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USING SERVICE DESIGN TO MANAGE EMERGENT SERVICES

Abstract:

Technology is developed in tremendous speed nowadays. Stand-alone system until now is going to Cloud Computing trend, many data can be used to save or transfer information through cloud computing. The study uses these technologies to design a multifunction e-service system for ambulance. The e-service system updated the new way from handwriting to smart device, it can ensure information to save and transfer to the hospital database. In order to improve the current ambulance system process and replace handwriting format, this study invents the e-service system for ambulance. We use service design approach to redesign service process of ambulance, and then this study uses smart device to install e-service system for ambulance. This e-service system integrates many various media (such as sound, pictures or text) and helps hospital employee to prepare some material before the patients arrive at hospital. This study will use Taiwan's ambulance to illustrate its process and try to improve it with service design methodology.

Keywords:

e-service, ambulance, cloud computing, service design, process

JEL Classification: C63, L89, M15

Introduction

Health care system is growing economy; it is for each national level growing of big economy. And Taiwan hospital information system (HIT) developing has Decades. Followed by progress of Information Technology (IT), operating from the hospital to enhance the scale clinical trials. Government vigorously supports Telemedicine or Electronic medical records in recent years. And the ambulance transfer very important role in the medical. Taiwan established a wide range of medical institutions, is hoping to have a quick and convenient medical network, do not have trek thousands of miles can get health care resources. Taiwan hospitals have 21,135 until 2011 years. Follows **Chyba! Nenalezen zdroj odkazů.** is hospitals in Taiwan:

Table 1 : Hospitals information in Taiwan

Unit: home								
End of the year	The number of hospital	Hospital			Clinic			
		all	Western medicine	Traditional Chinese Medicine	all	Western medicine	Traditional Chinese Medicine	Dentists
2012	21,437	502	488	14	20,931	10,997	3,462	6,472
2011	21,135	507	491	16	20,628	10,815	3,411	6,402
2006	19,682	547	523	24	19,135	10,064	3,006	6,065
2001	18,265	637	593	44	17,628	9,425	2,544	5,659
1995	16,104	787	668	99	15,317	8,680	1,933	4,704

Source: Ministry of health and welfare

According to Table 1, there are more than 2,125 ambulances in Taiwan, these ambulances need to serve twenty-three millions people and an ambulance has to standby for one million residential citizens in average. But the ambulance still used a paper to record what happen on this situation, this study tries to invent electronic service to substitute and use 3G or the next LTE (Long Term Evolution, 4G) system to build a medical service network on the smart device. The e-service can be invoked through this service and patient's data will return to the hospital automatically through medical service network before patient arriving at hospital. In order to have more explicit design process, this study apply an UML (Unified Modeling Language) to show the all process

and planning and also promote a service research model for service process design in section 3. The section 4 describes the implementation based on this model and uses a case study to illustrate the workflow in section 5. Finally, this study uses conclusion to summarize what are the next steps in the near future.

Related Works

In order to know what are the relationships of this study, we need to depict several aspects of medical development, ambulance process, and service architecture in the following paragraphs.

- Medical development in Taiwan

Taiwan has been promoted tele-medicine development since 1960, tele-medicine is an information exchange technology, and patients don't need to go to hospital can get professional advice for their treatment. In the 1960, Taiwan doesn't develop any Internet and networking hardware facilities cause by the high cost of facilities' installation. In the 1995, the information technologies began to popular of adopting computer to improve medical service, the hospitals gradually rapid development improve their health model and use Internet to cope with data-oriented design, multimedia delivery, self-help, Decision Support Systems, and EMR (Electronic Medical Records) (Taiwan's Department of Health,2001). In 2000, the hospital uses rapid development of handheld systems through Wireless Network, Internet Media, GPS (Global Positioning System) and RFID (Radio Frequency Identification). As in recent years elderly care is needed, the medical service integrates positioning and remote home health care into EMR and to transfer these information to the hospital immediately. In the 2010, this is smart device era, smart phone's market share of 47.2% at 2011 years in the mobile communication (Digital convergence development association, Taiwan, 2011), There are various smart phones and smart devices in the mobile service, these mobile devices integrate diverse functions such as camera, sound recording, flashlight and communications and use ICT (Information and communication technology) to coordinate with external facilities. The figure 1 depicts the generation of medical service development.

