Association for Information Systems

AIS Electronic Library (AISeL)

Critical Factors Influencing the Extent of Customer Relationship Management Systems Adoption in Hospitals

Shin-Yuan Hung

Wei-Hsi Hung

Chia-An Tsai

Shu-Chen Jiang

CRITICAL FACTORS INFLUENCING THE EXTENT OF CUSTOMER RELATIONSHIP MANAGEMENT SYSTEMS ADOPTION IN HOSPITALS

Shin-Yuan Hung [1], Wei-Hsi Hung [2], Chia-An Tsai [3], and Shu-Chen Jiang [4]
Department of Information Management National Chung Cheng University, Taiwan, R.O.C
[1]syhung@mis.ccu.edu.tw; [2]fhung@mis.ccu.edu.tw; [3]homeanking@gmail.com;
[4]cindralla@mis.ccu.edu.tw

Abstract

Customer relationship management system (CRMS) is an innovation technology which has dramatic impacts on healthcare quality and customer satisfaction. Although the critical factors for the adoption of information systems have been identified in prior studies, few of them specifically explore the extent of CRMS adoption in hospitals. To fill this gap, this study proposes an integrated model that incorporates both organizational and system related factors as primary determiners the extent of CRMS adoption in hospitals. A series of survey were conducted with three levels of health institutions including medical centers, regional hospitals, and community hospitals in Taiwan. The results indicated that hospital size and complexity have significant influence on the scope of CRMS adoption, and also indicated that hospital size, complexity and compatibility have significant influence on the depth of CRMS adoption in hospitals. These findings provided fruitful implications for both associated academics and practitioners.

Keywords: Customer Relationship Management; Information Systems Adoption; Hospitals

Introduction

American College of Healthcare Executives [2] identified a list of top issues confronting hospitals based on a survey among 1,080 hospitals in 2007. Three of nine issues concerned by the CEOs are related to customer relationship (care for the uninsured, physician/hospital relations and customer satisfaction), and interestingly, they were also on the top nine in the previous two years. Customer relationship management (CRM) for healthcare providers is a method to learn all they can about their customers and prospects, to communicate relevant, timely information to them, and to track results to make message and program adjustments as necessary [5].

In Taiwan, the National Health Insurance [24] system funded by the government in Taiwan covers nearly all of the country's population because it is a compulsory insurance for all citizens. This gives insured customers a much low access fees for various healthcare services, and in turn, has resulted in customers choosing the hospital by their favorites rather than price.

Due to customers can freely choose the healthcare providers and medical institutions without facing the financial burden, the expense of medical services is no longer a priority consideration when customers seeking the healthcare providers and medical institutions in Taiwan. Customers are attempting to address their concern on the satisfaction of medical services provided by Taiwan's hospitals when making a decision on choosing healthcare providers.

The cost of retaining existing customers is well below the cost of acquiring new customers. Better customer relationship and satisfaction can facilitate the hospitals to keep their existing customers and thus save their cost. CRM system (CRMS) is a software-based approach which used to capture customer information and maintain customer relationship. Many hospitals expect CRM application to provide services which can meet their customer need. Therefore, the application of CRMS is becoming more important in healthcare sectors.

A number of studies focused on exploring the factors affecting the adoption of CRMS in various industries, for example, financial servicing [15], fashion [17], and manufacturing industries [40]. Although these studies found some factors or characteristics, the applicability of these factors in the healthcare context is questionable. Medical customers sometimes need to be considered differently from business clients because they actually expect to receive more care than business customers, such as anticipating doctors to remember their attitudes and expectations [23].

American Hospital Association [3] indicated that nearly half of studied community hospitals reported moderate or high usage of information technologies (IT) for quality of care in 2006, compared to a response of 37 percent in 2005. Despite the increased usage of IT in hospitals, few studies specifically explore the critical factors for the extent of IT adoption. Once critical factors influencing the extent of CRMS adoption are understood, hospitals can develop better strategies to popularize CRMS usage and minimize resistant.

This study proposes an integrated model to investigate the critical factors for the extent of CRMS adoption in hospitals. We proceed with a

review of the literature. Then, a research model for investigating the extent of CRMS adoption is constructed, as followed by the research method, data analysis and results. Finally, this paper summarizes the research findings and provides implications for associated academics and practitioners.

