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The E-Hospital Website Measure Architecture Approach: Integrating Internal and External Customers' Needs in Information Delivery Services

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ABSTRACT

The "Electronic Hospital" movement has swept across almost all the world during the last decade. This movement represents not only a new paradigm for administration and services, but also a weapon for hospital competition. According to the literature reviewed, there have been many studies focusing on the technicalities of establishing the websites so as to allow customers more appropriate access to hospital information. However, few studies have paid attention to exploring relationship management among the different stakeholders of e-Hospitals. Therefore, the objective of this paper is to integrate the concepts of relationship management among the three groups of stakeholders which are: the hospital itself, its potential customers, and its employees. In addition, a triple-diamond measure framework for hospital website which supports the relationship management and information delivery services is developed and empirically tested. Finally, a design is proposed for an e-Hospital system function model that facilitates the effective use of computers and provides a systematic way to integrate the customers' expectations. This will furnish decision makers with valuable support for information delivery services.

Key words: electronic hospital; CRM; information delivery service.

1. INTRODUCTION

The pervasive spread of the WWW has created a tremendous opportunity for providing services over internet. In the last decade, "e-Hospital" has become an important catchword. Researchers and practitioners from different fields investigate various issues of hospital administration for virtual processes. Much of current research on e-Hospitals focuses on improving efficiency and increasing performance within administration processes. But an e-Hospital is definitely more than just redesigning of customer services and using state-of-the-art-IT. (Ball, 2003) According to the recent e-Hospital research (Ellis & Schonfeld, 2001; Latifi, Muja, Bekteshi & Reinicke, 2004; Arboleda, Campuzano, Restrepo & Cartagena, 2006), even with the use of advanced IT, e-Hospitals are still left with some key problems (e.g. the problem of heterogeneous systems, the lack of customer's viewpoint and the lack of employee's viewpoint etc.). Hospitals face serious challenges, the most important of which is to offer two-way-communication services for transactions between the administration and their partners. (Anderson, Rainey & Eysenbach, 2003; Stefanou & Sarmaniotis, 2003).

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In a word, the successful implementation of e-Hospital services requires that both their internal reorganization and their external relations with customers operate in a coordinated way (Harteloh, 2003). To provide the benefits of such transaction services, a customer-centered solution is necessary (Kettinger & Lee, 1994). Yet, a comprehensive approach has still not been found. The purpose of this paper is to propose a framework for a CRM-based online customer delivery service. This study proposes the design of E-Hospital system model that facilitates the effective use of the computing capability of computers and provides a systematic way to integrate the customers' expectations; thus providing decision makers with valuable support for information delivery services. In section 2, we discuss the evolution periods of e-Hospitals and in section 3 we describe the research methods. Section 4 provides a case study and data analysis. Finally, section 5 and 6 are the discussions and conclusions.

2. E-HOSPITAL IN ACTION

As a result of various web technologies, the functionality and utility of web technologies in health care management can be broadly divided into internal and external. Internally, the web and other technologies hold promising potential as effective and efficient managerial tools that collect, store, organize, and manage an enormous volume of data and information (Gruca & Wakefield, 2004). Hospitals also can transfer funds electronically to other departments or provide information to internal employees through an intranet or internet system. In addition, hospitals can do so many routine tasks more easily and quickly. On the other hand, externally, web technologies also facilitate hospital linkages with potential customers. Information and data can easily be shared with, and transferred to, external stakeholders. According to a review of recent e-Hospital research (Ellis & Schonfeld, 2001; Latifi et al., 2004; Arboleda et al., 2006), even with the use of advanced IT, e-Hospitals are still left with some key problems which can be discussed as follows.

The problem of heterogeneous systems: The delivered services electronically assume that the sector functions as an integrated environment. One of the major problems that hospitals will encounter is that their data are usually hard to reach, being distributed in disparate and inaccessible systems across various departments. (Pitt, Waton & Kavan, 1995) The problem becomes harder when it is related to cultural resistance for information dissemination. Adequate working environments must be established where employees can access information easily, evaluate it and share their emerging knowledge with fellow colleagues. Therefore, hospital employees should be able to make the most of document management, workflow and intranet tools to assist them in this difficult task.

