A SYSTEM DYNAMIC MODEL OF TEACHER'S ADOPTION OF E-LEARNING SYSTEM BY INTEGRATION OF ENVIRONMENT VARAIBLES AND TEACHER'S CHARACTERISTICS

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Abstract: In this study we develop a system dynamics model of teacher's adoption of e-learning system. We identify that environment variables and teacher's individual characteristics are the two main factors affecting teacher's adoption. Consequently we integrate well-known technology acceptance model into our dynamic model. This study also proposes three policies to enhance teacher's adoption. Each policy will be analyzed individually, and policy comparison will also be performed.

Keywords: E-learning system, Technology acceptance model, Teacher's characteristics, System dynamics

1. Introduction

Because of the quick development of internet and information system technologies, e-learning has a great improvement on the way of learning (Cappel and Hayen 2004). More and more education institutes, organizations, and corporations adopt e-learning systems to assist in their instruction activities, and higher education utilizes information technologies in instruction activities that will reduce the expenditure of education budget and improve the quality of education (Selim 2007). From the viewpoint of higher education, e-learning systems give students great help in their learning process(Selim 2007; Zhao 2007). Comparing to students who do not use e-learning systems, students who use e-learning systems have better performance in their learning performance(Ngai, Poon, and Chan 2007). Information and communication technologies have a tremendous impact on education field, and take

possession of magnificent niche in the field(Green and Gilbert 1995; Sahin and Thompson 2007). The higher education will not continue to progress without taking information and communication technologies into consideration(Sahin and Thompson 2007). Recently, both academy and business take great account of e-learning, and most of the countries put emphasis on developing e-learning platforms. E-learning has become a main research stream(Pituch and Lee 2006).

Regardless of the supreme development of e-learning systems, the amount of systems users do not grow up as many as the systems' accommodation(Ma, Andersson, and Streith 2005). E-learning system is human-machine system, and system users play the main role in the system life cycle. The e-learning systems will not perform well without enough users, and the investment on the e-learning systems will be for nothing. Study on the behavior of why teachers do not use e-learning system is necessary and important. The teacher's behavior of using e-learning system is a very complicated and multi-dimensional problem, to find out what factors affecting teachers' behavior toward using e-learning systems could ascertain the casual relationship among the factors of promoting teachers' use of e-learning system, and help executives to make polices to increase the amount of system users(Russell et al. 2003). Pituch and Lee (2006) suggest that if the users are lack of motivation toward using systems, the systems' performance will be low. They also suggest that there are not many researches on the effect of system characteristics toward system performance. Most of the researches' scopes are restricted to the comparison between the e-learning systems and the traditional learning. Selim(2003) suggests that the system characteristics of e-learning models' hypotheses have not been confirmed sufficiently. Some researches suggest both environmental variables and individual characteristics of teachers are main dimensions concerning whether teachers could integrate computer technology into their teaching activities (Becker and Ravitz 2001; Hayes 2007; Rosen and Weil 1995; Windschitl and Sahl 2002).

This study will collect the factors of environmental variables and individual characteristics of teachers from previous literature, classify the factors into separate modules, and find out the causal relationship among the factors and modules by literature review. This study will utilize system dynamics methodology to construct the causal-loop model. This model includes several modules and factors concerning the individual characters and environmental variables. We propose three policies to increase the teacher users of the e-learning system. By simulating the model, we could determine which policy is suitable for certain situation.

2. Literature Review

Environmental variables and individual characteristics of teachers are two main dimensions that affect teachers' behavior toward using e-learning systems. There are lots of factors included in the two dimensions. Collecting the factors from previous literature could help us to construct our dynamic model. The literature review section is divided into parts, which are environmental variables, individual characteristics of teachers and teachers' behavior toward e-learning system.

2.1 Environmental variables

From previous literature, we find out that there are four environmental variables affecting teacher's behavior toward using e-learning system, they are system quality, information quality, atmosphere and technical support.

2.1.1 Information quality

Zhao(2007) suggests that teachers consider that they can acquire effective information from information technology, and the information will be helpful. Rogers and Finlayson(2004) suggest that teachers can obtain information which they need by internet and communication technology, and the information can help teachers in their teaching activities. Condie and Livingston(2007) indicate that teachers obtain information which is produced by e-learning systems would lead teachers to believe that the e-learning systems is helpful or not. Andersson(2006) points out teachers believe that the e-learning systems can produce useful information for their work. Thomas and Stratton(2006) indicate that if the information from the e-learning systems will be helpful or useful for students, teachers will believe that the e-learning systems are helpful in teaching activities. Teachers will judge the e-learning systems whether helpful or not by the information which produced by the e-learning systems. If the information can help students in their learning process, or help teachers in their work, teachers will consider e-learning systems are helpful and useful for them. Increasing quality of e-learning systems' information will make teachers apt to use e-learning systems.

2.1.2 System quality

Hayes(2007) indicates that if teachers are satisfied with system function, teachers will be fond of using e-learning systems. Rogers and Finlayson(2004) indicate that if teachers spend too much time on manipulating e-learning system, it will diminish teachers' perception of actual benefit. Zhao(2007) indicates that a good information

system will be helpful and useful in teaching activities. Condie and Livingston(2007) indicate that teachers will judge e-learning systems are helpful or not by system functionality. Andersson(2006) indicates that teachers will consider e-learning systems useful when the functionality of e-learning systems fit in with teachers' need. Franklin(2007) indicates that if the e-learning systems' trial risk is too high, this will be the barrier for teachers to use e-learning systems. Cuban(2001) indicates that teacher will judge the system useful or not by whether it is easy to integrate the teaching activities into e-learning systems. Russell et al.(2003) indicate that teachers will consider whether e-learning systems are useful or not by the availability of the information. Thomas and Stratton(2006) indicate that teachers will judge the systems easy to use or not by system quality of e-learning systems. Teachers will judge e-learning systems useful or helpful by system quality. Before adopting e-learning systems as teaching assistant tools, teachers consider that whether it is easy to learn how to manipulate e-learning systems, the functionality of system can fit in with teachers' needs, and integration of teaching activities into e-learning system is easy or not.

