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Evaluation of Web-Based Systems: User Engagement Design, Psychological Empowerment, and Consequences

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An Abstract of

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This research investigates how faculty members are motivated to use Course Management Systems fully and extensively in the distance learning environment. It presents a Web-based system evaluation model based on the literature of Information System Success (DeLone & McLean, 1992, 2003), Structuration Theory of Technology (Orlikowski, 1992, 2000), Psychological Empowerment (Thomas & Velhouse, 1990), and Emergent Knowledge Processes (Markus et al., 2002). The model hypothesizes that

the system reconfigurability lets users feel empowered to use the system more actively. The motivated users will enhance the course design objectives, and reconfigure the system to achieve these goals. We also explore the role of the user's prior experience, and support in evaluating Web-based system success.

The measurement instruments for prior experience, course design, system reconfigurability, support, usage patterns, and perceived benefits are developed based on an extensive literature review. After a pilot study, a large scale study, with 348 responses across system applications, examines the relationships between and among user's prior experience, course design, system reconfigurability, support, psychological empowerment, usage patterns, and perceived benefits. The statistical methods employed include exploratory factor analysis (i.e., SPSS) and structural equation modeling (i.e., LISREL).

The data analysis shows that (1) richer user experiences lead to higher levels of course design and system reconfigurability; (2) higher levels of course design objectives lead to higher levels of system reconfigurability and psychological empowerment; (3) higher levels of system reconfigurability lead to higher course design objectives and let users feel more empowered; (4) higher levels of support make users feel more empowered; (5) psychologically empowered users will be more likely to reconfigure the system and use the system more extensively; (6) full system usage leads to a higher level of perceived benefits. However, results suggest that the path from psychological empowerment to course design is not significant.

The results indicate that psychological empowerment is an important factor which determines the system success. It provides a critical link between system design characteristics and function usages, which lead to system benefits at last. The results suggest that institution distance learning divisions should focus on creating a conducive environment to motivate the faculty to reconfigure the system if they want to make full utilization of the technology.

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Finally, I would like to send this dissertation as a gift to my parents as a reward for their sacrifice, caring, and love which I can not express completely with the words.

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Chapter 1: Introduction

The Web is now competing with traditional business and information services by providing an alternative way for individuals to satisfy their needs in work, education, and business. But it is unclear about the degree of success achieved by users in utilizing the Web for information-based activities, why and how user behaviors have been changed, and what benefits, if any, have been derived from the changes. In practice, many organizations made huge investments in Web development, but the return is unsatisfactory. The so-called "productivity paradox of information technology" (Brynjolfsson, 1993) also requests a dependent variable in the Internet research.

Previous research about the evaluation of the Web site success just addresses different aspects such as usability, user satisfaction, or outcomes. Website success is a multidimensional concept. An overall model is anticipated in this field (DeLone & McLean, 2003). Traditional information system success models (DeLone & McLean 1993, 2003) focus on system quality, usage, user satisfaction, and impacts. Applying these models in the Web site context, particular considerations need to be considered regarding the special nature of the Internet.

The Internet is a kind of reconfigurable technology (Orlikowski, 1992). It allows user engagement, and time-space continuity. By using Internet technology, users may be actively involved and consulted in designing, implementing, evaluating and improving the Web site.

As technologies become more amenable to design and development by users, empirical research is needed to identify the forces motivating the conception, development, and use of technologies with different degrees of interpretive flexibility. In a quest for dependent variables in Web site research, we need to examine how and why people are likely to use their technologies, and with what consequences in different conditions (Orlikowski, 2000). In this study, one type of Web-based system - Course Management System - will be selected. Distance learning is one type of knowledge work. Instructors have high levels of autonomy to craft their work – course design - and thus are highly motivated to interpret the systems in their ongoing use.

Web-based work systems can be viewed as socio-technical systems where the work system and the information system should be designed together for greater effectiveness. Human factors are concerned with the design of work tasks interacting with the Internet, whilst software engineering considers the design of the Web-based systems interacting with humans, thus achieving the objectives. Higher level and changing work design expectations require the engineers to design appropriate systems to support the process and accomplish the tasks. System design may enable or constrain the work design. In this sense, the technology needs to be designed to be easily reconfigured and consistent with task support patterns.

In today's knowledge economy, users play a more active role in determining how systems are used. User cognitions (i.e., user empowerment) are important because they are a pivotal link in a causal chain of constructs from the design of socio-technical systems to their socio and economic impacts (Doll and Deng). The user's power and control over the tasks, and reconfigurable system design characteristics, let users feel autonomy, pleasure, and a sense of usefulness; thus using the Internet artifacts to improve work process and achieve goals. Besides, empowered users are more confident, skillful, and motivated to reconfigure the system. In turn, they are motivated to use the systems more actively, fully, extensively, and effectively. This kind of usage will bring on more positive impacts.