Literature Review

Customer Relationship Management

Researchers viewed CRM from both managerial and technological perspectives. From a managerial perspective, Tiwana [35] believed that CRM is a process which manages the relationship with current customers and selectively retain newer customers in order to enhance customer loyalties, and increase customer profitability. Swift [32] believed that CRM is an organizational method which is used to improve customer acquisition, customer retention, customer loyalty, and customer profitability through a meaningful way of communication that understands and influences customer behaviors. Peppers and Rogers [25], from a narrower and IT oriented perspective, believed that CRM is a one-to-one marketing which utilizes computer technologies, such as database, interactive technologies, and mass production in order to develop and manage the learning relationship existed between customers and organizations.

CRM was originated from relationship marketing. Over the past 50 years, marketing strategies and practices have changed dramatically, from public marketing to one-on-one marketing. In order to sustain a long-term relationship with customers, Peppers et al. [26] believed that organizations should establish a long-term and continuous "learning relationship". Organizations could utilize a variety of technologies for CRM purpose, such as database management systems, Internet, data warehousing, online analytical processing (OLAP), data mart, data mining, and Call Centers. Supportive technologies include various kinds of interactive media, for example, telephone service centers, Web sites, sales automation, automation on the point-of-sale, which allow customers to specify what types of services they desire.

CRM and Supporting Systems in Hospitals

CRM in healthcare industry has three characteristics. Firstly, customer knowledge management is a basis. Wayland and Cole [38] believed that CRM is the use of effective knowledge and experience to acquire, develop, and maintain customer relations. Medical services are involved with a variety of professional medical service personnel, which is a knowledge-intensive industry. Thus, it is essential for medical institutions to manage customer related knowledge.

Secondly, the use of IT is the sufficient condition for implementing CRM that also helps the implementation of CRM and relationship marketing. An effective CRM requires a synergistic integration of strategies, people and technologies of an organization [28]. Customer knowledge database is the foundation for carrying out a customer demand analysis and forecast, active interaction, and marketing automation. Medical service providers particularly need to control and access to a large amount of customer information if they are involved in the National Health Insurance systems. Currently, most of medical institutions are utilizing electronic mediums to declare their cost [7]. This shows that the medical institutions must already have IT hardware, software, and infrastructure which are able to record, store, and transform their service information electronically.

Thirdly, the CRM in healthcare industry seeks to obtain customer loyalty and the lifelong value. In regard to customer loyalty, organizations which implement CRM consider two important effects. First, the effect derived from the number of customers. If the organization can increase customer retention rate, then substantial future revenue growth will occur from the repeat customers [6]. In medical institutions, loyalty indicators, such as the customer return rate, can show how satisfied and loyal the customers are [13]. With no difference to other types of organizations, the higher customers return rate, the more profits the hospital will have.

Although the disease has been cured this time, it is with no guarantee that this customer will not be sick anymore. Moreover, some sequels are left after treatment of some diseases, and resulted in continued treatment or follow-up rehabilitation. Facing some diseases, the customers are usually unable to be cured completely in one treatment, and need continuously tracking and treatment, such as hypertension, and diabetes. Therefore, it is strategically and economically important for healthcare providers maintain a high-quality and long-term relationship with customers.

Antecedents of CRMS Adoption in Hospitals

From the organizational perspective, the discussion of IT adoption is based on the characteristics of the technology and the organization. Thong [34] believed that it is necessary to examine whether large and small environments affect the adoption of innovative IT. In addition, Thong [34] also believed that the characteristics of executives, innovation, and organization could affect the adoption of IT.

Kimberly and Evanisko [16] suggested that several factors affect innovative adoption: characteristics of the leaders of organizations, characteristics of the organization, and characteristics

of the environment. Tornatzky and Fleischer [37] also have similar view and believed that the background of technological innovation includes three major elements: organizational, technical, and environmental backgrounds. Rogers [30] defined innovation as an idea, event, or an object. These ideas, events, or objects are perceived by an entity or adoption unit as a new item, that is, innovation. Rogers [30] also believed that the characteristics of innovation are important background factors for introducing IT.

Research Model

This research tries to examine what factors affect the extent of CRMS adoption among hospitals, and summarized the factors into two categories: characteristics of organization and characteristics of CRMS. The proposed model is sown in Figure 1.