2.1.3 Technical support

Cuban(2001) indicates that if school provides sufficient training and tools to enhance teachers' ability in integrating their teaching activities into e-learning systems, teachers will consider that e-learning is easy to use. Zhao(2007) indicates that teachers can not integrate their teaching activities into e-learning system without sufficient training. Hayes(2007) indicates that teachers consider training and technical supports can help them to use e-learning systems more effective and efficiency. Franklin(2007) indicates that if teacher can accept training about manipulating e-learning systems, they will consider that it will be easy to integrate their teaching activities into e-learning systems. Russell et al.(2003) indicate that when teachers use e-learning systems, teachers' feeling of easy or not to use the e-learning systems affected by the level of technical support and information department support. Condie and Livingston(2007) indicate that teachers can integrate teaching activities into e-learning systems easily after accepting appropriate training. Thomas and Stratton(2006) indicate that training can help teachers learn how to manipulate e-learning systems, and help teachers integrate teaching activities into e-learning systems. Sufficient training and technical support can help teachers integrate their teaching activities into e-learning systems, and make teachers feel that it is easy to manipulate e-learning systems. When teachers perceive that it is easy to manipulate e-learning systems, they will tend to use e-learning systems when they teach students.

2.1.4 Atmosphere

Andersson(2006) indicates that teachers will consider e-learning helpful and useful if there are lots of their colleagues using e-learning systems. Russell et al.(2003) indicate that teachers will consider that e-learning system is helpful for students in learning if students take e-learning systems as requirement. Hayes(2007) indicates that if executives of schools encourage teachers to use e-learning systems, teachers will consider e-learning systems helpful and useful in their work. Teachers will consider whether e-learning system is useful or not for their work by atmosphere. If the executives of school, students and colleagues expect or encourage teachers to use e-learning system, it will increase teachers' motivation toward using e-learning systems. Teachers decide to use e-learning systems not only by the usefulness or ease of use of e-learning systems, but also other people's expectation.

From previous researches, we conclude four main factors concerning environment variable, they are information quality of e-learning systems, system quality of e-learning systems, technical support and atmosphere. Investment on e-learning systems will increase information and system quality of e-learning systems. To hire more information department staffs will provide more technical support to teachers. The executives' support will encourage teachers to use e-learning systems. The three policies will be set in the simulation model to test and verify which policy is suitable for certain situation, and simulation results of different policy will be compared.

2.2 Teacher's individual characteristics

Hayes(2007) indicates that teachers will adopt e-learning systems rapidly if they possess sufficient self-confidence and manipulation skills of e-learning systems. Franklin(2007) indicates that teachers will consider whether integrating teaching materials into e-learning systems is easy or not by their self-confidence, and teachers will use more information technology if they have more confidence with information technology. Condie and Livingston(2007) indicate that teachers will consider e-learning systems easy to use or not by their self-confidence, and teachers will be obstructed to use e-learning systems by the lack of confidence. Zhao(2007) indicates that if teachers were confident with information technology, teachers would be encouraged to use e-learning systems, but teachers might not change their teaching patterns because of only having confidence with information technology. If teachers have positive experience during e-learning system training, teachers will be more confident in using e-learning systems. Russell et al.(2003) indicate that teachers'

confidence will affect their behavior toward using e-learning systems. Thomas and Stratton(2006) indicates that if teachers' confidence increases, it would enhance their behavior toward using e-learning systems.

From previous researches, there are two main factors concerning teachers' individual characteristics, they are teachers' self-confidence and experience about using information technology. If teachers have positive experience in using information technology, they will be confident with e-learning systems. The training courses about manipulating e-learning systems will enhance teachers' experience in using information technology, and it will also increase teachers' confidence in e-learning systems. More information department staffs hired, more training courses could be held. The personnel of information department also provide technical support to teachers, when teachers use e-learning systems with difficulties, the information department staffs assist teachers to figure out problems. The policy of hiring more information department staffs will not only enhance teachers' technology literacy, but also increase teachers' confidence with e-learning systems and teachers' experience in manipulating e-learning systems.

2.3 Teachers' behavior toward e-learning system

Franklin(2007) indicates that teachers consider that information technology would bring essential benefits when teachers could integrate teaching activities into e-learning systems easily. The e-learning systems is easy to use or not will influence teachers' willing toward using e-learning systems. Rogers and Finlayson(2004) indicate that teachers will feel e-learning systems is beneficial when they do not need lots of time and efforts to manipulate the systems. When teachers consider that e-learning systems bring benefits, it will increase their intention toward using system. Ma, Andersson and Streith(2005) indicate that teachers' perception of ease of use enhance teachers' perception of usefulness, and teachers' perception of usefulness enhance teachers' intention toward using e-learning systems. Russell et al.(2003) and Thomas and Stratton(2006) indicate that the ease of use of information technology will affect teachers' intention toward using information technology. Andersson(2006) indicates that when teachers believe that the e-learning system can provide assistant in teaching activities, they will like to use e-learning systems more often. Previous researches explicit that usefulness and ease of use of e-learning systems will enhance teachers' intention toward using e-learning systems. If the system quality and information quality of e-learning system are promoted, that will enhance teachers' perception of usefulness and ease of use of e-learning systems. The atmosphere factors, like executives promotion on e-learning, will also enhance teachers'

perception of usefulness of e-learning systems. The teachers' individual characteristics, like self-confidence, will also enhance teachers' perception of ease of use of e-learning systems. If we can increase teachers' perception of usefulness and ease of use of e-learning systems, teachers will be more intend to use e-learning systems. It is possible to increase the amount of teachers who use e-learning systems by policies which increase teachers' perception of usefulness and ease of use of e-learning systems.