MIS literature has proposed several models for evaluating system success. Given Web-based systems can be considered as a kind of information system, thus providing justification for the application of information system (IS) theories, this study starts from the traditional information systems success model - DeLone and McLean's (1992, 2003) IS success model - which identifies design quality, usage, user satisfaction, and net benefits. Doll and Torkzadeh (1998) have described a system-to-value chain, which includes causal factors, beliefs, attitude, behaviors (i.e., effective use), impact on work at the individual level, and organizational impact. Later, Doll and Deng extend this chain by incorporating work design and system design based on socio-technical theory. This study also addresses Orlikowski's (1992, 2000) stucturational technology model, which contends "the duality of the technology", that is, not only human action is enabled and constrained by technology, but technology is also the result of human actions. Regarding system design characteristics, Markus et al's (2002) emergent knowledge processes (EKPs) design theory provides several design principles.

Most research in the IS field just examines that technology artifact affects human behavior, but they do not explain how and why the user's behavior is changed. Or they miss the pivotal link between technology and usage, that is, through human cognitions. Further, we still don't know what design characteristics lead to psychological empowerment. Also, most researchers contend that technology changes human behavior, but they do not explore that usage or user's cognitions can also impact technology. Therefore, an overall Web-based system evaluation model is developed to examine how users are empowered to fully use the system in Web applications, and how the users can also change both the work design and system design in their ongoing use. Building on the existing socio-technical theory, structuration theory, and empowerment theory, the model identifies (1) how the system reconfigurability and work design empowers users to make full use of the system functions and (2) how the user empowerment encourages users to redesign work and reconfigure systems. The purposes are three-fold: first, to show how the Web-based system features and development characteristics need to be modified for the special requirements – to be interpretive flexible; second, to examine the relationship between Web design characteristics and human cognitions; third, to explore the active role of the user in the Web-based system design and applications.

By selecting course management systems, this study evaluates Web-based system success in the distance learning context, and the conclusions will be made from faculty perspective. Working in the Web applications, this research first develops and adapts measurement instruments for the model and then investigates the relationships between the prior user experience, course design, system reconfigurability, psychological empowerment, support, usage patterns, and net benefits. These results may give insights into the opportunities of human choice and Web-based system design, and should be of interest to academic researchers, and Web-based system designers. The results also provide valuable information to individuals and organizations about how to adopt and utilize the Web-based systems in their specific work environment.

Chapter 2: Theoretical Foundations and Literature Reviews

Many organizations are facing "productivity paradox of information technology" (Brynjolfsson, 1993) nowadays. Especially for the Internet - a kind of new advanced technology. They made huge investments in computers and networking, but the return is unsatisfactory. There are many explanations to this phenomenon, such as mismeasurement of outputs and inputs (Denison, 1989), lags due to learning and adjustment (Brynjolfsson et al.), redistribution and dissipation of profits (Baily and Chakrabarti, 1988), and mismanagement of information and technology (Roach, 1991). The phenomenon of the technology productivity paradox makes the evaluation of systems success a more important topic, especially for Web-based systems. Given the different needs of the users, this study first argues that the failure of the technology application may be attributable to the nature of the systems the organization purchased, that is, these Web-based systems do not enable self-deploying (Markus et al, 2002) or reconfiguration (Orlikowski, 1992) in order to meet unique individual demands. Second, this study argues that the failure may also be attributable to the lack of empowerment to users, and support to their usages, which results in the incomplete usage of the functions provided by the software. Thus, a new system success model is needed to include all the above factors into the whole model in the Web application.

This study starts from the traditional information system (IS) success model. There are many mature IS success models. Before applying these models in the Web context, the justification of this application is needed.

2.1. Traditional information system and Web-based system

The Internet is one type of advanced information technology; it can unify dispersed computer based information systems in the organization into one rich "system". Previous research (Molla & Licker, 2001) contends that a Web-based system can be considered as a kind of information system - thus providing the justification for the application of information systems (IS) theories.

While a Web-based system can be considered as a kind of information system, but the additional uses distinguish it from the traditional information systems. Hence, any effort to apply IS success models and measures to Web-based systems needs to consider the additional business function, and special natures that can be performed using Web-based systems, as opposed to information systems. This research selects distance learning systems to demonstrate some special natures which differentiate Web-based systems from traditional information systems.

2.1.1. Course Management Systems (CMSs)

Distance learning has rapidly advanced from the realm of experimenters and early adopters to a mission-critical component of an institution's educational environment. With the course management systems (CMSs), institutions are implementing successful strategies for engaging users, increasing enrollment capacity without making major facilities investment, and serving student populations. The diversity of these users demands that e-learning technology provide the highest level of flexibility to meet their needs. From the faculty's perspective, different users from different departments have different course-based processes, and goals; thus initiating functions provided by the software differently. For example, faculty from the College of Business may focus on case studies, and use discussion board, and/or audio frequently; but professors from the chemistry department may need to conduct chemical reactions, and they prefer to use video streaming to record the experiment process and results.

The distance learning system application requires the researchers to consider special natures such as user engagement design, and interpretive flexibility, which distinguish the Web-based systems from the traditional systems.