A significant number of pervious studies based on technology, organization and environment (TOE) framework have already explored the critical factors on IT adoption [7, 8, 18, 41]. Diffusion refers to the spread of innovation within the organizations. As organizational and information systems contexts are playing a pivotal role in this study, this study summarizes the factors which influence the extent of CRMS adoption as characteristics of organization and characteristics of CRMS.

```
┌─────────────────────────────────────┐
│  Characteristics of Organization    │
│  • Size of Organization             │
│  • Innovation of Senior Executive   │
│  • Knowledge Management Capabilities│
└─────────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────────┐
│      The extent of CRMS adoption    │
└─────────────────────────────────────┘
              ▲
              │
┌─────────────────────────────────────┐
│  Characteristics of CRMS            │
│  • Relative Advantage               │
│  • Complexity                       │
│  • Compatibility                    │
└─────────────────────────────────────┘
```
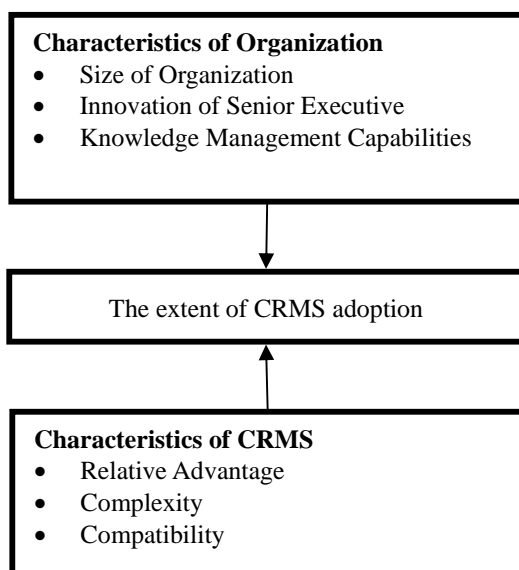
Figure 1. Research Model

The government meddling is disregarded in this study since the government in Taiwan does not establish the explicit assistance policies and grant program for CRMS adoption currently. In addition, the external environmental context is also uncovered in this integrated model. The reason is that the study subjects of this research are the hospitals ranked as

medical centers, regional hospitals, and community hospitals. Since the competition among hospitals is originating from the same rank of healthcare organizations, when the hospitals are from different ranks, the contexts of external competition will be explained differently.

This study views CEO characteristics as a part of the internal organizational characteristics. Zhu et al. [41] proposed that the leadership characteristics can be viewed as specific internal organization properties. In comparison with Thong 's [34] research model, the model of this study considers the variable of innovation of senior executive as one type of organizational characteristics and disregards the variable of senior executive's IS knowledge. Regarding to IT adoption in hospital, CIO is more suitable than other managers for responding our questionnaire. Yet, CIOs normally have stronger backgrounds on IT than the other managers in the organization and have more opportunities to upgrade their IS knowledge after IT adoption. Letting CIOs evaluate the senior team's IT knowledge or IT capabilities objectively is more likely to be impossible. Thus, this study abandon the measure for the variable of senior executive's IT knowledge, and respectively this variable is excluded from the aspect of characteristics of organization in our research model.

Research Hypotheses

Dewar and Dutton [10] and Moch and Morse [22] believed that a large-scale organization has more resources and infrastructure to promote innovation. Welsh and White [39] also argued that small businesses usually suffer more restrictions, such as lack of resources, financial constraints, lack of experts, and management with short-term insight. Baldridge and Burnham [4] and Lind et al. [21] placed speculation that large organizations have more potential than small ones to the use of information systems because of their large-scale operations. Thus, the size of organization is positively related to the scope and depth of CRMS adoption.

H1a: hospital size will be positively related to the scope of CRMS adoption.

H1b: hospital size will be positively related to the depth of CRMS adoption.

Thong [34] believed that the characteristics of senior executives in organizations affect the adoption of IS. Rizzoni [29] believed that the senior executives in organizations are the critical person to determine the organizational attitude toward innovation because these executives are usually owners and important policy-makers. Generally speaking, the change of organizations depend not only on its size and market factors, but also the ability of senior executives, his or her preferences, and his or her readiness to prompt.

H2a: innovation of senior executive will be positively related to the scope of CRMS adoption.

H2b: innovation of senior executive will be positively related to the depth of CRMS adoption.

The meaning of knowledge management capabilities is that organizations based on reliable information capture, manage, and transmit real-time customer product and service information organizations in order to enable organizations a rapid decision-making to improve customer response [1, 14]. Therefore, Skyrme and Amidon [31] proposed that it is important for organizations to work on the development of knowledge management and having adequate capacities to manage knowledge in order to respond to dynamic global economy.

H3a: knowledge management capabilities will be positively related to the scope of CRMS adoption.