3. Research Model

This section will discuss the modules of the model and casual relationship in the model. The research model can be divided into four modules, each module is an entity which has some kind of internal dynamics, and the modules can be integrated together by some relationships. The causal relationships form the feedback loop of the dynamic model, and the causal relationships among factors will be identified by the result of literature review.

3.1 Model structure

According to the result of literature review, the research model is separated into four modules, which are environment variables module, teacher's characteristics module, behavior module and use module, as presented in Figure 1. Each of these modules contains several factors, the factors have internal dynamics, and the dynamic among modules is connected by causal relationship.

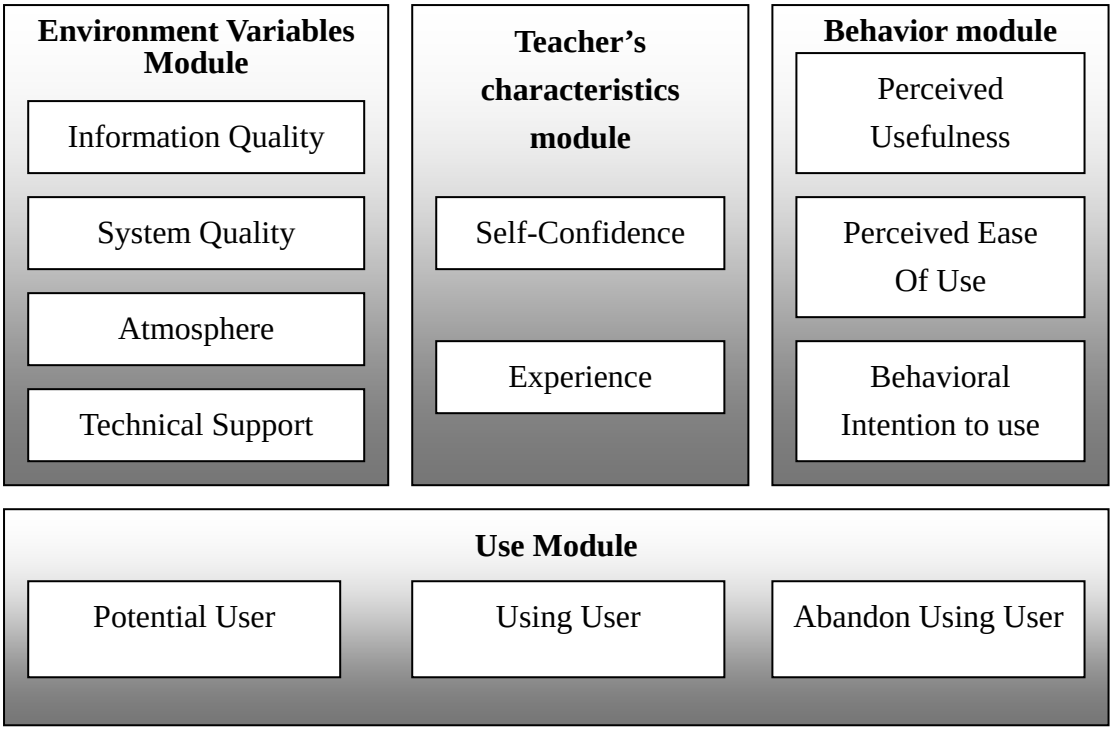


Figure 1 Modules in the model

3.1.1 Environment variables module

There are four factors including in the environment variables module, they are information quality, system quality, atmosphere and technical support. Both information quality and system quality are properties of e-learning system, and these two factors will indirectly affect teachers' behavior toward using e-learning systems through teachers' perception of usefulness and perception of ease of use. The most important factors of this module are atmosphere and technical support. Atmosphere factor indicates that teachers' situation in some kind of atmosphere. The atmosphere factor will promote teachers to use e-learning system or obstruct teachers to use e-learning systems. The executive's promotion on e-learning systems, students' attitude toward e-learning systems, and colleagues' intention toward using e-learning systems set up the atmosphere. The atmosphere factor affects teachers' behavior toward intention of using e-learning systems and teachers' perception of usefulness directly. Pre-service teachers' intention toward using e-learning systems isn't affected by the atmosphere(Ma, Andersson, and Streith 2005), but some researches suggest that the atmosphere factor will affect teachers' intention toward using information technology(Andersson 2006; Franklin 2007; Hayes 2007; Kadijevich 2006; Russell et al. 2003). Pre-service teachers are students, not real teachers, and the atmosphere where pre-service teachers and real teachers stay is different. It is not unexpected that

the atmosphere factor does not affect pre-service teachers' behavior. To verify whether the atmosphere factor affects teachers' behavior is necessary.
The technical support factor indicates that there are sufficient information department staffs to support teachers in using e-learning systems. The more information department staffs, the more training courses been held. Technical support will enhance teachers' information and technology literacy, which will increase teachers' confidence in using e-learning systems. When teachers are confident in using information technology, it will enhance their intention toward using e-learning systems.