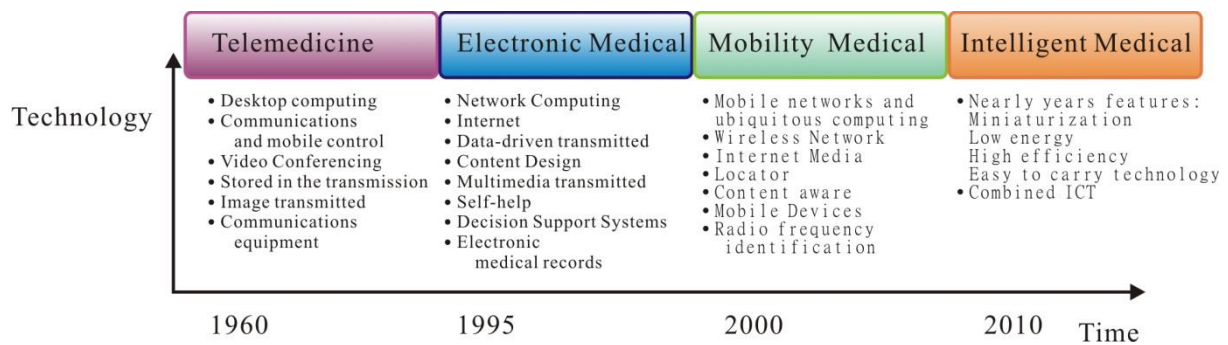


Figure 1:Recent medical developments, Source:Ministry of health and welfare

- Ambulances of process and development

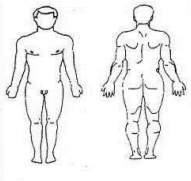
In the 1988, Taiwan's executive Yuan promoted EMS (emergency medical service) and is found EMS by the medical development in Taiwan, ambulance service was also including in medical service. People can use a free call in 119, 119 uses a dedicated line to call the nearest fire stations or hospitals which has shortest distance for dialing patient. The operators notify to the scene after the query map, the medical employee will also on the ambulance to do some emergent operations.

But it is hard to explicit the emergent situation, if you want to take photo or to record sound, you need to use another device. The patient also needs to confirm the situation of hand-writing script and to sign on the script. When the patient arrived at the hospital, hospital will review the entire ambulance table. If there was no health resource of patient, ambulance will send patient to the next hospital. The script of ambulance is depicted in Figure 2.