2.1.2. User Engagement

People are tending to use technology to generate power which enables them to push to the fore information. Internet heightens this spread of engagement and activities. In traditional information systems, users often register frustration regarding the outcome of problems solved in an actuarial way; they are not yet experienced in taking initiative themselves and sharing in control. Through Internet technology, users may be actively involved and consulted in designing, implementing, evaluating and improving the Web site.

2.1.3. Time-Space Continuity

With traditional information systems, the processes of development and use are often separated in time and space from the actions that are constituted by the technology, with the former typically occurring in vendor organizations, and the latter occurring in customer sites (Orlikowski, 1992). This time-space discontinuity makes users treat technology as a closed system or "black box" (see Figure 2.1). However, the open-up trait of the Internet technology makes it possible for designers to adopt an open systems perspective on technology, and thus enables time-space continuity. On one hand, human agents exert a greater engagement during the initial development of the Web-based systems; on other hand, throughout users' interaction with it, these systems may be reconfigured or changed.

After the justification of the IS success theories in the Web context, and the presentation of the differences between traditional IS and Web-based systems, the next section will track some prominent IS theories, on which the research model will be developed. First, this research begins with DeLone and McLean's Information Systems Success Model.

2.2. DeLone and McLean Information Systems Success Model

IS success is a multidimensional concept that can be addressed at different levels (such as technical, individual, group, and organizational) and can use a number of not necessary complementary criteria (such as economics, financial, behavioral and perceptual). Before 1992, the research in this field just addresses different aspects: system quality, user satisfaction, impacts, etc. DeLone and McLean (henceforth, "D&M"), after a comprehensive review of various measures used in the literature to assess IS success, propose a model that incorporates several individual dimensions of success into an overall model of IS success (see Figure 2.2). This model is based on the communications research of Shannon and Weaver (1949), and information "influence" theory of Mason (1978). Shannon and Weaver define the technical level of communications as the accuracy and efficiency of the communication system that produces information. The semantic level is the success of the information in conveying the intended meaning, and the effectiveness level is the effect of the information on the receiver. Building on this, Mason (1978) relabels "effectiveness" as "influence", and defines the influence level of information to be a "hierarchy of events which take place at the receiving end of an information system which may be used to identify the various approaches that might be used to measure output at the influence level". Accordingly, in the D&M IS Success model, "system quality" measures technical success; "information quality" measures semantic success, and "user satisfaction, individual impacts", and "organizational impacts" measures effectiveness success.

DeLone and McLean's work in this field is regarded as a major breakthrough. During the period 1992 to mid-2002, 285 refereed papers in journals and proceedings have referenced the D&M Model. In 2003, they make minor refinements to the model and propose an updated DeLone and McLean IS Success Model (see Figure 2.3).

The model is to be interpreted in the following ways: System Quality, Information Quality and Service Quality singularly and jointly affect both Use (Or Intention to Use) and User Satisfaction. Additionally, the amount of Use can affect the degree of User Satisfaction – positively or negatively – as well as the reverse being true. Use and User Satisfaction directly affects Net Benefits, and vice versa.

Figure 2.1. Traditional Models of Technology Design and Technology Use

(Discontinuous in Time-Space) (Source: Orlikowski, 1992)