3.1.2 Teacher's characteristics module

Teacher's self-confidence of information systems and experience in using information systems will affect teachers' behavior of using e-learning system. Self-confidence indicates that teachers believe that they have control on information technology. If teachers are skillful to manipulate information system, they will be confident in using e-learning system. Providing teachers more training courses will enhance teachers' computer literacy and promote their skill about manipulating information systems. Teachers' positive experience about using information technology will encourage them to use e-learning systems, and they will feel like they can manipulate information technology without difficulties. If teachers have positive experience in learning manipulating e-learning systems during the training period, they will more likely to integrate their teaching activities into e-learning systems. Hiring more information department staffs will increase both teachers' self-confidence and positive experience in using information systems. If there are a lot of information department staffs who can provide sufficient training courses to teachers who will have enough experience in using information systems and their self-confidence will be promoted after finishing the training courses.

3.1.3 Behavior module

The behavior module contains three factors concerning the behavior of teachers' adoption of e-learning systems. The three factors are perceived usefulness, perceived ease of use and behavioral intention to use. These three factors match to the technology acceptance model(TAM)(Bagozzi, Davis, and Warshaw 1992; Davis, Bagozzi, and Warshaw 1989). Perceived ease of use affects perceived usefulness, and both perceived ease of use and perceived usefulness affect behavioral intention to use in the technology acceptance model. Szajna(1996) indicates that perceived ease of use

affects systems user's behavior at beginning, as time goes by, the affection of perceived ease of use decreases, and the affection of perceived usefulness will not change by time.

Teachers' perception of usefulness is affected by information quality and atmosphere factor. Information produced by e-learning system can help teachers to manage teaching activities and receive feedback from students. This information is useful for teachers to improve their teaching performance. The atmosphere factor, for example, is that a lot of colleagues use e-learning systems will make teachers consider e-learning systems useful and helpful.

System quality and self-confidence affect teachers' perception of ease of use. High system quality means that the graphic user interface is friendly, easy to learn, on-line FAQ is sufficient and helpful, and etc. Teachers will consider easy to use when e-learning systems possess high quality. If teachers are confident in information technology, they will not afraid of manipulating e-learning system.

3.1.4 Use module

Because the affection of perceived ease of use changes by time, it is necessary to divide users into different stages. The factors which affect teachers' behavior are different when teachers are at different stages. This module divides users into three stages, which are potential users, using users and abandon using users. Teachers' behavioral intention toward using e-learning systems is dynamic and changes by time. Every teacher is potential user at beginning. After the environment variables and individual characteristics affect teachers' behavior, teachers will try to use e-learning systems. If teachers find that it is not beneficial to use e-learning systems after using for a period, teachers will abandon to use e-learning systems, and teachers will enter the abandon using uses stage. If teachers find that there is a new application on e-learning systems one day, they will try to use e-learning system once again and re-enter to the using user stage. From previous researches, when teachers are at potential stages, both perceived ease of use and perceived usefulness have the same affection on teachers' behavior, and both self-confidence and atmosphere also have the same affection on teachers' behavior. When teachers are at abandon using user stage, the self-confidence affection on teachers' behavior is lower than atmosphere factor, and perceived ease of use has lower affection than perceived usefulness. When working out a policy, it is necessary to consider teachers being at what stage.