H3b: knowledge management capabilities will be positively related to the depth of CRMS adoption.

Rogers [30] defined perceived characteristics of the innovation based on what affects the adoption of innovation of the organization implementing the innovation. In Rogers' innovation diffusion theory, he believed that the formation of a personal attitude towards innovation as a cause of a decision to adopt or reject, to decide whether to adopt or implement an innovation. According to the characteristics of innovation in the innovation literature, Tornatzky and Klein [36] defined relative advantage, compatibility, and complexity based on the innovation characteristics of the attitude to the use of IT innovation.

H4a: relative advantages will be positively related to the scope of CRMS adoption.

H4b: relative advantages will be positively related to the depth of CRMS adoption.

H5a: complexity will be negatively related to the scope of CRMS adoption.

H5b: complexity will be negatively related to the depth of CRMS adoption.

H6a: compatibility will be positively related to the scope of CRMS adoption.

H6b: compatibility will be positively related to the depth of CRMS adoption.

Research Methodology

Definitions of Variables and Measurements

The variable of the *size of hospital* in this research was measured as the number of beds on seven levels. According prior research [16], the predominant trend of hospital researches is to use the same method to measure this variable.

Innovation of Senior Executive is the preferences of senior executives adopting different problem structures which are the solution to innovation. The source of items was adopted from Thong and Yap [33]. *Knowledge Management Capabilities* is the abilities of retrieving, managing,

and transmitting real-time customer information in order to enable timely responses to customers, and shortened decision-making process. The source of items was adopted from Croteau and Li [9]. *Relative Advantage* is the advantage, such as economical benefits and reputation that the innovation can bring into the organization. The source of items was adopted from Premkumar and Roberts [27]. *Complexity* is the difficulties of understanding and utilizing the innovation. The source of items was adopted from Premkumar and Roberts [27]. *Compatibility* in the process of innovation is perceived as consistent with present systems, procedures and value systems. The source of items was adopted from Premkumar and Roberts [27]. All of these research variables were measured based on five-point Likert-type (1 = strongly disagree, 5 = strongly agree).

There are two variables used to measure the extent of CRMS adoption in this study: scope and depth of CRMS adoption. The scope of CRMS adoption is measured by how many types of communication channels are being utilized for performing CRM while the depth is measured by how many types of CRM related technologies are being used in the hospital (Some examples of communication channels and CRM related technologies are shown in Table 2).

Liang et al [20] developed an instrument for measuring the dependent variable in their adoption model. Since this instrument is designed specifically for measuring the adoption degree of innovation in Taiwan context, it is suitable for this study to measure the adoption of CRMS in the same country and culture. Based on Liang et al's [20] instrument, hospitals were asked if they are currently adopting CRMS by selecting which stage of CRMS adoption that they are in: (1) fully implemented with profits earned, (2) implemented and promotion is in progress, (3) partially implemented, (4) planning to implemented, (5) unimplemented. This study identifies hospitals as adopters who respond "adopted" and select one of the first three stages, and the respondents who select the last two stages are categorized into non-adopters.

Population and Sampling Method

The study subjects of this research were the hospitals ranked by the Department of Health (DOH) as medical centers, regional hospitals, and community hospitals which passed the "Accreditation Appraisal on Hospitals and Teaching Hospitals". Sample source is achieved by using the roster of "Taiwan Bureau of National Health Insurance". A total of 508 health institutions were identified including 21 medical centers, 74 regional hospitals, and 413 community hospitals. Questionnaires were sent to the IS executives of these institutions (such as: Chief

Information Officer and Vice President of MIS department, etc.).

Questionnaire Distribution and Collection

In this study, questionnaires were posted to the 508 health institutions. The electronic address of an online questionnaire was listed on the sent questionnaires in case if any participant preferred to reply their answers conveniently through the virtual channel.

This study sent questionnaires to 508 hospitals, and with a total of 97 returned questionnaires showing a response rate of 19.09 %. However, only 95 usable questionnaires since two incomplete questionnaires were deleted. The usable response rate was 18.7 % in this study.

Results of Analysis

Sample Characteristics

Table 1 summarizes the sample characteristics including to the type of respondent and hospital. This table shows that, 50.5 % of respondents hold top-level positions in IS department. Furthermore, there is a wide distribution of hospitals ranking among medical center (13.7 %), regional hospital (32.7 %) and community hospital (53.6 %) in terms of the sample characteristics.