The lack of customer's viewpoint: Web-based customer services are generally perceived as being successful, but there has been little evaluation of how well the web meets its users' primary information requirements (Churchill, 1979). In other

words, the important point is what the customers expect, want and need, and the way they perceive, accept and judge the services of the administration (Jeong & Lambert, 2001). As an example, customers not familiar with the logic of administrative thinking will need active help in finding the information items they are searching for. Thus, the challenge for today's e-Hospital is to integrate the technological advancements for customer's benefit.

The lack of employee's viewpoint: Before the internet emerged in the late 1980s, hospitals were already actively pursuing information technologies to improve operating efficiency and to enhance internal communication. However, the focus of e-Hospitals in that era was primarily internal and managerial. (Mello, Almeida & Pereria, 2001) The internet has gradually matured into a user-friendly platform for employees to communicate directly with customers and to deliver massive quantities of information.

While there is a lack of internal customer's perspective, it becomes difficult to design and develop employee's expectations and integrate interdependent networks coordinated by regulation.

In regard to these problems, an e-Hospital can see four perspectives: employees and customers, processes (reorganization) and (tele)cooperation and knowledge. Figure 1 shows the evolution periods of an e-Hospital, which reflects the degree of interaction with users.

Phases	1st	2nd	3rd	4th	5th	6th
Description	Paper and word processing	Legacy system tracking	40% out of box tracking and escalation	75% out of box FS/D integration immature internet offerings	Integrated service	Internet computing architecture e-Hospital
Technology And Architecture	Paper and pencil	Dumb Terrane MVS CICS	Two-tier client /server Unix Windows	Browser HTML pages, limited workflow	Problem resolution hospital workflow	Three-tier JAVA Active-X and XML
Period	1970s	1980	1990	1995	2000	2005

Figure 1. The evolution periods of e-Hospital.

In Figure 1, the first stage is "Paper and word processing," it only a basic face to face service with customers. Stages 2 and 3 are "Computer-assisted," where customers' data are collected artificially. Stages 4 and 5 are "IT-automated." Because of the Internet, the target of stage 4 is to improve the management of customer satisfaction and is calculated technically by statistical software programs which also combine the database structure. In order to rapidly respond to customers' requests, the computer and Internet are essential to speed up the

processing of these requests and let customers get what they need. The target of stage 5 is the management of customer accounts and orders. In the final stage, hospitals use ingenious information system to provide a personalized service for customers. Through the function of a think-tank and the Internet, hospitals integrate all dimensions of information and reach the goal of customer personalization management.

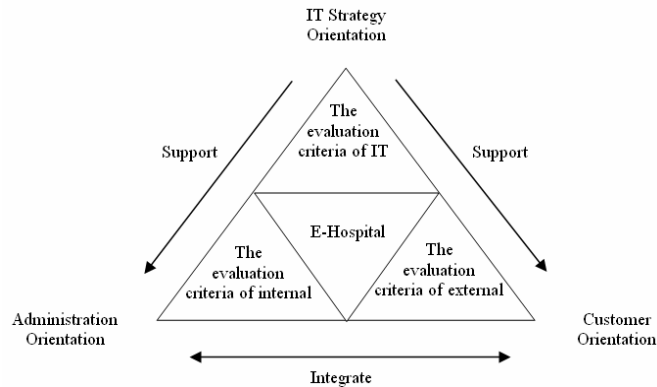


Figure 2. The triple-diamond website measure framework of an e-Hospital.

However, the framework just simply provides an exploratory conceptual tool that helps one understand the evolutionary nature of an e-Hospital. The crucial problem, not yet completely addressed, is the challenge of developing an evolutionary architecture to integrate large heterogeneous systems and to meet the requirements of customers. Frequently, crafting an architecture involves not only reengineering technological systems according to a hospital's needs, but also reengineering the administrative processes that provide services to customers (Mieczkowska, Hinton & Barnes, 2004).

3. RESEARCH DESIGN

Based on the above discussion, the challenge for today's e-Hospital is the need to integrate the technological advancements for the customers and employee's benefit (Randeree & Rao, 2004). In order to develop a measure framework for e-Hospitals, a systematic approach is used. Figure 2 shows the triple-diamond website measure framework of an e-Hospital, which consists of three functional orientations: IT strategy orientation, customer orientation and administration orientation which offer transport, basic and cooperative services with each other.