3.2 Causalities in the model

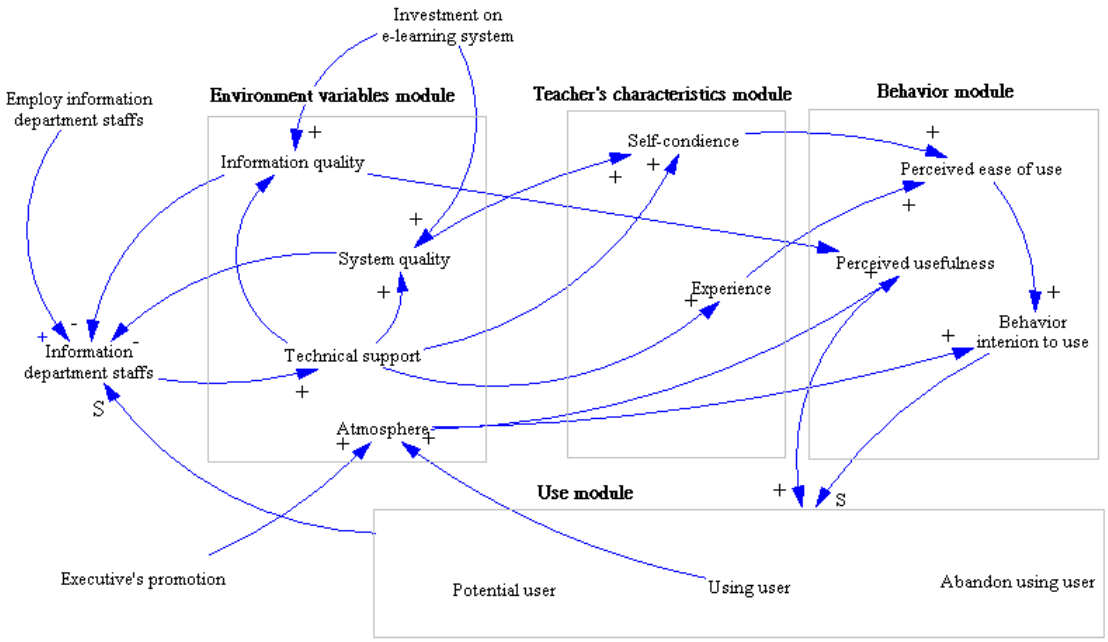


Figure 2 Causal loop diagram illustrating teacher using e-learning system

The causal impact chain among environment variables, teacher's characteristics and actual use is presented in Figure 2. Figure 2 contains the key dynamic factors in the model. The factors are grouped in modules, and dynamic relationships within each module and dynamic relationships among modules are presented by relationship line. The three policies: investment on e-learning system, employing information department staffs, and executive's promotion on e-learning system, are outside the module frames. This is a simple model: the environment variables module contains factors such like information quality, system quality, technical support and atmosphere. These four factors have affections on the teacher's characteristics module directly and on the behavior module indirectly. Information quality and system quality affect self-confidence in teacher's characteristics module, technical support affects both self-confident and experience, and atmosphere factor affect perceived usefulness in the behavior module directly. Both the self-confidence and experience factors in teacher's characteristics module affect perceived ease of use in the behavior module. Perceived usefulness and behavior intention to use affect the use module directly, and both these two factors will enhance teachers to use e-learning systems. Perceived ease of use affects use module indirectly through behavioral intention to use, and this factor has different affection on users who at different use stage. When teachers are at potential user stage, perceived ease of use affect teacher's behavioral intention, but perceived ease of use has no affection on teacher's behavioral intention at using user stage and abandon using user stage. When teachers have used e-learning system, they have already known the functionality of e-learning system, they can judge whether

e-learning system is useful or not. Teachers will continue to use e-learning systems when they believe that e-learning systems will bring them benefit, they may not decide to use e-learning systems only by the ease of use of e-learning system. The amount of teachers at using user stage affect atmosphere factor in environment variables module, when there are more and more teachers using e-learning system, teachers who have not used e-learning systems would feel panic whether they are old-fashioned teachers. The more teachers are using e-learning systems, the more pressure teachers who have not used suffer.

This study proposes three policies for increasing the amount of teachers using e-learning systems. The policies are: investment on e-learning system, executive's promotion on e-learning systems and employing more information department staffs. If organization raises budgets for constructing e-learning system, the e-learning system will possess higher information quality and system quality, which will affect teachers' behavior toward using e-learning systems. Executive's promotion on e-learning systems affect the atmosphere factor in the environment variables module. Executive's promotion will encourage teachers to use e-learning system to achieve the executive's expectation. The policy of employing information department staffs affects the technical support factor in the environment variable module. If there are enough information department personnel to provide services and training courses to teachers, this will increase teachers' experience and self-confidence toward e-learning systems. The employing information department staffs policy was affected by the two factors of information quality and system quality in the environment variables module, and it also affected by the use module. When information quality and system quality accomplish certain degree corresponding to organization goal, organization will not employ information department personnel any more and going to decreasing the personnel of information department. When most of the teachers have used e-learning systems and familiar with e-learning systems, teachers' requirement from information department staffs is becoming lower and lower and organization will not hire information department personnel any more, this will also reduce the amount of information system personnel. The amount of information department staffs changes by time, when organization starts to construct e-learning systems, the requirement of information department staffs grows up and organization hires more staffs. After most of teachers have used e-learning systems, the requirement is not as much as beginning, and the organization does not hire staffs any more.

4. Simulation Settings and Preliminary Results

This study uses Ventana Systems VenSim software to set up dynamic model for

simulating modeling environment. Some variables' settings in the model should be addressed in advance. The important variables' settings and description is presented in Table 1.

Table 1 Important variables in the model

Variable Name	Description	Value
Potential User	The initial amount of teachers in this model. The amount of teachers in a general university in Taiwan, e.g. National Cheng-Kung University, is about 1200. The potential users will become using users and abandon using users.	1200
Amount of Information Department staffs	One of policy variables. Hiring more information technology staffs will enhance information quality and system quality of e-learning system.	80, 100, 120
Degree of investment on e-learning system	One of policy variables. If organization raises the amount of e-learning system budget, system quality and information will increase.	Low, medium, high
Executive's promotion	One of policy variables. Executive promotes e-learning system will changes the atmosphere where teachers situate.	Low, medium, high