Table 1. Sample characteristics

Hospital rank	Frequency	Percentage
Medical center	13	13.7%
Regional hospital	31	32.7%
Community hospital	51	53.6%
Title of Responder	Frequency	Percentage
Chief Information Officer	48	50.5%
Vice President of MIS department	15	15.8%
Other Senior Managers	32	33.7%
Adoption Stage	Frequency	Percentage
Fully implemented with profits earned	2	2.1%
Implemented and promoting	8	8.4%
Partially implemented	29	30.5%
Planning to implement	11	11.6%
Unimplemented	45	47.4%

Since this study tends to explore the critical factors influencing the extent of CRMS adoption, the subject in this study should adopt the CRMS in hospital essentially. In total, 39 hospitals were adopters and 56 hospitals were non-adopters. Table 2 summarizes the communication channels and CRM related technologies regarding CRMS adopters.

Table 2. Sample characteristics in adopters' category

Communication Channels	Frequency	Percentage
Call center	27	69.2%
Interactive Web services	26	66.7%
e-mail	28	71.8%
Kiosk	22	56.4%
Others	1	2.6%
CRM related technologies	Frequency	Percentage
Data warehouse	10	25.6%
Data mart	9	23.1%
Data mining	6	15.4%
Database	34	87.2%
OLAP	10	25.6%

With small sample size, this study utilized Partial Least Squares (PLS) for data analysis for the technique's ability to analyzing small sample size. Following a two-stage analytical procedure, this study then conducted an assessment of construct reliability and validity in the measurement model, and followed by the assessment of the structural model.

Measurement Model Analysis

Convergent validity is demonstrated when the associated items are high correlations among the same construct [12]. Table 3 presents the Cronbach's alpha, composite reliability (CR), the loadings of items and the average variance extracted (AVE) for each construct.

Excluding one item of RA1 factor loading less than 0.7, two items of KMC5 and ISE3 are also loading less than 0.7, other items have significant classification component and load stronger on their associated factors. The loading coefficient is above 0.7 and significant at the 5% significance level. All of the reliability and CR in each construct are greater than 0.7. The AVE for each construct also exceeds 0.5. Thus, the convergent validity is demonstrated.

Table 3. Construct reliability and validity

Constructs	Items	Factor loading	Alpha value	CR
Innovation of	ISE1	0.94^{**}	0.70	0.86

senior executive AVE = 0.76	ISE2	0.79**		
Knowledge management capabilities AVE = 0.76	KMC1 KMC2 KMC3 KMC4	0.81** 0.93** 0.84** 0.89**	0.90	0.92
Relative Advantage AVE = 0.71	RA2 RA3 RA4	0.70** 0.93** 0.88**	0.82	0.88
Complexity AVE = 0.80	COM1 COM2	0.95** 0.84**	0.78	0.89
Compatibility AVE = 0.86	COMPA1 COMPA2	0.91** 0.94**	0.84	0.92
** = p < 0.05				

Discriminant validity is demonstrated when the associated items are low correlations among the other construct [12]. Table 4 presents the square root of each variance shared in diagonal which between a construct and its items. Correlations between the constructs and other constructs should lower than the square root of each variance shared between a construct and its items. The results confirm the criteria and demonstrate the discriminant validity in this study.

Table 4. Discriminant validity

	ISE	KMC	RA	COM	COMPA
ISE	**0.87**				
KMC	0.27	**0.87**			
RA	0.19	0.61	**0.84**		
COM	-0.03	0.44	0.17	**0.89**	
COMPA	-0.04	0.41	0.30	0.46	**0.93**
Diagonal represent the square root of AVE					

Structural Model Analysis

The testing results are presented in Table 5. The results indicated that hypothesis H1a and H1b are supported. This shows that hospital size has positively influence on the scope and depth of CRMS adoption. H5a and H5b are supported. This denotes that complexity has negatively influence on the scope and depth of CRMS adoption. H6b is support, and this shows that compatibility has positively influence on the depth of CRMS adoption.

R^2 means the predictive power for the dependent variables in the model. The R^2 for the scope of CRMS adoption was 0.22, and for the depth of CRMS adoption was 0.30.