IT strategy orientation: Basically, the central issue of an e-Hospital is applying IT in information activities, in order to redefine and improve existing administration services. IT is used in a broad sense of information resource

configurations referring to IT handling techniques (storage, processing, transport, capturing and presentation) of data including text, sound and visual images and knowledge. It is an intermediate technology or communication gateway, enabling electronic interaction between actors. Therefore, the sector needs to understand the role of the new technology in information service delivery, aiming at developing inter-organization cooperative information systems supporting e-Hospital actions.

Customer orientation: Hospital support and assistance should be available anytime to aid the potential visitor as a valuable customer, reflecting the fact that a hospital respects the customer. However, referring to potential patients as customers reflects the attitude that a hospital must have when it interacts with patients. It is meant to acknowledge that issues such as customer satisfaction, fulfilment of needs, quality of service etc. should be part of an e-Hospital's mentality and practice.

Administration orientation: This study suggest that hospital administrations face serious challenges and requirements both as regards their internal reorganization and their external relations with customers. A successful IT implementation of e-Hospital services requires the internal and external components to be developed in a coordinated way. Therefore, their tasks can be better structured, and employees can concentrate on improving the quality and performance of their process workflows. For this purpose, the employee-oriented design goes one step further by categorizing information and services on the Web according to the needs of different departments or work groups.

Therefore, hospitals have to rethink their existing services and possibly create new ones. These services must be developed in a way accessible to all customers, easy to use and based on delivery channels assisted by advanced technological means, requiring a evaluation of the hospital's processes.

When customers perceive that the information meets their needs and requirements, they are willing to criticize the value of each product or service based on their purchase decision criteria. Thus, determining customers' perception of information delivery quality on the web is a primary stage in assessing their potential behavior. Customers' attitudes toward accepting the hospital's website was constructed with the combined effect of three measurement scales: customer, administration and IT. For this reason, an established scale was used, and a customer-focus performance evaluation scale system for the hospital's website was measured by using 22 positively worded items from the e-Hospital performance evaluation scale (see Table 1). In order to develop an employee-focus performance evaluation scale for a hospital's website we firstly define 12 dimensions for a hospital information delivery service from a literature review and experts' opinions. The 51 items of the 12 defined dimensions are named "ease of use," "ability," "reliability," "communication," "safety," "understanding," "form," "classification & frame," "approachability," "information quality," "useable" and "maintainable." With growing interest in the evaluation of internet information resources, many sets of criteria have been proposed for the evaluation of websites (Marche & McNiven, 2003; Seilheimer, 2004). In order to develop the criteria used for the evaluation of a hospital's website. This study has adapted the related literatures and concluded the

IT measurement, which identified five dimensions (e.g. security, the constructional capacity of the network, data processing, performance, database system) and 32 attributes (Table 2).

Table 1. *The criteria for customer delivery service quality & measure at Hsin-Chu General Hospital*

Customer-focus performance evaluation scale system for hospital's web site (Cronbach $\alpha=0.8988$)	
1	I'm satisfied with the query system.
2	The hospital website informs me of the status of business processing.
3	I can find the information to meet my needs via the hospital website anytime.
4	It can actively accomplish all the related applications to various offices under my authorization.
5	All of the functions & service items can be operated normally.
6	The web site is equipped with a confidential service.
7	The web site is equipped with a plan for identification.
8	There is no need to worry about personal information being used illegally by others.
9	There is no need to worry about hospital not having received my register.
10	The Q&A column of the hospital web site answers common questions.
11	Information offered by the hospital website meets my needs.
12	From the image introduction of the hospital website it is easy to find information.
13	Information provided by the hospital is organized and classified.
14	The hospital website provides me with the latest news of the hospital.
15	The image introduction of the hospital website helps me to classify related businesses.
16	Information on the hospital web site is easily understood.
17	The organization of the hospital website plans teaching activities to help me access to the service of the hospital website.
18	The hospital web site provides me with a channel to express myself.
19	Through letters, ads, and activities etc., the hospital informs me of the network service.
20	I know that I have an equal opportunity to access the service provided by the hospital website.
21	There are staff to respond to my opinions and questions on the website.
22	There is no difficulty for me to find the connection to the hospital website.

