AN EMPIRICAL STUDY ON THE MATERIAL MANAGEMENT INFORMATION SYSTEM (MMIS) IN INTENSIVE CARE UNITS

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ABSTRACT

The materials cost constituted a major proportion of expenses in the hospital. And a large proportion of materials cost are used in the Intensive Care Unit. So it is an important subject to find an effective way to control materials cost of Intensive Care Unit in the hospital. The Materials Management Information System is useful to manage materials and control cost. The research framework is based on Technology Acceptance Model and Management Support, Communication, and Computer Self-Efficacy are involved to survey the staff's Behavior Intention on using Materials Management Information System in ICU. The research samples were drawn from 198 hospitals. There were 250 healthcare staffs working in ICUs administered by structured questionnaires randomly and totally 60 effective responses which accounted for 24% response rate. The results revealed the predictive power of Behavior Intention is 69.1%. It indicated that the model could be used to predict the materials management staff's behavior on using Materials Management Information System in ICU.

Keywords: Material Management Information System (MMIS), Intensive Care Unit, Healthcare organization, Modified Technology Acceptance Model

Introduction

National Health Insurance has implemented since March, 1995 in Taiwan. Due to the dramatically rising of medical expenditures, it has been a significant predicament in the current. In order to effectively control medical costs and maintain a balance of the payment systems, a variety of problem-solving programs were implemented by governmental agency. Therefore, the income of the healthcare organizations has been gradually restricted, to cope with such a large impact that bound to adjust its operating style.

Moreover, the cost behavior in healthcare organizations was usually found that personnel costs for the main expenditure item, accounting for at least half of total costs, materials costs shall be followed. Researchers of the US [1] found that an estimated cost of 1,420 billion U.S. dollars at least in the ICU per year. Since the ICU patients usually suffer from critical condition, monitoring the vital signs and providing emergency care are necessary. That eventually results in rising costs

without expectation.

Information technology is one of the important strategic resources in modern enterprise as well as healthcare organizations. It can promote the organization to efficiently achieve the business goals [2]. It can improve the patient's outcome, then reduce the cost of management, and improve the efficiency and efficacy in healthcare organizations.

This research sampling design was focused on the material management staff in ICU. It explored user attitude and behavior intention for materials management information system. The research model is modified intensively by the Technology Acceptance Model (TAM) which was proposed by Davis [3]. The purposes of this study were as following:

1. To explore the variables of supervisor support, communication and coordination and computer self-efficacy which affect on PU (perceived usefulness), PEOU (perceived ease of use), attitude and BI (behavioral intention).
2. To explore the materials management staff's PU, PEOU and attitude that affect on BI in the currently material management information system.
3. To understand the level of user intention for the material management information system.

Literature Review

In general, materials used in healthcare organizations, means to provide patients with comprehensive medical services, which must be used to all the medical supplies. Researches found that the cost of hospital operating costs ranged usually from 30% to 50% [4].

Material Management Information System (MMIS)

Information systems are purposely designed to improve performance in decision-making, by cost reduction, increasing revenue and improving service [5].

TABLE1. The differences in characteristics between information system industries

Medical information system industry	Information system technology industry
Output targets for human	Output targets for the products or services
Improper use of information systems, will endanger the lives of patients	Improper use of information systems, will not affect the safety of human life
Information system performance, security and stability were higher than the cost considerations	Cost is usually the most important factor for consideration
The development and use of information systems often affected by government legislation, such as medical law, medical information security and privacy protection law	The development and use of information systems, less susceptible to the impact of governmental laws
Changes in patient demand for medical services, which is difficult to predict by the information system output results	By input factors and tools to predict the number and the required output form.
Often needs to save and handle a large number of patients medical records, in addition to text descriptions, data reports, more graphics, and images and other information	Save more types of data homogeneity

Technology Acceptance Model

TAM (Technology Acceptance Model) was proposed by Davis in 1989. TAM has become the most widely theoretical model to predict and explain user's acceptance of information technology. The main dimensions of TAM were PU, PEOU, attitude and behavioral intention.

This study focused on understanding the acceptance of materials management information system. TAM is a kind of model that focused on the model used in the field of information technology and it usually can explore users' behavior. Therefore, a number of reasons that decided to adopt the theoretical basis of TAM-based research:

1. The original TAM theory is used in exploring the adoption of information technology for users.
2. TAM was empirically proven successful in predicting user behavioral intention about 40% of the variance in using the system.
3. There are many researchers used TAM or expansion TAM to explore different research areas. However, the original TAM model has more explanatory power than expansion TAM.

Research Methods

A total of targeted hospitals are 198, including 24 medical centers, 88 regional hospitals and 86 regional hospitals. The subjects are staff of material management in ICU. All survey items were measured using a 5-point Likert scale.

Research Conceptual Framework

The framework is mainly based on the technology acceptance model (TAM) which also modified with supervisory support, communication and coordination, computer self-efficacy and other external variables, was shown in Figure 1.