Table 5 Hypothesis testing results

The scope of CRMS adoption	β	t-statistic
Size of Organization	0.41	2.04**
Innovation of Senior Executive	-0.04	-0.12
Knowledge Management Capabilities	0.12	0.57
Relative Advantage	0.14	0.87
Complexity	-0.43	-1.79*
Compatibility	0.03	0.22
The depth of CRMS adoption	β	t-statistic
Size of Organization	0.45	2.47**
Innovation of Senior Executive	-0.03	-0.20
Knowledge Management Capabilities	0.05	0.38
Relative Advantage	0.08	0.46
Complexity	-0.35	-1.66*
Compatibility	0.30	1.74*
* = p < 0.1 ** = p < 0.05		

Discussion

An increase of size seems to have a positive influence on the scope and depth of CRMS adoption because of the increased availability of resources and specialized knowledge [19]. This study chose the number of beds to measure the size of hospital. In general, the hospital with more beds is larger in the scale and with more abilities to set up more assets, and therefore is more affordable to the resources required for using more CRMS related technologies.

Moreover, the number of beds positively affects the relationship with the number of customers the hospitals can handle. When dealing with more customers, hospitals face more medical problems. They need deploy more communication channels between the customers and hospitals in order to understand what their customers want and what the problem their customers are experiencing. For larger hospitals adopting CRMS is to provide more timely information to customers and to respond to their requests efficiently in order to establish a powerful communication channels.

Technological innovation is always considered

as a complex assignment and bewildered to the adopting department [11]. Complexity in this research is significant to influence the scope and depth of CRMS adoption negatively. The more complexity in CRMS, the less willingness the hospital would have to use CRMS related technologies. Since the existing CRMS is complexity for hospitals, they will decrease in using more CRMS related technologies to maintain the customer relationships.

On the other hand, the more complexity in CRMS, the less willingness the hospital would have to add communication channels between customers and hospitals. The existing CRMS is difficult to understand and utilize in hospitals. They will not increase the communication channels which are supported by CRMS in order to decrease their loading on keeping customer relationships.

The variable of compatibility discussed in this research showed that the more compatibility of CRMS with present system, the more willingness the hospital would have to use CRMS related technologies. When CRMS is perceived as consistent with present systems, it is easier for hospitals to use. Hence, the characteristic of compatibility let hospitals try using more related technologies to assist CRMS in supporting CRM.

Implications
Implications for Researchers
Several implications are suggested here for researchers studying on the extent of CRMS adoption. First, this research contributes to the IS adoption literatures in healthcare domain by empirically building an integrate model. Although this research provides the critical factors toward the extent of CRMS adoption, sufficient explanations for justifying how these factors influence managerial decision-making is lacking. Therefore, we suggest that future research can use follow-up interviews with hospital's CEO to elicit the explanations.

Second, the current study, based on surveys, indicated the factors which have direct influence to the extent of CRMS adoption for healthcare. Future research can investigate whether other potential factors exist.

Third, researchers can refine the current model to a better extent. Understanding the factors which influence the performance and implementation of CRMS is encouraged.

Last, researchers can consider medical policies and IT security standards in their future research on the extent of CRMS adoption. Customers are not the only ones driving change in healthcare. For example, in the United States, Health Insurance Portability and Accountability Act (HIPAA) sets a variety of security norms, standards, and restrictions on the deployment of the healthcare information technology [39].

Therefore, when hospitals deploy and use of CRMS, they must be particularly careful to consider medical policies and the regulations of security restrictions.

Implications for Hospitals
Two implications are revealed for hospitals. First, it is reasonable to infer that a larger hospital, which is with more sickbeds, should have more needs to increase the scope and depth of CRMS adoption because of maintaining more complicated customer relationships and fulfilling more customers' requirements. In line with this inference, the larger hospital should explore the invisible advantages and potentials of CRMS.

Second, this research provides lessons for the smaller hospitals. They will face the same situations that the larger hospitals are facing, such as more complicated customer relationships when they are expanding CRMS. Therefore, they should be enhancing their system capabilities while growing their business scales.

Implications for CRMS Vendors
Three implications are revealed for CRMS vendor. First, the fact of hospital size (in terms of sickbed number) being positively associated with the depth of CRMS adoption gives CRMS vendors a clue to develop specific marketing strategies for identifying potential adopters. Hospitals with sufficient assets and financial resources have more intention to be innovative and thus vendors can promote CRM related technologies for larger hospitals.

However, smaller hospitals are normally lack of financial ability to cover the enormous cost of CRM related technologies. Purchasing the module of CRM related technologies and fitting with their core organization functionality therefore is an attractive solution to smaller hospitals. This study recommends that CRMS vendors to invest on the development of module packages of CRM related technologies for smaller hospitals because those can alleviate the pressure of financial expenditure and support the original CRMS in smaller hospitals.