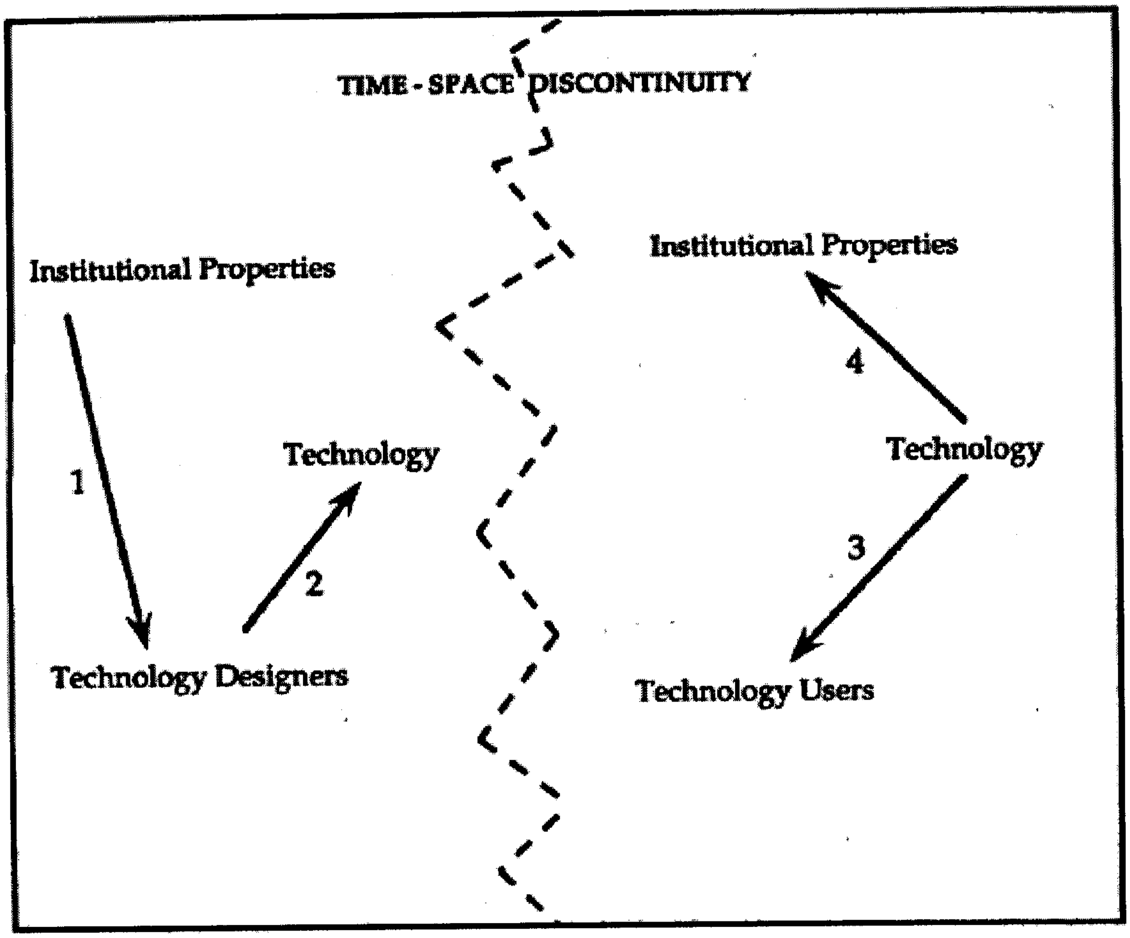


Figure 2.2. DeLone and McLean IS Success Model (1992)

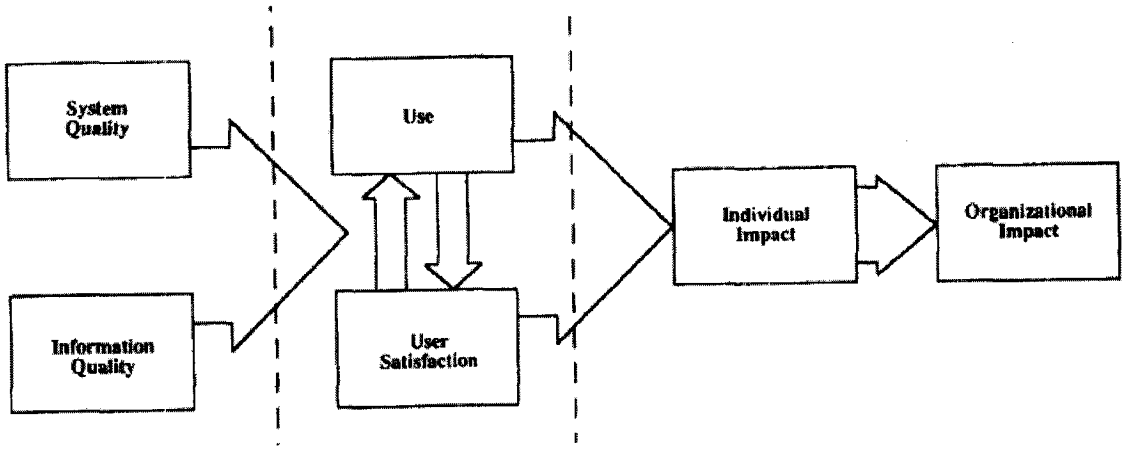
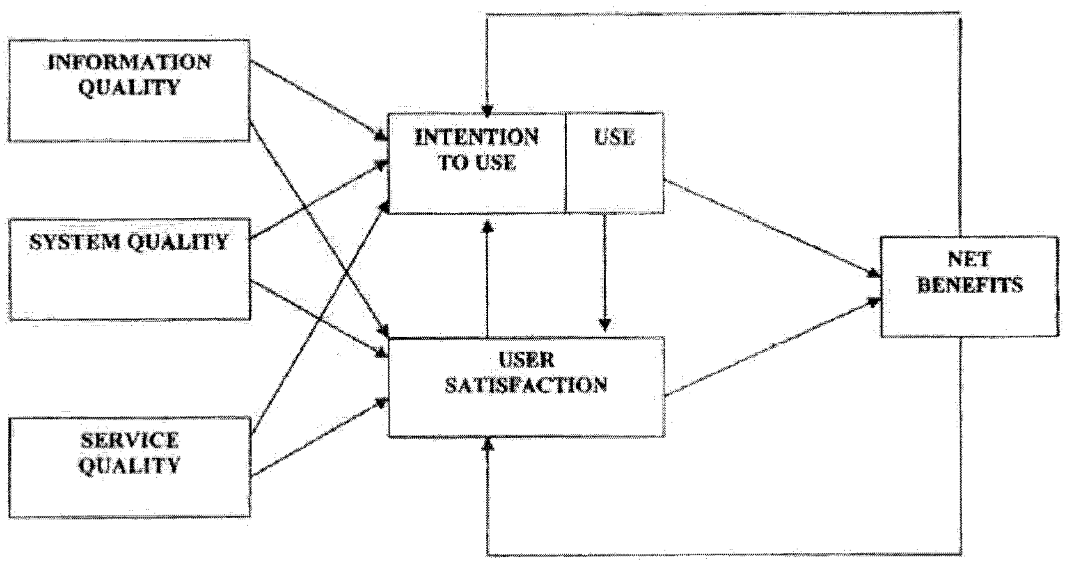