Table 2. *The measurement of website delivery service quality*

Dimension	Attribute	Index	Result	
Security	1 Fire wall	Y/N	N/A	
	2 Backup and Load equation	Y/N	N/A	
	3 Routine test and Monitor	Y/N	N/A	
	4 Standard Operation Procedure	Operating manual		N/A
		Obey communication protocol		N/A
	5 System monitor software	User access log analysis		YES
		User route log analysis		N/A
		User flow analysis		N/A
	6 Privacy	Selectivity		N/A
		Fire wall function		N/A
		Privacy announce		NO
		Accessible		NO
		Encryption		N/A
		Public key recognize system		NO
	7 Authority	Independent supervise faculty		NO
		Copyright announce		YES
		Relief regulation		NO
	8 Completeness	Data-guard supervisor system		NO
Version declare			YES	
Digital Signature			NO	
9 Undeniable	Id/No. Check		YES	

Table 2 (continued).

Dimension	Attribute	Index	Result
Network Capacity	1 Performance analysis	Low bandwidth Support	YES
	2 Quality service	Proxy server provide	NO
Data Processing	1 Reliable	Renew update	YES
		Full linkage execute	NO
	2 Rapid	Provide pure-text page	YES
		Download file within 15 seconds	YES
	3 Managerial efficiency	Show a message for wrong linkage	NO
		Backup function	N/A
	4 Free from suffering	Make a recovery plan	N/A
		24x7service	NO
	5 Search	Keyword search	NO
		Advanced search	NO
	6 Publish	Classify function	NO
		Download function	YES
	7 Related data linkage	Print function	YES
		Basic data support	YES
		Site map	NO
		News	YES
8 Index	Subject matter	NO	
	Outline all functions	NO	
	Provide the interpretation	NO	
Operating Performance	1 Speed	Reasonable average response time	22 Sec.
		Fit in with 3 clicks	NO
		E-mail response within 2 days	N/A
	2 Consistency	Webpage name accords with content	YES
		Same format	YES
		Right information	YES
	3 Elasticity	Multi-format download files	NO
		Linkage to homepage	YES
		Support for other browsers	YES
	4 Malfunction service	Phone Service	YES
		Linkage to webmaster	NO
	5 Communication	Audio clip	NO
		Video clip	NO
		E-mail Service	YES
		Chat	NO
		FAQ	NO
E-newspaper support		YES	
6 Effortless	Community or not	NO	
	Site map	NO	
	Website guild	NO	
	URL accord with content	YES	
	No complex URL	YES	
	Use the ranking record	NO	
7 Linkage portal	Content search function	NO	
	Y/N	YES	
Database System	1 Usability	Click No. v.s Access No.	NO
		Several file formats for download	NO
	2 Expandable	FTP function support	NO
		Whether customizable or not	NO
	3 Multilanguage support	Y/N	NO
	4 English support	Y/N	YES
5 Easy backup	Y/N	N/A	
6 Update function	Y/N	YES	

Table 3. *The criteria for employees delivery service quality & measure at Hsin-Chu General Hospital*

Employee-focus performance evaluation scale system for hospital's website (Cronbach $\alpha=0.8959$)	
1	This website improves my working quality.
2	This website saves me working time.
3	I feel that this website can improve my working efficiency.
4	The information provided by the web site meets my working needs.
5	Through the website, I can respond to the questions and opinions from customers.
6	Through the web site, I can transfer and organize information from various organizations and customers.
7	The e-Hospital handles my problems correctly.
8	I can contact the Webmaster easily to inform about website problems.
9	Fast response from the customer service to my query.
10	During the use of the website, I have clear ideas of the steps and expectations of coming results.
11	The titles and contents are consistent and they are connected efficiently.
12	I won't see wrong content and information.
13	All of the characters and illustrations can be presented normally during my access to the web site.
14	I trust the content provided by the website.

