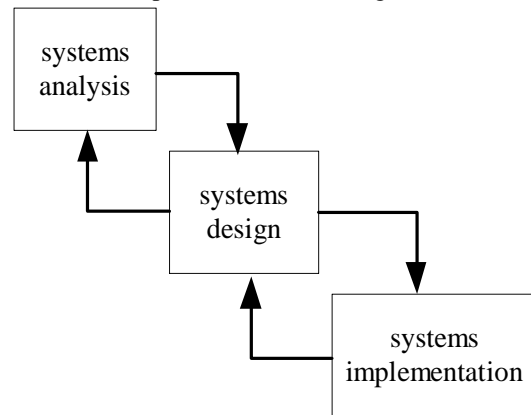


Fig.4 systems development model

A. Systems analysis

Analysis phase includes feasibility analysis, demand analysis and systems analysis. Feasibility and demand analysis phase are to identify clearly the nature and scope of the problem. This requires a preliminary investigation, which is a critical step, because the outcome will affect the entire development process. In order to cooperate with user's demand effectively, the system often uses documents analysis, observation, interview, questionnaire, meeting and developing jointly. These methods can be applied alone, or blended. PDA on-line query system adopted documents analysis, observation, interview and meeting to understand user's demand.

Systems analysis is to learn exactly how the current system works, to determine and document fully how the system could work better to support business needs, to develop a logical, and to make recommendations to management [8]. PDA on-line query system used documents to define the systematic function in detail after understanding the system planning.

B. Systems design

The purpose of the systems design is to develop an information system design that satisfies all documented requirements and then work on four tasks: output design, input design, file and database design, and system architecture.

C. Systems implementation

Systems implementation is to perform a series of application development tasks, followed by the system installation. During application development, all necessary system programs and code modules are designed, written, tested, and documented. The systems installation includes user training, file conversion, the actual changeover to the new system[8].

IV. DATA TRANSMISSION STRUCTURE OF PDA ON-LINE QUERY SYSTEM

Each PDA has a specific IP for security during data transmission via Internet. Data will be transmitted through GPRS service (General Packet Radio Service) from a PDA to its local access point before entering the communication machine room. Data are fully protected because of being encrypted (including compressed and verified) by the router from VPN (virtual private network) before being transmitted. The PDA query server needs to obstruct any hacker's invasion with the firewall and gateway when connecting with the database.

The data transmission structure is on Fig.5.

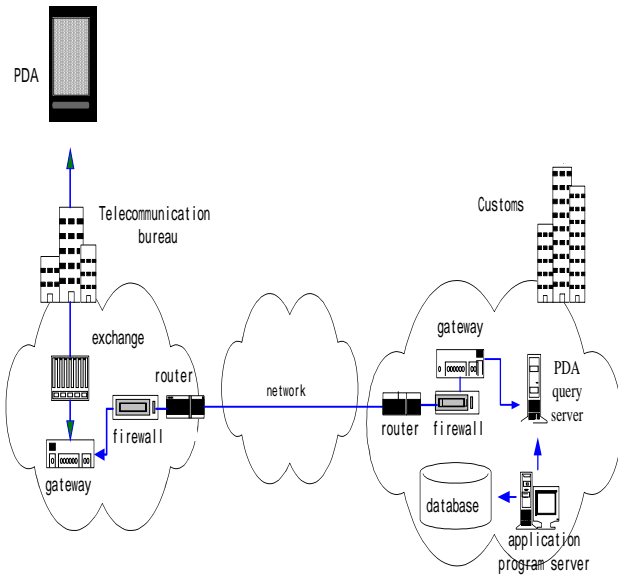


Fig. 5 The data transmission structure of PDA on-line query system

V. THE CONTENT AND FUNCTION OF THE SYSTEM

The content and function of PDA on-line query system, presented in Fig. 6 and explain as follows.