Figure 2.3. Updated DeLone and McLean IS Success Model (2003)



The updated model proposes that technology artifacts affect user behavior and satisfaction, and thus bring on net benefits, but it does not explain why and how the system design affects human behavior. Or there might be a missing link between the technology design and human behavior. Other research (Doll and Torkzadeh, 1991; Doll and Deng) addresses the motivating cognitions' role in the IS measurement. That is, technology artifacts influence the user's cognitions, and these motivating cognitions may affect user behavior and satisfaction.

2.3. Socio-Technical System to Value Chain

2.3.1. Doll and Torkzadeh's System-To-Value Chain

Based on attitude-behavior theory, Doll and Torkzadeh (1991) describe a "System-To-Value Chain" of system success constructs from causal factors to beliefs, attitude, performance-related behavior, the impact on work at an individual level, and organizational impact (see Figure 2.4).

The system-to-value chain views that the upstream antecedents (i.e., beliefs and attitude) predict the system use. It also suggests that system use explains its downstream impacts of IT.

2.3.2. Doll and Deng's Socio-Technical System To Value Chain

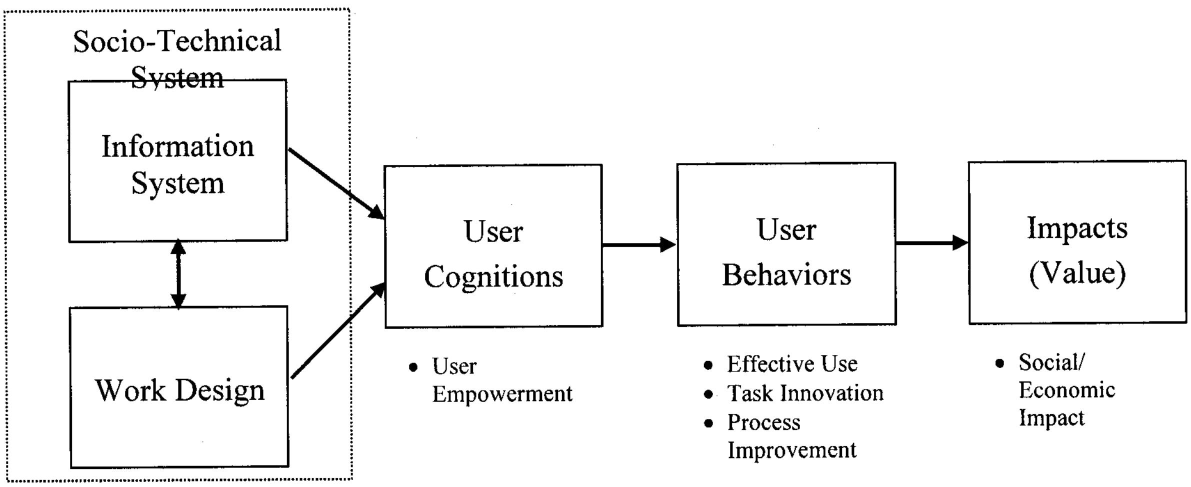
In their study of the computer-mediated work environment, Doll and Deng extended the "System-to-Value Chain" based on socio-technical theory, and proposed "Socio-Technical System to Value Chain" (see Figure 2.5).

Figure 2.4. System-to-Value Chain

<---------- upstream -- downstream ----------->

Causal Factors → Beliefs → Attitude (User satisfaction) → Behavior (Performance related) → Impact on work at individual level → Organizational impacts

Figure 2.5. Socio-Technical Systems to Value Chain



Different from previous research of information system success, Doll and Deng propose that users play a more active role in determining how systems are used in today's knowledge economy. The design question has shifted to how the information systems and work systems interact to empower users, that is, to use technology in ways that leverage the intellectual skills of individuals and work groups.

This design question has increased interest in what cognitive task assessments empower users and how these cognitions motivate a wider range of behaviors, including how effectively individuals use information technology for important organizational functions, and how actively they craft their work processes. These user behaviors are important to realizing the potential social and economic impacts of information technology.

They further propose that user empowerment is an important dependent variable in upstream information systems research, focusing on how social technical systems should be designed to empower users. Typical system success measures, such as user satisfaction (D&M, 2003) or hours of use, are more appropriate for computer systems designed to automate work, than for those designed to informate and stimulate work (Dutta et al., 1997). User empowerment is also an important dependent variable in downstream research on how user empowerment motivates a wide range of user behaviors essential to productivity and learning in a knowledge economy.

2.4. Psychological Empowerment

In the IS literature, there is a growing realization that user cognitions play an important motivational role in determining how effectively information technology is used (Doll and Deng). Employee empowerment is desirable because all human beings have an innate desire to control their environment to experience pleasure, reduce stress, and to prevent unsatisfactory outcomes. Empowering employees enhances the innovativeness and effectiveness of individuals, work groups, and organizations.