Next, for the external customer, this study organized a panel of coders composed of 98 college students to conduct structured content evaluation of the website of Hsin-Chu General hospital, to define the concepts perceived from customers' perspectives. Subjects were given a 30 min training session to familiar themselves with the websites of Hsin-Chu General hospital. Scales were developed for measuring each of the attributes in the Tables 1 and 3. For each scale, students were asked to express the degree to which they agree with the state on a 1-4 scale with "1" representing disagree completely and "4" agree completely. Ninety-eight subjects handed in their responses and all of them were valid. Second, for the internal customer, we conducted 40 structured interviews with administrative employees of Hsin-Chu General hospital. A customer's perception of information quality is presumed to affect their intention and acceptance to use web information positively. In this part, attitude measures were developed by asking respondents to rate each attribute on a 4-point semantic differential scale by ascending from "not at all agree" to "very agree." Finally, IT quality was represented by the five constructs: Security, Network capacity, Data Processing, Operating performance and Database system. In order to discriminate the different levels of each construct, they were marked with "yes," "no" or "N/A (Not Available)."

4. DATA ANALYSIS

Of the 98 external customer, 63 (64.3%) were males. The subjects between the ages of 20 and 29 comprised 87.6% of the sample. As shown in Table 5, customers' intention to use an e-Hospital website was directly and positively affected by their perceptions of "Understanding." "Safety," received a lower average score, followed by the attributes, "Response," "Friendliness,"

“Communication.” Second, for the internal customers, of the 40 respondents, 80% had technical jobs, and 20% were in administrative positions. The results are shown in Table 6. In the light of the IT quality, we study the features that are available at Hsin-Chu General hospital website. Regarding this criterion, the results are shown in Table 4.

Table 4. *The criteria for IT delivery service quality measure at Hsin-Chu General Hospital*

1. Security criteria	4. Operating performance criteria
1.1 Fire wall	4.1 Speed
1.2 Backup and Load equation	4.2 Consistence
1.3 Routine test and Monitor	4.3 Elasticity
1.4 Standard Operation Procedure	4.4 Malfunction service
1.5 System monitor software	4.5 Communication
1.6 Privacy	4.6 Effortless
1.7 Authority	4.7 Linkage portal
1.8 Completeness	
1.9 Undeniable	
2. Network capacity criteria	5. Database System criteria
2.1 Performance analysis	5.1 Usability
2.2 Quality service	5.2 Expandable
	5.3 Multilanguage support
3. Data Processing criteria	5.4 English support
3.1 Reliable	5.5 Easy backup
3.2 Rapid	5.6 Update function
3.3 Managerial efficiency	
3.4 Free from suffering	
3.5 Search	
3.6 Publish	
3.7 Related data linkage	
3.8 Index	

Table 5. *The average and variance of customer's response*

Attribute	Average	Variance
Friendliness	2.60	0.65
Response	2.57*	0.67
Ability	2.92	0.44
Reliability	2.76	0.62
Communication	2.60	0.59
Safety	2.44*	0.65
Understanding	2.41*	0.57
Search	2.73	0.61
Channel	2.78	0.58
Information Quality	2.88	0.50
Equitable	3.01	0.59
Total	2.60	0.65

The coefficient alpha estimation of customer-focus performance evaluation scale system was 0.8988. These 22 items were divided into 3 dimensions, which were respectively named “systemic ability,” “website design” and “promotion.” In order to verify the employee-focus performance evaluation scale for the website, we invited experts to examine the content validity, and conducted a field study in

Hsin-Chu General hospital. Based on the results of factor analysis, we found that three dimensions, which are respectively named “usability,” “responsiveness,” and “reliability,” can represent the proposed scale (see Table 7). A Cronbach α analysis revealed that each dimension and the scale have high reliability, ranging from 0.7567 to 0.8832 (see Table 8). The Cumulative Variance explained was 0.68717. Finally, 14 employee-focus performance evaluation scales were developed to assess the website. The individual questionnaire items used to construct the scales in the analysis are shown in Table 3.