4.1 Investing on e-learning system

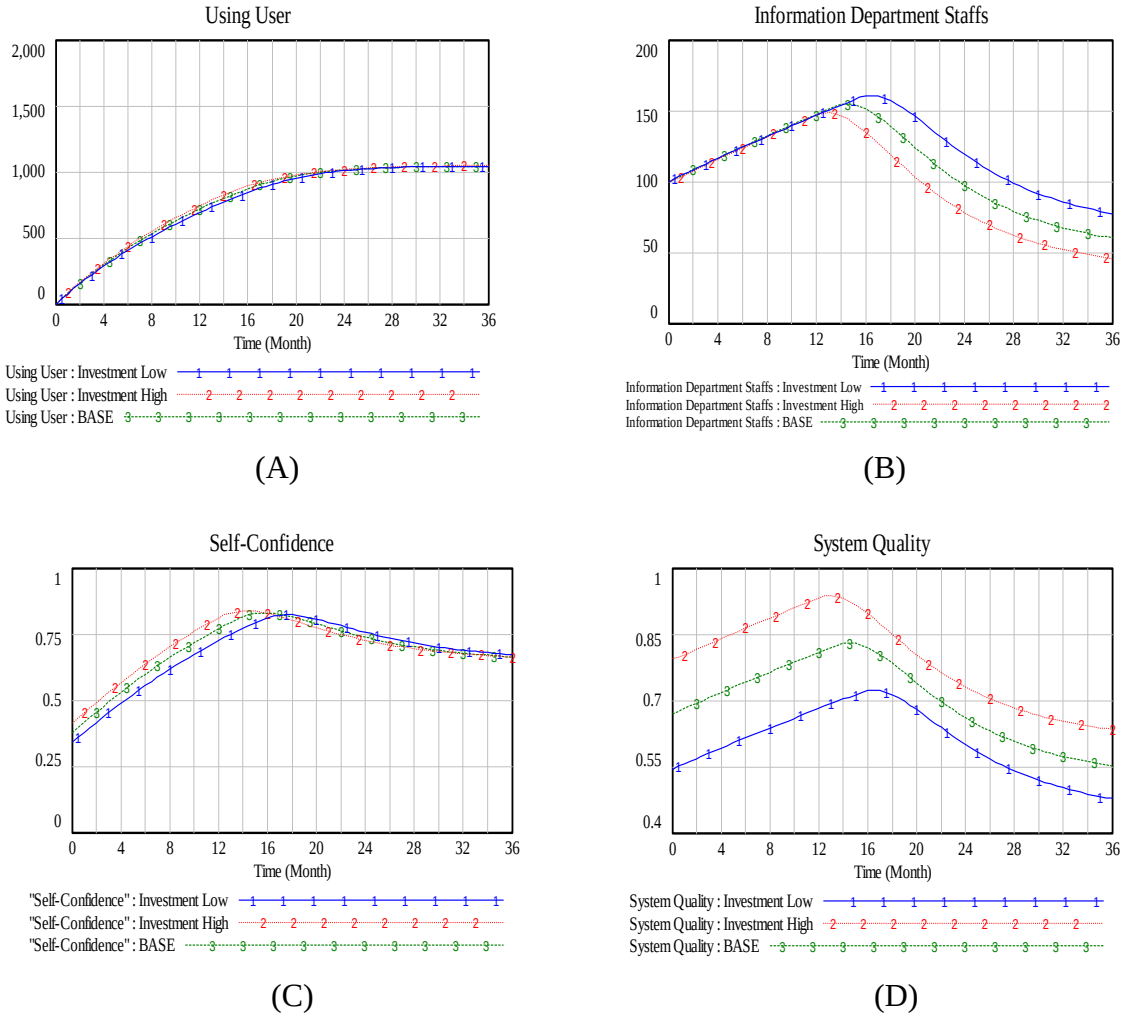
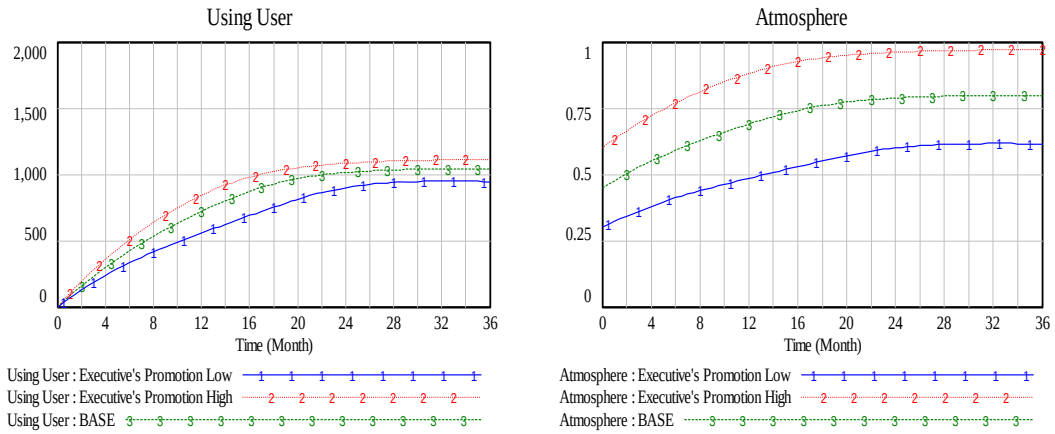


Figure 3 Different investments amount on e-learning system

Simulation results of different investment amount on e-learning system are presented in Figure 3. Line 2 indicates high investment, line 3 indicates medium investment, and line 1 indicates low investment. At high investment, the amount of using users of e-learning system increases faster than other two investment level, but the amount of using users is the same finally. This is because of high investment result in high information quality and system quality (Figure 3-D), and organization needs less information department staffs to maintain e-learning system, this presented at Figure 3-B. From Figure 3-C, there is an interesting finding, at high investment level, teachers' self-confidence is the highest at beginning, but the lowest at the end of simulation. When organizations invest e-learning system at high budget level at the beginning, the system quality and information quality have already reaching certain degree, because of this, teachers believe that they have enough skills to manipulate these systems, and organizations do not need as many as information department

staffs at low budget level to maintain e-learning systems. Organizations hire more information department staffs to maintain e-learning systems at low budget level, and this is why teachers' self-confidence is higher at low budget level than at high budget level at the end of simulation.