The early management literature treats empowerment largely from a structural point of view (Crozier, 1964; Homans, 1974; Bacharach and Lawler, 1980) that emphasizes power differences in organizations that are intentionally created to accomplish organizational goals. This is referred to as a relational view of empowerment because it describes the perceived power or control that one individual actor (e.g., supervisor) has over others (e.g., subordinates). In this relational perspective, empowerment means the delegation of authority (Leana, 1986; Ford and Fottler, 1995) to subordinates (e.g., self-determination) and/or the sharing of resources or decision making influence (Dacheler and Wilpert, 1978) with subordinates (e.g., participative decision making).

Delegating authority and participative decision making practices often do not have the intended effects if employees do not feel empowered. In psychological literature, empowerment derives from the concepts of power and control. Power and control are motivational and/or expectancy belief-states that are internal to individuals (Conger & Kanungo, 1988). They are intrinsic needs for self-determination (Thomas & Velthouse, 1990) or beliefs in personal self-efficacy (Bandura, 1986). Empowerment thus means to enable or motivate – rather than simply delegate, through enhancing personal efficacy. Enabling implies creating conditions for heightening motivation for task accomplishment through increases in workers' effort-performance expectancies or, using Bandura's (1977, 1986) term, feelings of self-efficacy.

Thomas and Velthouse (1990) argue that empowerment is a multi-dimensional concept; its essence cannot be captured by a single cognitive factor. They define empowerment more broadly as increased intrinsic (within individual) task motivation manifested in a set of four cognitive task assessments reflecting an individual's orientation to his or her work role: self-determination or choice, competence or self-efficacy, meaning or inherent value, and impact or perceived consequence.

Spreitzer (1995) has developed and validated a model for measuring this multi-faceted concept of psychological empowerment consisting of a single second-order factor (empowerment) with four first-order factors (i.e., self-determination, competence, meaning, and impact). She finds that each dimension has a strong loading on the second-order construct in two samples. Thus, she contends that the four dimensions combine to form an overall "gestalt" of the experience of empowerment in the work place.

The management literature suggests that these four cognitive task assessments (self-determination, competence, meaning, and impact) specify a nearly complete or sufficient set of cognitions for understanding psychological empowerment (Spreitzer 1995, Thomas and Velthouse 1990). People are psychologically empowered when they perceive themselves as having choices in how they do their work, have confidence in their ability to be successful in their work, believe that their work has inherent value, and perceive that their actions will have positive consequences for their work group or organization.

If we realize that user cognitions play an important role in determining how effectively technology is used, the consequent question should be how to design the system to motivate users? Or what design characteristics lead to users' psychological empowerment?

In the distance learning environment, the types of users are diversified: novice users, skilled faculty, and experts. Besides, the users' needs are unique and emergent; faculty from different departments may enact different functions of the system, and even the same faculty may further activate system features to enhance their course design process and achieve higher teaching goals in their ongoing use. Markus et al's design theory provides guidelines for this kind of emergent knowledge process.

2.5. Markus et al's EKP Design Theory

Markus et al. (2002) address the design problem of providing IT support for emerging knowledge processes (EKPs). They define EKPs as organizational activity patterns that exhibit three characteristics in combination (1) an emerging process of deliberations with no best structure or sequence; (2) requirements for knowledge that are complex (both general and situational), distributed across people, and evolving dynamically; (3) and an actor set that is unpredictable in terms of job roles or prior knowledge. They argue that EKPs require a new IS design theory, as explicated by Walls et al. (1992).

Markus et al. (2002) create such a theory while designing and deploying a system for the EKP of organization design. They try to reconceptualize (1) the requirements of the organization design process (as those of an emergent); (2) the features of a system that would adequately support the work of organization design (as a support system that combines general and contextualized knowledge and knowledge sharing capabilities); (3) and the process of developing such a system. They describe their design theory as a set of six combined design and development principles for EKPs. Figure 2.6 summarizes EKP design theory.

Principle #1: Design for customer engagement by seeking out naïve users. System must be self-deploying; developers should conceptualize each user-system interaction as a customer engagement process and repeatedly seek out "naïve" users through a process of "onion-layering" the design team.