As shown in Table 9, the results of analyzing the existing website of Hsin-Chu General hospital are divided into three parts. The most common disagreements observed on the website are lack of navigation support, design inconsistency, overly long reaction times, lacking a foreign language version, orphan pages, security issues, and lack of biographies. Many of the above mistakes are interrelated and symbolize the failures of coordination between the different phases of the website development. Most importantly, all of them could cause serious integrated problems on the usability and endanger the effort of this hospital. Hence, to ameliorate these problems, a formal strategic planning needs to be implemented and suitable IT measures need to be adopted.

Table 6. *The average and variance of employee's response*

Attribute	Average	Variance
Ease of use	2.91	0.57
Ability	2.72*	0.63
Reliability	2.94	0.56
Communication	2.71*	0.53
Safety	2.72*	0.59
Understanding	2.95	0.50
Form	2.97	0.52
Classification & Frame	2.81*	0.58
Approachability	2.98	0.48
Information Quality	2.86	0.46
Maintainable	2.63*	0.63
Total	2.84	0.55

Table 7. *Results of the exploratory factor analysis (internal customer)*

Dimension	Items	Communality	Factor Loadings	Cumulative Variance explained
Usability	23	0.768	0.878	26.694%
	34	0.703	0.804	
	11	0.613	0.767	
	14	0.672	0.743	
	28	0.644	0.705	
	37	0.640	0.617	
Responsiveness	26	0.793	0.856	52.220%
	24	0.724	0.782	
	47	0.603	0.742	
	25	0.688	0.735	
	27	0.683	0.705	
Reliability	48	0.724	0.804	68.717%
	15	0.684	0.788	
	43	0.663	0.707	

Table 8. Results of reliability test (internal customer)

Dimension	Reliability Coefficients (Alphas)	Total-Scale Reliability
Usability	0.8832	
Responsiveness	0.8686	0.8959
Reliability	0.7567	

Table 9. The results of analysis of the website of Hsin-Chu General hospital

Citizen orientation	Administration orientation	IT orientation (selected No)
- Channel (75%)	- Perceived ease of use (75%)	- Security (privacy, authorization)
- Reaction (73.5%)	- Trustworthy (65.6%)	- The constructional capacity of network (proxy server offer)
- Connective (68.7%)	- Ability (59.4%)	- Data processing (linkage, 24x7 service, search engine, Web map, index)
- Trustworthy (68.4%)	- Classification (59.4%)	- Performance (format, communicable, perceived ease of use)
- Perceived ease of use (61.7%)	- Approachability (59.4%)	- Database system (usefulness, expandable function, customized, multi-lingual)
- Ability (59.4%)	- Information quality (59.4%)	
- Safety (59.4%)	- Format (50%)	
- Search (53.1%)	- Maintainable (50%)	
- Equitable (53.1%)	- Communicable (43.8%)	
- Friendly (44.1%)	- Usefulness (40.6%)	
- Information quality (43.8%)	- Perceived ease of use (31.3%)	
	- Safety (28.1%)	

5. DISCUSSION

In order to identify the success of the e-Hospital action, the e-Hospital measurement framework was proposed as in Figure 3 and described as below.

External Customer: IT holds great potential to improve the interface between hospital and customers. The information may comprise simple “where-to-go,” detailed information regarding delivery service, support for customers searching processes or even general everyday information. For example, customers who are not familiar with the logic of administrative thinking will need active help in finding the information. Therefore, by way of external customer criteria for the evaluation of website, the goal is to move constituents to this new channel while continuing to provide excellent service through the internet.

Internal Customer: In the e-Hospital domain, for information sharing over the network, the internal customer criteria for the evaluation of a hospital’s website will play a crucial role for realizing the expected revolution. Similar to the customers, the employees do not only search and access information, but also communicate and operate to fulfill the administrative processes with others through the website. The websites also support employees demands when accomplishing their tasks.

IT Strategy: For the purpose of co-operation, autonomous machine agents should be available. This will support employees demands when accomplishing their tasks. In addition, these IT elements need to be tightly integrated and need effective analysis by the information technology criteria for the evaluation of websites. The successful elements are highly dependent on the effectiveness of the other elements.