Figure 2. The script of ambulance

救護紀錄表

行政院衛生署94年7月20日衛署醫字第094020214號公告修正

派遺資料						處置項目 (此欄可複選)											
日期	年	月	日	出動單位	受案單位	<input type="checkbox"/> 救災救護指揮中心	<input type="checkbox"/> 分隊自行受理	呼吸處置	心肺復甦術	請在圖上標示說明受傷部位及其尺寸:							
出動通知時間	時	分	分	到達現場時間	時	分	分	<input type="checkbox"/> 口咽呼吸道	<input type="checkbox"/> CPR: _____分鐘								
時分	時	時	時	時分	時分	時分	時分	<input type="checkbox"/> 喉咽呼吸道	<input type="checkbox"/> 洗眼EOD	<input type="checkbox"/> 洗眼	<input type="checkbox"/> 不建議電擊	<input type="checkbox"/> 電擊 _____次					
發生地點						<input type="checkbox"/> 鼻管 _____/副口	<input type="checkbox"/> 非再呼吸器面罩	藥物處置									
送往醫院或地點						<input type="checkbox"/> 喉化吸入器面罩	<input type="checkbox"/> 靜脈輸液 [0, 90NS]	<input type="checkbox"/> 靜脈輸液 [0, 90NS]					<input type="checkbox"/> 靜脈輸液 [0, 90NS]				
病者資料						<input type="checkbox"/> 氣管內管 _____號	<input type="checkbox"/> 喉子口置鼻導管/喉	其他處置	<input type="checkbox"/> 洗滌傷口 <input type="checkbox"/> 止血 <input type="checkbox"/> 心理支持 <input type="checkbox"/> 置放生命徵象監測 <input type="checkbox"/> 協助生產 <input type="checkbox"/> ALIS支援								
病人姓名	性別	年齡	病人對物明細:	病人住址		<input type="checkbox"/> 冷熱止血法	<input type="checkbox"/> 其他 _____										
身分證字號	<input type="checkbox"/> 男 <input type="checkbox"/> 女		病人對物明細:	鄉鎮	里/村	路(街)	段	巷	弄	號	樓						
現場狀況						生命徵象											
<input type="checkbox"/> 非刺傷 <input type="checkbox"/> 呼吸困難(胸/呼吸急促) <input type="checkbox"/> 毒藥物中毒 <input type="checkbox"/> 呼吸道阻塞(異物阻塞) <input type="checkbox"/> 一氧化氫中毒 <input type="checkbox"/> 昏迷(意識不清) <input type="checkbox"/> 癲癇/抽搐 <input type="checkbox"/> 胸痛/悶 <input type="checkbox"/> 眩暈 <input type="checkbox"/> 腹痛 <input type="checkbox"/> 精神異常 <input type="checkbox"/> 一般疾病 <input type="checkbox"/> 孕婦急產 <input type="checkbox"/> 頭痛/頭暈/昏倒/昏厥 <input type="checkbox"/> 溺水 <input type="checkbox"/> 中暑 <input type="checkbox"/> 院前心肺功能停止 <input type="checkbox"/> 噁心/嘔吐/腹瀉 <input type="checkbox"/> 因交通事故 <input type="checkbox"/> 肢體無力 <input type="checkbox"/> 其他 _____						<input type="checkbox"/> 刺傷 <input type="checkbox"/> 一般外傷 <input type="checkbox"/> 胸部外傷 <input type="checkbox"/> 穿刺傷 <input type="checkbox"/> 燒燙傷 _____度 <input type="checkbox"/> 凍傷 <input type="checkbox"/> 腹部外傷 <input type="checkbox"/> 電擊傷 <input type="checkbox"/> 生物咬傷 <input type="checkbox"/> 院前心肺功能停止 <input type="checkbox"/> 非交通事故 <input type="checkbox"/> 其他 _____						時間 意識狀況 呼吸 脈搏 血壓 <input type="checkbox"/> 清 <input type="checkbox"/> 濁 次/分 次/分 mmHg <input type="checkbox"/> 響 <input type="checkbox"/> 靜 次/分 次/分 mmHg <input type="checkbox"/> 快 <input type="checkbox"/> 慢 次/分 次/分 mmHg <input type="checkbox"/> 到院後 <input type="checkbox"/> 清 <input type="checkbox"/> 濁 次/分 次/分 mmHg <input type="checkbox"/> 響 <input type="checkbox"/> 靜 次/分 次/分 mmHg					
求救原因 (主要原因) _____ 其他原因 _____ 過去病史 _____						指導說明: 備註: 線上醫師: _____ (簽章) 救護人員簽名 _____ 醫護人員簽名 _____ 拒絕送醫簽名 _____ 送醫後病人/家屬/關係人簽名 _____ 簽名欄: 一、(編號:) _____ 二、(編號:) _____ 三、(編號:) _____ 時間: _____時 _____分 聯絡電話: _____ 救護人員關係: _____ 聯絡電話: _____											
過去病史 <input type="checkbox"/> 無 <input type="checkbox"/> 心臟病 <input type="checkbox"/> 腦血管病 <input type="checkbox"/> 糖尿病 <input type="checkbox"/> 高血壓 <input type="checkbox"/> 糖尿病 <input type="checkbox"/> 慢性肺部疾病/氣喘 <input type="checkbox"/> 神經疾病 <input type="checkbox"/> 癲癇 <input type="checkbox"/> 末期腎病洗腎中 <input type="checkbox"/> 其他 _____						過去病史 <input type="checkbox"/> 曾 <input type="checkbox"/> 不曾 <input type="checkbox"/> 藥物 <input type="checkbox"/> 食物 <input type="checkbox"/> 其他 _____											

注意: 本表一式3份並應保存10年。 高雄市政府衛生局印製

第1聯: 交診醫院(紅色) 第2聯: 送救災救護指揮中心(黃色) 第3聯: 救護單位自存(白色)

the service blueprint architecture

Services design creates a valuable service for customers, hence many research of services design should be standardized structure and to create source of service value, and services design evolves the services blueprint and services flowchart, it is showing the work, policy decision, resource flows, customer and staff, and services order of services process. Building services blueprint can help designers to understand the logical process of service, and to identify possible bottlenecks of service procedures.