Second, CRMS vendors need to prepare IS training to hospitals that can relief hospitals from technological barriers in innovation diffusion stage. If the vendor could assign consultants to assist hospitals in preparing related IS capabilities, it will improve the extent and depth of CRMS adoption.

In the end, the more compatibility, the more CRM related technologies will be used in hospitals. This relationship offers CRMS vendors a useful advice for designing CRMS and planning marketing propaganda to hospitals. Vendors can improve their marketing strategy on CRM related technologies according to the degree of the compatibility of CRMS in hospitals. They can promote the new CRM related technologies for hospitals when they have

perceived the compatibility of the existing CRMS.

Research Limitations

The cross-sectional nature of this research restricts our ratiocination to the decision-making of CRMS adoption. This research recommends that longitudinal study is needed to identify the dynamics of the effects among the critical factors and decision-making. With no difference to other research, this research only considered the major characteristics of organization and CRMS, and thus may ignore other undiscovered contexts. When possible, future research should attempt to conjoin additional theory-based contexts in order to enhance the explanatory ability of our model.

Conclusions

CRMS can facilitate the customer relationship management by providing timely information and quickly responses. The purpose of this research is to identify the factors which will influence the extent and depth of CRMS adoption in healthcare from the organizational and system perspectives. Theoretically, a review of prior IS innovation literatures supported us to generate an empirical model, and this model had been empirically verified by the results of a survey on 508 hospitals in Taiwan. The results indicated that hospital size, complexity and compatibility have significant influence on the extent and depth of CRMS adoption in hospitals. Hopefully, the critical factors identified by this study can provide substantial aids and advices for academics and associated practitioners.

References

[1]   Alavi, M., and Leidner, D. "Knowledge Management Systems: Emerging Views and Practices from the Field," Proceedings of the 32th Hawaii International Conference on System Sciences, Maui, Hawaii, 1999, pp. 1-11.

[2]   American College of Healthcare Executives (ACHE), "Top issues confronting hospitals," 2007, Available at http://www.ache.org/ (retrieved on 10 December 2008).

[3]   American Hospital Association (AHA), "Hospital use of information technology," 2006, Available at http://www.americanheart.org/ (retrieved on 15 August 2008).

[4]   Baldridge, J.V., and Burnham, R.A. "Organizational innovation: individual, organizational and environmental impacts," Administrative Science Quarterly, 20 (2), 1975, pp.165-176.

[5]   Benz, G., and Paddison, N.V. "Developing patient-based marketing strategies," Healthcare Executive, 19 (5), 2004.

[6]   Bhattacherjee, A. "An empirical analysis of the antecedents of electronic commerce service continuance," Decision Support Systems, 32 (2), 2001, pp.201-214.

[7]   Chang, I.C., Hwang, H.G., Hung, M.C., Lin, M.H., and Yen, D.C. "Factors affecting the adoption of electronic signature: Executives' perspective of hospital information department," Decision Support Systems, 44 (1), 2007, pp.350-359.

[8]   Chau, P.Y.K., and Tam, K.Y. "Factors affecting the adoption of open systems: an exploratory study," MIS Quarterly, 21 (1), 1997, pp.1-24.

[9]   Croteau, A.M., and Li, P. "Critical Success Factors of CRM Technological," Canadian Journal of Administrative Sciences, 20 (1), 2003, pp.21-34.

[10] Dewar, R.D., and Dutton, J.E. "The adoption of radical and incremental innovations: an empirical analysis," Management Science, 32 (11), 1986, pp.1422-1433.

[11] Grover, V. "An empirically derived model for the adoption of customer-based inter-organizational systems," Decision Sciences, 24 (3), 1993, pp.603-640.

[12] Hair, J.F., Rolph, E.A., Ronald, L.T., and William, C.B. Multivariate Data Analysis with Readings. NY: MacMillan Publishing Company, 1992.

[13] Jones, T.O., and Sasser Jr, W.E. "Why satisfied customers defect," Harvard Business Review, 73 (6), 1995, pp.88-91.

[14] Jutla, D., Craig, J., and Bodorik, P. "Enabling and measuring customer relationship management Readiness," Proceedings of the 34th Annual Hawaii International Conference on System Sciences, Maui, Hawaii, 2001, pp. 1-10.