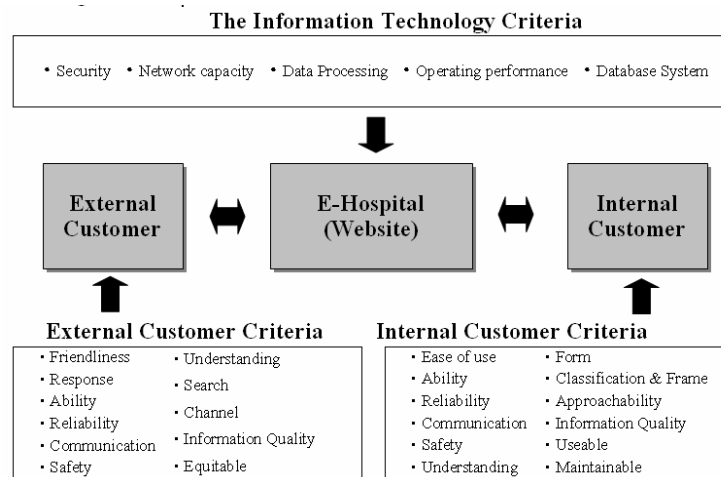


Figure 3. E-Hospital measurement framework.

These elements must be integrated in a seamless fashion. While each of these IT elements has obvious advantages, it is the relationship among these elements that provides a hospital with the potential to effectively interact with its customers. When a hospital's information strategically links together with these key elements, it produces an atmosphere of customer interaction where the product is greater. As mentioned above, the e-Hospital is a new management concept that relies heavily on technology and process automation to create its environment. However, to create such an environment will entail change. Berry (1995) referred to technology's role in customer delivery service as 'high touch through high tech'. Information technology can be used in both manual and automated customer interactions. Figure 4 shows the e-Hospital website function model, which consists of two components offering transport, basic and co-operative services.

5.1 Automated Interaction

The key to the automated service encounter is to pass the control of interaction process to the customer (see part I of Figure 3). Technical infrastructure is a key consideration when a hospital designs its automated interaction strategy. This will consist of a telecommunication network and terminal equipment and can be internal or external to the hospital.

Customer Use Interface (CUI): IT holds great potential to improve the interface between hospital and customers. The information may comprise simple 'where-to-go', detailed information regarding delivery service, support for customers searching processes or even general everyday information. Therefore, the Web-Interface presence is well suited to new efficiencies afforded by e-Hospital, and the goal is to move constituents to this new channel while continuing to provide excellent service through the internet.

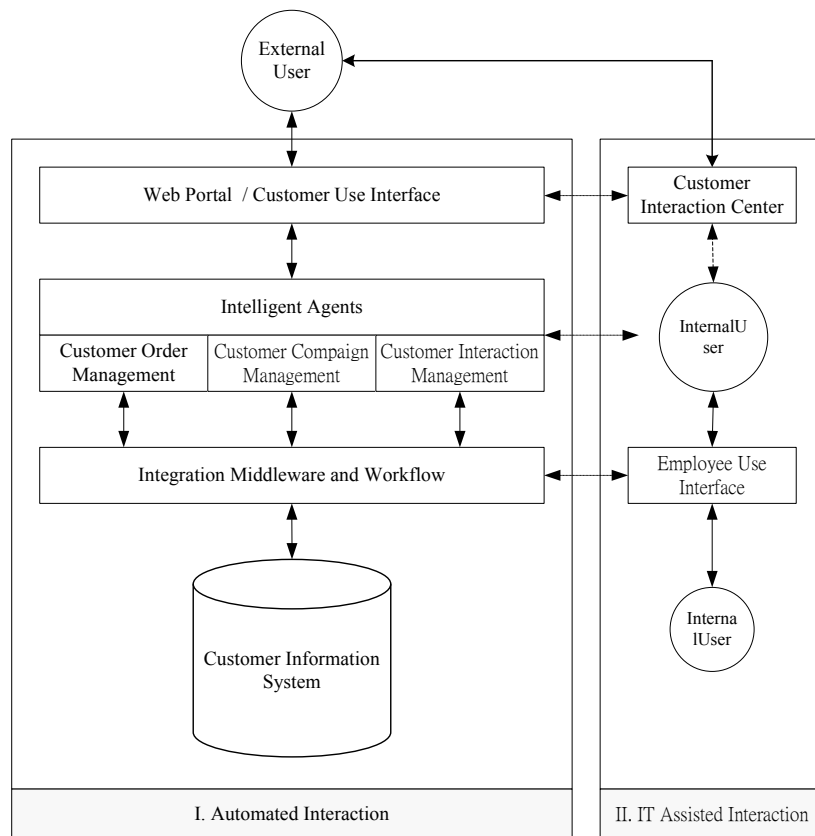


Figure 4. E-Hospital system function model.