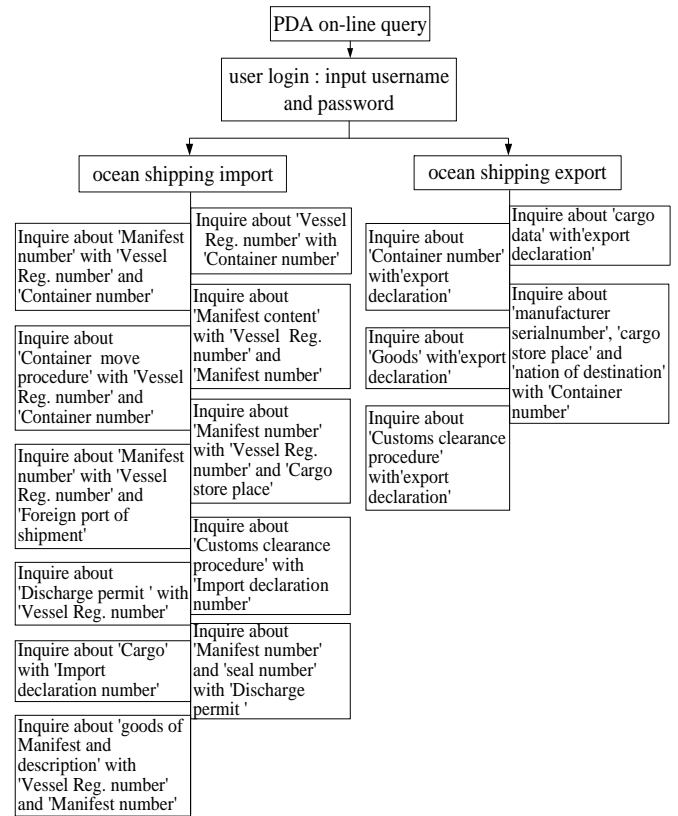


Fig.6 The content and function of the system

A. Inquire about 'goods of manifest and description' with 'Vessel Reg. number' and 'Manifest number'

Customs officer input 'Vessel Reg. number' and 'Manifest number', then show 'Goods of manifest', and 'Goods of description'.

Vessel Reg. NO.

Manifest NO.

Vessel Reg. NO.

Manifest NO.

goods of manifest	
goods of description	

B. Inquire about 'Cargo' with 'import declaration number'

Customs officer input 'Import declaration number', then show 'goods', 'produce the country', 'gross weight', 'quantity', 'tariff classification'.

Import declaration number

NO.

Goods :

produce the country :	gross weight :
quantity :	tariff classification :

C. Inquire about 'Discharge Permit' with 'Vessel Reg. number'

Customs officer input 'Vessel Reg. number', then show 'General Discharge Permit' and 'Special Permit'.

Vessel Reg. NO.

Vessel Reg. NO.
General Discharge Permit

Special Permit

D. Inquire about 'Vessel Reg. number' with 'Container number'

Customs officer input 'Container number', then show 'Vessel REG.', 'VOY No', 'arrive date' and 'shipping company'.

Container NO.

Container NO.

Vessel REG.	VOY NO.	arrive date	shipping company

E. Inquire about 'Manifest number' with 'Vessel Reg. number' and 'Cargo store place'

Customs officer input 'Vessel Reg. number' and 'Cargo store place', then show 'Manifest number'.

Vessel Reg. NO.

Cargo store place

Vessel Reg. NO.	
Cargo store place	
Manifest NO.	Manifest NO.

Click 'Manifest number' then show 'Cargo store place', 'Number', 'Gross Weight', 'description of goods', 'Consignee's' and 'Import declaration number' promptly.

Vessel Reg. NO.

Manifest NO.

Number	Gross Weight	Cargo store place
Description of goods		
Consignee's		
Import declaration NO.		

Click 'Import declaration number' then show 'Customs clearance procedure' promptly.

declaration	Examine type	
Shipping company		
procedure		
NO	Process date	procedure
1		
2		
3		
4		
5		

F. Inquire about 'Manifest content' with 'Vessel Reg. number' and 'Manifest number'

Customs officer input 'Vessel Reg. number', 'Manifest number', then show 'Cargo store place', 'Number', 'Gross Weight', 'Description of goods', 'Consignee's' and 'Import declaration number'.

Vessel Reg. NO.

Manifest NO.

Vessel Reg. NO.
Manifest NO.

Number	Gross Weight	Cargo store place
Description of goods		
Consignee's		
Import declaration NO.		