[15] Karakostas, B., Kardarasb, D., and Papathanassiou., E. "The state of CRM adoption by the financial services in the UK: an empirical investigation," Information & Management, 42, 2005, pp.853-863.

[16] Kimberly, J.R., and Evanisko, M.J. "Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations," Academy of Management Journal 24 (4), 1981, pp.689-713.

[17] Ko, E., Kim, S.H., Kim, M., and Woo, J.Y. "Organizational characteristics and the CRM adoption process," Journal of Business Research, 61 (1), 2008, pp.65-74.

[18] Kuan, K., and Chau, P.Y.K. "A perception-based model for EDI adoption in small business using a technology-organization-environment framework," Information & Manage

ment, 38 (8), 2001, pp.507-512.

[19] Lee, G., and Xia, W. "Organizational size and IT innovation adoption: a meta-analysis," I*nformation & Management*, 43 (8), 2006, pp.975-985.

[20] Liang, T.P., OuYang, Y.C., and Hsu, R.C. "Factors affecting the adoption of knowledge management," *Journal of Information management* 12 (3), 2005, pp.1-38.

[21] Lind, M.R., Zmud, R.W., and Fischer, W.A. "Microcomputer adoption－the impact of organizational size and structure," *Information & Management*, 16 (3), 1989, pp.157-162.

[22] Moch, M.K., and Morse, E.V. "Size, centralization and organizational adoption of innovations," *American Sociological Review*, 42, 1977, pp.716-725.

[23] Mulhall, K.J., Ahmed, A., and Masterson, E. "The "doctor-customer" relationship: Hippocrates in the modern marketplace," *International Journal of Health Care Quality Assurance*, 15 (1), 2002, pp.9-10.

[24] National Health Insurance (NHI), 2005, Available at http://www.nhi.gov.tw/english/index.asp (retrieved on 6 December 2008)

[25] Peppers, D., and Rogers, M. *The one to one manager: real-world lessons in customer relationship management.* New York: Currency/Doubleday, 1999.

[26] Peppers, D., Rogers, M., and Dorf, B. "Is your company ready for one to one marketing? " *Harvard Business Review*, 77 (1), 1999, pp.151-160.

[27] Premkumar, G., and Roberts, M. "Adoption of new information technologies in rural small businesses," *Omega,* 27 (4), 1999, pp. 483-484.

[28] Reddy, B.K., and Acharyulu, G.V.R.K. "Customer relationship management (CRM) in health care sector - a case study on master health check," *Journal of the Academy of Hospital Administration*, 14, 2002.

[29] Rizzoni, A. "Technological innovation and small firms: a taxonomy," *International Small Business Journal*, 9 (3), 1991, pp.31-42.

[30] Rogers, E.M. *Diffusion of Innovation*. New York: Free Press, 1983.

[31] Skyrme, D., and Amidon, D. "New Measures of Success," *Journal of Business Strategy*, 19 (1), 1998, pp.20-24.

[32] Swift, R.S. *Accelerating customer relationships: using CRM and relationship technologies.* New Jersey: Upper Saddle River: Prentice Hall 2001.

[33] Thong, J., and Yap, C.S. "CEO characteristics, organizational characteristics and IT adoption in small businesses," *Omega*, 23 (4), 1995, pp.429-442.

[34] Thong, J.L.Y. "An Integrated Model of Information System Adoption in Small Businesses," *Journal of Management Information Systems,* 15 (4), 1999, pp.187-199.

[35] Tiwana, A. *The essential guide to knowledge management e-Business and CRM Applications*. New York: Prentice Hall, 2001.

[36] Tornatzky, L.G., and Klein, K.J. "Innovation characteristics and innovation adoption-implementation: a meta-analysis of findings," *IEEE Transactions on Engineering Management* 29 (1), 1982, pp.28-45.

[37] Tornatzky, L.G., and Fleischer, M. *The Processes of Technological Innovation*. Lexington, MA: Lexington Books, 1990.

[38] Wayland, R.E., and Cole, M. *Customer connections: new strategies for growth,* Boston, MA, 1997.

[39] Welsh, J.A., and White, J.F. "A small business is not a little big business," *Harvard Business Review*, 59 (4), 1981, pp.18-32.

[40] Wu, I.L., and Wu, K.W. "A hybrid technology acceptance approach for exploring e-CRM adoption in organizations," *Behavior & Information Technology*, 24 (4), 2005, pp.303-316.

[41] Zhu, K., Kraemer, K., and Xu, S. Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems* 12 (4), 2003, pp.251-268