Intelligent Agents (IAs): IAs are the customer interface architectural sub layer, as are sets of customer-facing function logic that assist customers in conducting complex, multistage transactions or sets of transactions. Generally, these transactions represent events that have known, typical lifecycles; IAs assists the customer through the life cycle, over application boundaries, and over time (stop and start) and channels. IAs are the electronic equivalents of knowledgeable service clerks.

Integration Middleware and Intermediation Hub (IM/IH): A key function of this part is the ability to match customers to their records to ensure a unified customer history. Hospitals must develop metadata definitions for customer name and address data elements that are used consistently across databases. Ideally, updates such as change of address should be dealt with one time, with revisions made available to all systems that rely on this data. Besides, information delivery services provide functionality to multiple agencies or applications' shared services.

Customer Information System (CIS): IT's impact on customer services has been studied based on the MIS and marketing disciplines. With respect to IT, there have been those who have focused on how data integration and customer support activities can be a foundation for improving a hospital's ability to serve customers effectively. Within the content of this part, CIS is defined as the acquisition, storage, and distribution of customer information. In addition, the desired end result is to increase profitability and customer satisfaction by getting the right campaign information, order information, and interaction information to targeted customers. In hospital, the goal is about getting the right information to the customer, while the analytical focus is on improved delivery service and more efficient internal operations.

5.2 IT-Assisted Interaction

IT-assisted interaction is predominantly a manual process that uses IT to enhance the relationship between the service provider and the customer (see part II of Figure 3). This will consist of a customer interaction center and employee use interfaces, which can be mentioned as follows:

Customer Interaction Center (CIC): Providing customer service over the web is a given, but as expectations expand, customers' demand for self-service options will cross over to non-Internet channels. Therefore, the complexities of anticipating and responding to customers increase and robust customer interaction centers become even more essential. A Customer Interaction Center should concentrate on providing a framework for supporting applications that solve administration issues, rather than satisfying the urge to deploy point solutions.

Employee Use Interface (EUI): In an e-Hospital domain, for information sharing over the network, the EUI plays a crucial role in realizing the expected revolution. Similar with the CUI (Customer Use Interface), through the website, employees not only search and access information, but they also communicate and operate to fulfill the administrative process with others. For the purpose of co-operation, autonomous machine agents should be available that will support officials on demand when accomplishing their tasks.

The previous discussion highlights the fact that these IT elements need to be tightly integrated. The success of either element is highly dependent on the effectiveness of the other element. It is our contention that for a hospital to maximize its ability to interact with its customers, these elements must be integrated in a seamless fashion. While each of these IT elements has obvious advantages, it is the relationship among these elements that provides a hospital with the potential to effectively interact with its customers. When a hospital strategically links together each of these key elements, it produces an atmosphere of customer interaction where the product is greater than the sum of its parts.

6. CONCLUSIONS

This paper examines the emerging issue of e-Hospitals in a Web-based system function framework. By investigating local hospitals in Taiwan, the survey results show that customers' requirements are significant factors in the implementation and development of e-Hospitals. According to the results of this study, the data also raises a number of issues relevant to e-Hospital policymakers and practitioners. This study also proposes an evaluation framework for an online customer information delivery service support. In this evaluation framework, there are obvious interrelationships that are necessary for a hospital to realize the benefits of becoming an e-Hospital. We suggest that future research should assess the extent to which this model is validated by e-Hospital reality, in particular the way in which the model develops from initial rhetorical intentions through strategic planning, systems development, integration to final transformation. Such innovations may well change hospitals as we know them today. In addition, the result can be used by decision-makers as a guidance and direction for architecture development, to reduce the complexity of the progression of e-Hospital initiatives, to communicate changes to the rest of the organization and to provide milestones to evaluate and control cost of architecture development.

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