4.2 Executive's promotion on e-learning system



(A) (B)

Figure 4 Different degrees of executive's promotion on e-learning system

Simulation results of different degree of executive's promotion on e-learning system are presented in Figure 3. Line 2 indicates high promotion degree, line 3 indicates medium promotion degree, and line 1 indicates low promotion degree. From Figure 4-A and 4-B, when executive's promotion degree is high, teachers will be encouraged to use e-learning system, the amount of using user grows up faster than other two degrees and using users are much more than other two degrees at the end of simulation. This indicates that if executives encourage teachers to use e-learning systems, teachers will use e-learning system rapidly, and the total amount of teachers who use e-learning system increase significantly.

4.3 Employing information department staffs

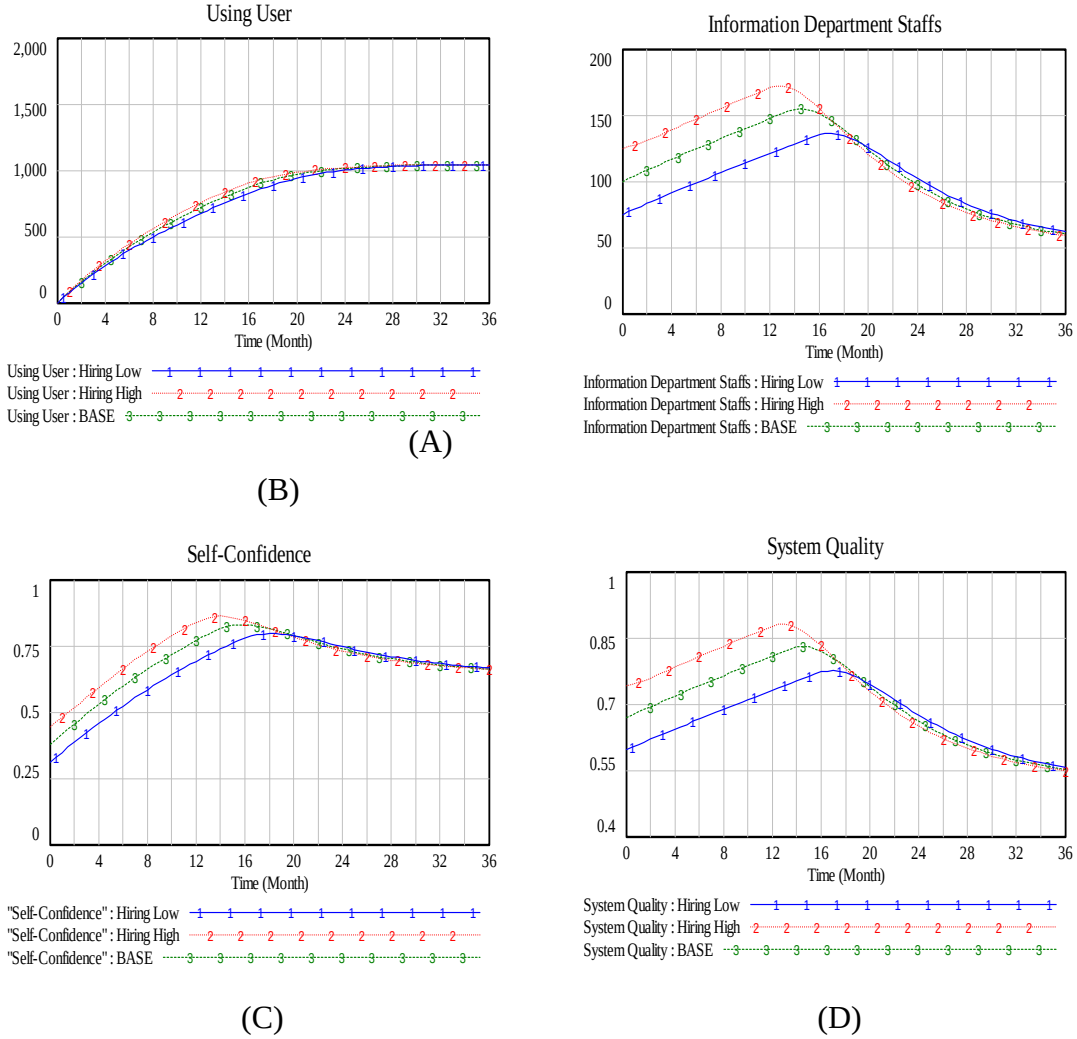
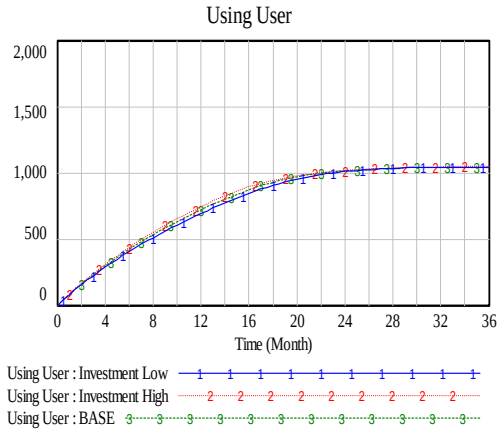