Click 'Import declaration number' then show 'Customs clearance procedure' promptly.

declaration	Examine type
Shipping company	
procedure	
NO	Process date
1	
2	
3	
4	
5	

G. Inquire about 'Container number' with 'export declaration'

Customs officer input 'export declaration', then show 'Container number'.

Export declaration NO.

Export declaration NO.

Container number	Container number

H. Inquire about 'goods of description' with 'export declaration'

Customs officer input 'export declaration', then show 'Name of the goods'.

Export declaration NO.

Export declaration NO.

NO	Name of the goods
1	
2	
3	
4	
5	

I. Inquire about 'cargo data' with 'export declaration'

Customs officer input 'export declaration', then show 'customs broker box', 'manufacturer serial number', 'cargo store place', 'Gross Weight', 'Number', 'container number', 'description of goods' and 'Customs clearance procedure'.

Export declaration NO.

Export declaration NO.

customs broker box	manufacturer serial number
store place	nation of destination
number	Gross Weight

Export declaration NO.

	description of goods
1	
2	

declaration		Examine type
Shipping company		
procedure		
NO	Process date	procedure

VI. IMPLEMENT THE EFFECT AND CONCLUSION

A. Implement the effect of PDA on-line query system

PDA online query system is developed using the Waterfall Development Model. Document analysis, observation, interview, and discussion are used to discover users' demands. The query system includes ocean shipping export and import, and other operating procedures that are designed according to the demands for inspection. For example, it can be queried with the container number, the name of the cargo, the registered ship, the cargo storage, the cargo Customs clearance procedure, and the Customs clearance procedure, etc. to enhance the efficiency and performance of anti-smuggling operation.

After half year of the trial period, the online query staff thought that the system can control the inspection information, and one of its advantages is maneuverability, compared with the traditional inspection. The traditional inspection needs an office or a place with network to search for suspicious information and print it out to the dock to do inspection on the spot. If the related information cannot be obtained in time when there is a suspicious situation, the opportunity for inspection could be lost. Furthermore, cargo Customs clearance has maneuverability that the procedure has been changed in a short time from the office to the dock. Therefore, the traditional inspection procedure is out of date now. If a PDA online query system is used for inspection, the above disadvantages of the traditional inspection will be avoided to control the procedure of cargo Customs clearance anytime.

B. Implement the limitation of PDA on-line query system

Albers and Kim highlight three specific issues that affect user access to information via handheld devices: (a) users' reading of text of a handheld computer screen is more difficult than on paper, (b) presenting graphical information is limited in the size and complexity of image, and (c) challenges for interactivity are increased due to the lack of key-board and mouse and also the screen size limits space for interactive elements to be displayed[1]. The key limitation of handheld technology for the delivery of learning objects is the small screen that is available for effective display[5].

The purpose of using a PDA is set for official inspection in this study. However, limitations are similar when learning with such handheld devices. It is concluded through the on-line query staff that it still needs improvement in using PDA for inspection.

First, the screen is too small that the information cannot be read clearly. Second, the transmission speed needs to be advanced. Third, a PDA is so small that it is easily dropped and damaged. Therefore, maintenance should be available anytime.

C. Conclusion and further research

This study aims at developing a PDA online query system to enhance the service and make the staff be able to query the dynamic information and the inspection work will be more active. The developing process emphasizes user friendliness to explore real demand and technology support, and think of the possibility of problem solving. As the coming of economic globalization causes the increase of the business of Customs import and export clearance, the automation of Customs clearance is government's aim to advance the competitiveness of industry.

This study uses Waterfall Development Model to build the PDA online query system. The staff has positive opinion on the mobility and convenience of using the devices for inspection. However, there are limitations of PDA handheld devices that need improvements with future technology. For example, the establishment of communication infrastructure will promote the transmission speed of PDA. Using a tablet PC or a PDA with a bigger screen helps reading the information. Handheld mobile devices will be used for commercial and public business in the future if combining 3G mobile phones with PDA functions, using handwriting sensitive pen and mini keyboard to increase interaction, or establishing a high-speed wireless environment. Further research of this study can be continued with the updating of the PDA online query system.

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