Services blueprint is an important tool for service flowchart, it used with the construction of architectural blueprints to render specific concept and detail design specifications (Rao, B. and Mina kakis, L. , 92). When the service blueprint is depicted, you must understand that interactive services in producing process first. By the difference between core services and supportive services, the designer can concatenate various processes together and to integrate above activities in prototype service blueprint. After this integration, we can invent a basic service and try to improve this service.

Medical facilities process of medical facilities first, this study will define in the service process all work, activity and resource flows of medical service. Service design plans to understand the original service structure and figures out where are the blind spots of developing service and the service process can be more fluent after service design.

Research Model

In order to understand how to design services for ambulance, this study proposes “STEP2” to model the service design framework. Due to service is development of People-based environment, and using some technologies such as hardware and software, and relating to process. Therefore, this study integrates Service, Technology, Environment, Process, and People (STEP2) to redefine the meanings of service design, each word of STEP2 can be illustrated as following:

- Service : Get experience opportunity of another group of under the conditions.
- Technology : Using hardware, software, and technique integrate service intention through internet and method to solve the problem.
- Environment : Service is occurring within an environment or a range of things.
- People : The human beings operate several actions in a real location and participator will be people or services provider.
- Process : The service always provides a solution for procedures to solve people’s problems and the problem always occurs in the environment.

The Figure 3 depicts the relationship among these roles in this research model.

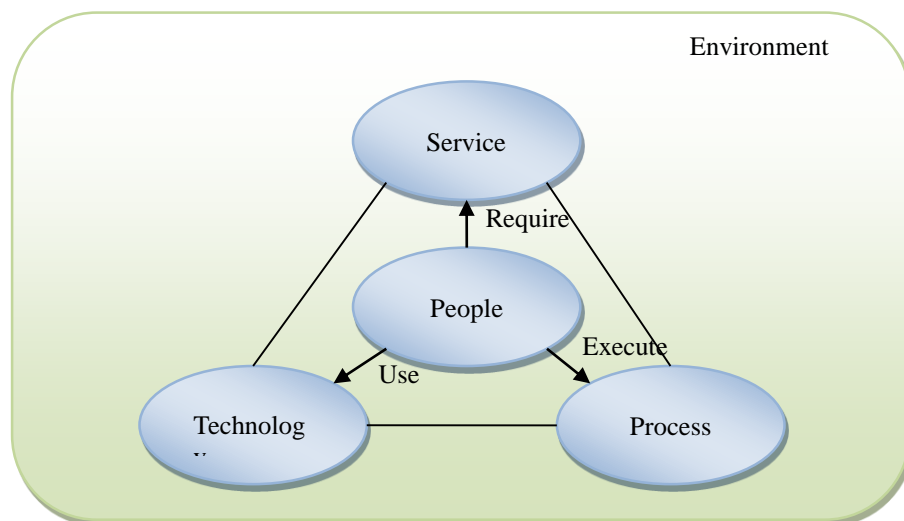


Figure 1. The research model

System Implement

According to physical situation and the research model of Figure 3, this study designs a rescue environment for emergent service architecture for ambulance. The emergent service management needs to record voice, use texture, drawing, signature and other functions in a mobile device. In addition to transfer these collective information, this service requires a database to record and there are also two databases. One is for employee of the first line information on the ambulance, the other is to integrate multiple

hospital database of patient data. In order to ensure that the information is unique, the service has to assign a random number without duplicate. And the data transfers to the hospital through mobile network. While the patient arrived at hospital, the doctor can scan the barcode on the patient’s bractle. The Figure 4 depicts the scenario of emergent service.