Figure 5 Different initial amounts of information department staffs

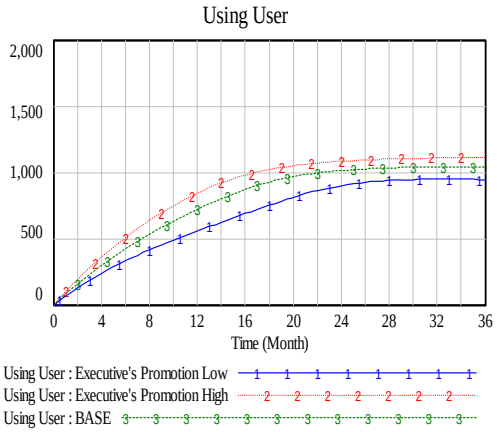
Simulation results of different initial amount of information department staffs are presented in Figure 3. Line 2 indicates 120 staffs, line 3 indicates 100 staffs, and line 1 indicates 80 staffs. Figure 5-A shows that the using user amount of different initial amount of information department staffs. At the beginning of simulation, using users increase faster at high amount of staffs, but at the end of simulation, using user will be the same. This is because organization will continue to hire more information systems staffs to increase the amount of using users. From Figure 5-B, the amount of staffs increases gradually at the beginning of simulation, but after reaching a peak, the amount of staffs goes down. As time goes by, there are more and more teachers using e-learning systems and teachers will be familiar with e-learning systems gradually. The information department staffs are becoming less important and the organizations will start to dismiss redundant staffs. Finally, the organization will only retain adequate staffs to maintain the system and provide technical support. Figure 6-C

shows that teacher's self-confidence changes corresponding to the amount of information department staffs. Figure 6-D shows that system quality changes corresponding to the amount of information department staffs. At the beginning of simulation, system quality grows up, and after organizations dismiss information department staffs, system quality goes down to a certain level in the end of simulation.

4.4 Policy comparison



(A)



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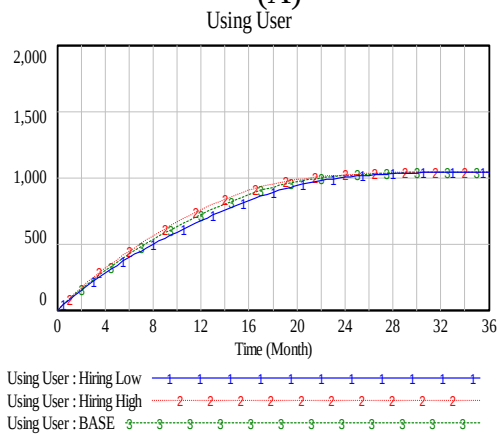

(C)

Figure 6 Amount of using user at different policy

Figure 6-A is using user amount of investment on e-learning system policy, Figure 6-B is executive's promotion on e-learning system policy, and Figure 6-C is employing information department staffs. Comparing with these three policies, it is very easy to find out that the executive's promotion on e-learning system is relative a better policy than other two policies. The amount of using user at both investment on e-learning system policy and employing information department staffs policy has similar result. The amount of using users is the same at different policy level. Only the

executive’s promotion on e-learning system policy increases the amount of using user at high policy level.

5. Conclusion and Discussion

This study contains two contributions, which are theoretical results and modeling results. The two main dimensions, environment variables and teachers’ individual characteristics, affect teachers’ behavior toward using e-learning system. To identify the internal factors and the relationships among these factors within the two dimensions and describe relationships between the two dimensions and teachers’ behavior toward using e-learning systems can help researchers to construct dynamic model more accurately. This study indicates that teachers’ behavior toward using e-learning system is corresponding to well-known technology acceptance model, and this study integrates the TAM model into current dynamic model. It is rare to integrate existing model into under constructing dynamic model in previous researches. By integrating some of TAM variables into dynamic model, this study approve that this method is validated. Because the existing models have been validated by lots of researches and been used comprehensively, utilizing existing model to assist constructing dynamic model can enhance the theoretical foundation of dynamic model and promote accuracy of dynamic model. It is necessary to do prior research in confirming whether the existing model is appropriate to integrate into the dynamic model. From previous literature, this study finds out that teachers decide to use e-learning system or not by ease of use and usefulness of e-learning system. The two constructs of perceived usefulness and perceived ease of use in the TAM model are corresponding to previous literatures about teachers’ behavior toward using e-learning systems(Andersson 2006; Franklin 2007; Rogers and Finlayson 2004; Russell et al. 2003; Zhao 2007), and it is appropriate to integrate TAM model into dynamic model. The two of main constructs in the TAM model are perceived usefulness and perceived ease of use, both of the two factors’ affections toward teachers’ behavior are the same in the beginning of the simulation, but the affection of perceived ease of use goes down significantly in the end of the simulation and the affection of perceived usefulness does not. Previous researches have identified this and considered that the perceived ease of use is not significantly affect teachers’ behavior toward using e-learning system, and explicated that this is caused by user’s experience. This study also proves that experience affects teachers’ perception of ease of use, but perceived ease of use affects teachers’ behavior significantly at the end of simulation. This study proposes that perceived ease of use always has affection on teachers’ behavior, the affection changes by time, and decreases gradually, but it does not disappear.

Table 2 below lists the practical implications from the simulation results. The possible policies are listed separately, but combining the policies in reality is feasible.

Table2 Managerial implications of the model

Policy	**Investment on E-learning System**	**Executive's Promotion**	**Hiring Information Department staffs**
Effect	Increase system quality and information quality.	Increase the atmosphere of using e-learning system.	Increase system quality, information quality and technical support.
Strategic Implications	Boost teachers' behavior toward using e-learning system, but the amounts of users do not increase significantly.	Both teachers' behavior toward using e-learning system and the amounts of users increase significantly.	Boost teachers' behavior toward using e-learning system, but the amounts of users do not increase significantly.

This study is on a preliminary stage and needs to do further developments to develop more accurate model. The modeling is according to previous researches, most of constructs and relationships in the model have theoretical foundation, but some of constants and assumptions in the model should be further validated by other research methodology, like quality research method. The model also should be verified by teachers and executives to enhance the validation of the model.

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