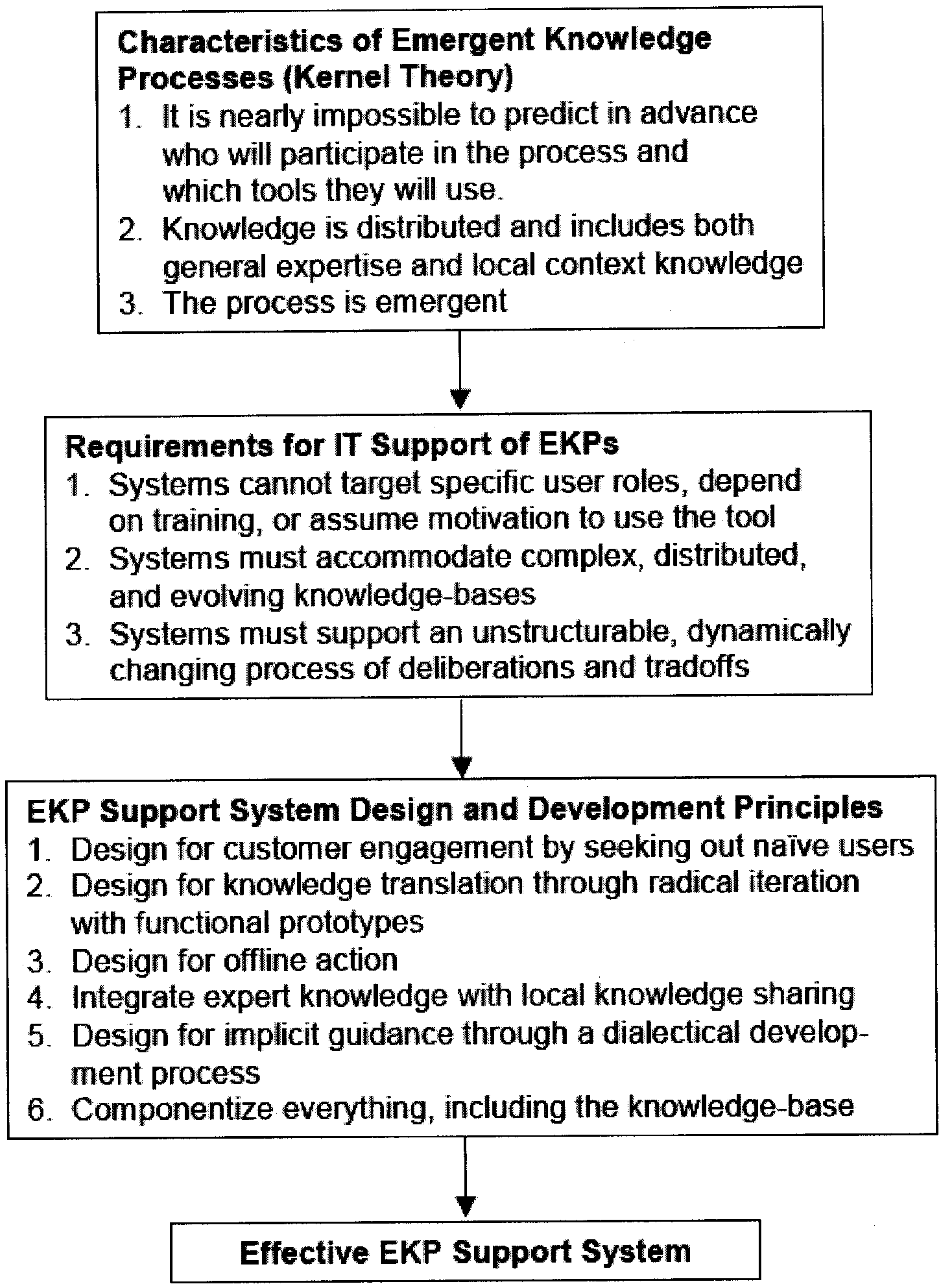
Principle #2: Design for knowledge translation through radical iteration with functional prototypes. System must translate expert knowledge into actionable knowledge for non-experts; developers should expect to need many functional prototypes, instead of a few nonfunctional prototypes.

Principle #3: Design for offline action. System must induce users to take offline action; developers must observe and strive to change users' offline, as well as online, action.

Principle #4: Integrate expert knowledge with local knowledge sharing. System must integrate expert knowledge with local knowledge sharing, and multiple needed functionalities must be integrated rather than added.

Principle #5: Design for implicit guidance through a dialectical development process. System must implicitly guide users' deliberations in desirable directions, without restricting them to a prescribed process, and developers should use a dialectical development process instead of a consensus-seeking approach.

Figure 2.6. A Design Theory for Systems That Support Emergent Knowledge



Principle #6: Componentize everything, including the knowledge-base. System must be extremely flexible, and developers should componentize everything, including the knowledge-base.

The six principles covered both system design and support aspects. For example, principle #1, #5, and #6 can be classified into a system design category. Generally speaking, they argue that the system must be self-deploying, or reconfigurable to enable user-system interaction, and provide a higher level of user engagement. They also propose to componentize everything, that is, to use module design. Principle #2, and #4 may be classified into a support category. They suggest using functional prototypes, and encourage knowledge sharing.

This EKP design theory is important in Web-based system design (1) it addresses the IT support and development process requirements of an important class of human activities; (2) it shows how the features of familiar system types can be effectively integrated (not just added) to accomplish effective support; (3) it shows how IS development practices need to be modified for the special requirements of EKPs. This theory recommends dialectical development as a way to design system features that reconcile, rather than trade off, conflicting requirements.

But, all above research treats IS as an independent influence on human behavior that exerts unidirectional, causal influence over human cognitions or behaviors. They did not explore the users' active role in affecting the system design and work design. The special nature of the Internet enables user engagement not only in the development stage, but also in their ongoing use. The time-space continuity makes this real and feasible. Users are more likely and willing to reconfigure the system to improve work process and achieve higher level of task goals in Web applications. Orlikowski's (1992) structurational model provides a strong theoretical base of this view.