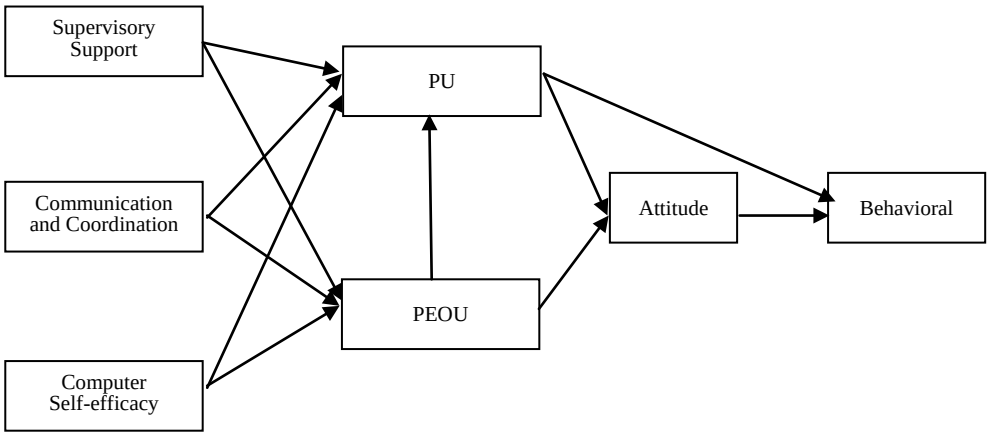

FIG. 1 Research conceptual framework

Hypothesis

Researchers [6] [7] found that managers' support is significant on the PU and PEOU, but it indirectly effects users behavioral intention of information technology.

H1: Supervisor support will have a positive effect on PU

H2: Supervisor support will have a positive effect on PEOU

Johlke et al. [8] explored the organizational communication research and had found that communication frequency, communication direction and content of communication will affect the operational capacity of organization. Gefen and Ridings [9] also pointed out that the system users and system providers usually belong to different organizational units, so it will have different values and goals.

H3: Communication and coordination will have a positive effect on PU

H4: Communication and coordination will have a positive effect on PEOU

The researcher [10] found that computer self-efficacy was a significant positive relationship on PU. Venkatesh & Davis [11] thought that computer self-efficacy is the important variable to affect PU.

H5: Computer self-efficacy will have a positive effect on PU

H6: Computer self-efficacy will have a positive effect on PEOU

The researcher [12] found that PEOU will positively affect PU. It will make the materials management staffs feel useful and help them effectively improve performance.

H7: PEOU will have a positive effect on PU

Researchers [13] [14] found that when information technology can effectively improve operational efficiency, and unnecessarily spend too much effort to learn the information technology which will have more positive feelings.

H8: PU will have a positive effect on Attitudes

H9: PEOU will have a positive effect on Attitudes

The researcher [13] found that if users of the system considered this system can effectively improve their job performance, it would have higher behavioral intention on using information system.

H10: PU will have a positive effect on Behavioral Intention

Researchers [3] [15] found that when individuals for the use of new technology products or systems more positive attitudes, then behavioral intention of using the system will be higher.

H11: Attitude will have a positive effect on behavioral intention

Data Analysis

This study used SPSS 16.0 and SmartPLS 2.0 for statistical analysis.

Basic data sample

Overall, 60 valid questionnaires were received in a total of 250 questionnaires and the response rate was 24%. The majority of the respondents are medical legal hospital(40.0%). With regards to the hospital-level, educational background, year of service, nursing background, systems approach to building, the majority of the respondents are regional hospital(46.7%), university(61.7%), more than two years(80.0%), yes(86.7%), outsourcing(41.7%). With regard to the occupancy rate,

the answer of over 76% represented the majority of the respondents (70.0%).

Structural Model

The results are positive significant. Besides, communication and coordination is not significant with PU and computer self-efficacy is negative significantly with PU.

TABLE 2. Standardized path coefficient

Path Relations	path coefficients (β)	t-value	p-value
Supervisor Support→PU	0.114972	1.621645	0.0540*
Supervisor Support→PEOU	0.144549	1.595536	0.0569*
Communication and Coordination→PU	-0.070374	-0.736223	0.2317
Communication and Coordination→PEOU	0.318362	3.123922	0.0012***
Computer Self-efficacy→PU	-0.206605	-1.694178	0.0467**
Computer Self-efficacy→PEOU	0.426864	3.372294	0.0005***
PEOU→PU	0.831267	2.090738	0.0000***
PU→Attitude	0.214726	2.718615	0.0195**
PEOU→Attitude	0.631846	8.095123	0.0000***
PU→Behavioral Intention	0.233751	5.590666	0.0039***
Attitude→Behavioral Intention	0.659704	6.983121	0.0000***

Conclusions and Discussion

TAM was not yet widely adapted in material management information systems in healthcare organizations. In this study, the overall variance in prediction of behavioral intention was 69.1%, which indicated this research model can significantly predict and explain the intensive care unit for using materials management information system.

1. The impact of material management information system in using behavioral intention

This study found that PEOU has more influence on attitudes than PU. The possible reason was inferred that these material managers all came from the nurse training background, so usually relatively unskilled in computer operation. The system is ease of use and the system uses those who hold on a positive attitude to the system, improving the user on the system BI.

2. Research variables impacted on the technology acceptance model

(1) PU

These findings from the above, the enhancement of computers self-efficacy will lead to the PU of negative effects. The inference may be due to materials used in the current management information system which the function may not be perfect and cannot meet the operational requirements of the users. The data was collected from users also found negative comments on the system functions such as lack of flexibility, lack of timeliness, software functional connectivity is incomplete, the report still need to manually implement, and can not be set out into the detailed status.

So re-examining, making perfect design and plan, and improving performance would be necessary, then that prompted PU in the future.

(2) PEOU:

The research found that computer self-efficacy is the most significant variable than others. The materials managers in computer self-efficacy who hold a nurse background were lower than non-nursing background. Therefore, enhancing capability of computer self-efficacy would be critical, and then increasing their PEOU in the system. Communication and coordination were also of great significantly impact on PEOU. If there are many channels to allow them to ask the questions, it would effectively improve PU. Finally, supervisor support is essential that will make PEOU up, and then willing to use the system.

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