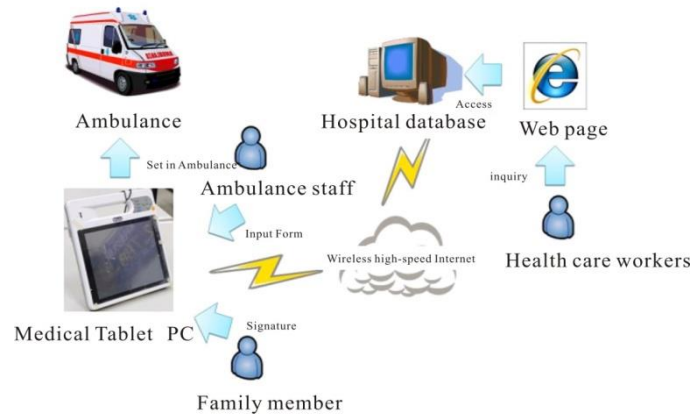


Figure 4. The scenario of emergent service.

According to Figure 4, this study designs a software framework for emergent service. The framework can be divided into two parts, one is for mobile device, and the other is used in the hospital information system. Currently, each hospitals information system is designed in different architecture, but most of them have database facilitate. This study adopts Web service to communicate with heterogeneous systems and use browser interface to show the record of patient. Therefore, you can also design different layouts corresponding to different hospitals, it solves various hospital information systems. The software framework is shown in Figure 5.

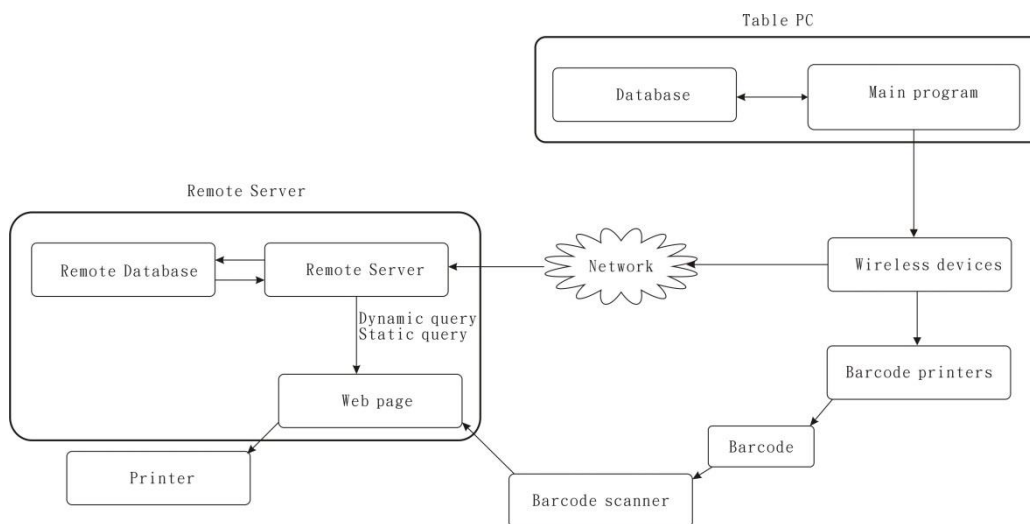


Figure 5. Software framework of emergent service

Conclusion

In this study, we design a vehicle system which could digit immediately, both reduce mistake, and send the data to hospital at the same time. It also speed up the time while data input, this data will become the basis for statistics or review. Owing to our system

that data be digit immediately. For instance, there are almost 81 thousand people take medical treatment in a year that could save more than 81 thousand papers; suppose every rescue procedure take 8 minutes, by the system could decrease more human capital cost, furthermore; hospital can advance send words and medical treatment to rescue team. But there is a necessary thing to have a Tablet PC and keep network freely flowing with a person who is mastery of the equipment, on account of some remote districts reception not well it would be an obstacle. Except the benefit this system also could decrease the 7 service mistakes made by handwriting, and let the medical rescue on the instant without lost data, both casualty get better treatment. In the future hope this scheme will be available to all ambulance and evolved into APP mode, and let the wounded have better first aid. Our system will proceed with human-based and add mobile internet such as GPS PC to Phone biometric verification and so on ;as well as invent interactive information transmission, for example the patient medical record, method of common people use or connecting doctor online; etc., to provide greater quality medical treatment.

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