2.6. Structuration Theory and Orlikowski's Structurational Model of Technology

Orlikowski's structurational model of technology was rooted in Giddens' structuration theory.

2.6.1. Structuration Theory

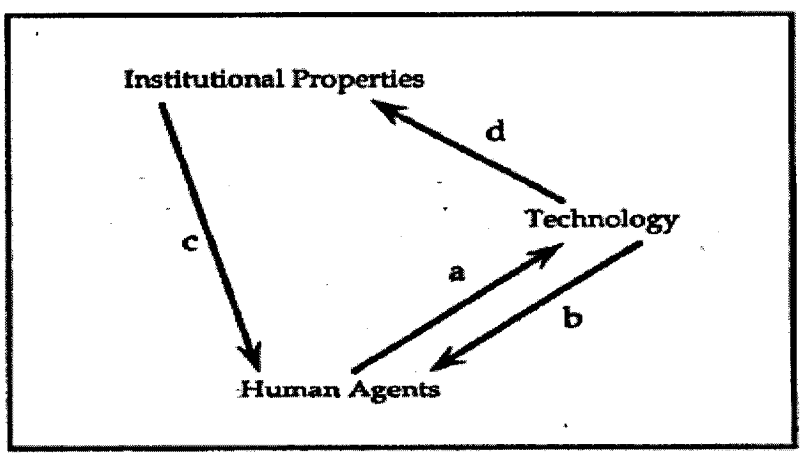
Recent work in social theory (Giddens, 1976, 1984, 1993) has challenged the long-standing opposition in the social sciences between subjective and objective dimensions of social reality. Giddens (1979, 1984, and 1993) articulated his theory of structuration as a model for how social actors both create and are guided by structures which define interaction in social contexts. That is, human actions are enabled and constrained by structures, yet these structures are the result of previous actions. The key principle in structuration theory is that of duality of structure – human action is enabled and constrained by structure, but structure is also the result of human actions. Action and structure presuppose each other and they are therefore viewed as a duality in structuration theory. That is, through their actions, individual agents collectively develop the structural aspects of social life (e.g., perceptions of space and time, language) which serve to guide and constrain future action. Social actors can nevertheless choose actions which affect changes in the structures adopted.

2.6.2. Orlikowski's Structurational Model of Technology

Orlikowski's structurational model of technology provides a more comprehensive view in contrast to the prevailing conceptions of interaction between human actors and the technology they employ. A central tenet of the model is the concept of the duality of technology which states: "Technology is physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meaning they attach to it and the various features they emphasize and use" (Orlikowski, 1992). Within the structurational model, human agents create technology, not just in the overtly creative systems development process, but also through the process of appropriation.

Orlikowski's structurational model of technology can be classified into three premises. First, "duality of technology" – technology is created and changed by human action, yet also used by humans to accomplish some action. It is physically constructed by actors working in a given social context, and socially constructed by actors through the different meanings they attach to it and the various features they emphasize and use. Once deployed, however, it tends to become institutionalized, becoming more objective in nature. On other side, interaction of technology and organizations is a function of the different actors and socio-historical contexts implicated in its development and use. Many of the actions that constitute the technology are often separated in time and space from the actions that are constituted by the technology, with the former typically occurring in designer sites, and the latter occurring in user sites. Structuration model of technology posits artifacts as potentially modifiable throughout their existence. Human interaction with technology has two iterative modes: design mode and use mode. Second, a corollary of the first, is that technology is "interpretive flexibility" - the degree to which users of a technology are engaged in its constitution (physically and/or socially) during development or use. It is described as an attribute of the relationship between humans and technology, therefore influenced by characteristics of the material artifact, characteristics of the human agents and characteristics of the context. If a technology is not infinite - constrained by material characteristics of technology - different levels of knowledge and power affect actors during the technology's design and use. Finally, technology is the product of human action. As a human artifact, technology only comes into existence through creative human action or sustained by human action. Once deployed in an organization, technology remains inanimate and ineffectual unless given meaning and is manipulated. Interpretive flexibility operates in two modes of interaction – design mode (human design rules into technology) and use mode (appropriate technology by assigning shared meanings to it).

Figure 2.7. Structurational Model of Technology



Orlikowski's structurational model of technology can be described by Figure 2.7. First, this model contends that technology is the product of human action (arrow a). That is, technology is an outcome of such human action as design, development, appropriation, and modification. Second, technology is the medium of human action (arrow b). Because technology is used by workers, it mediates their activities. That is, technology facilitates and constrains human action through the provision of interpretive schemes, facilities, and norms.

Further, Orlikowski (2000) describes how people, over time, constitute and reconstitute a structure of technology use, that is, they enact a distinctive "technology-in-practice". She argues that the use of technology is temporally and contextually provisional, and thus there is, in every use, always the possibility of a different structure being enacted. Users have the option, at any moment, to choose to use the technology differently (i.e., to enact new technologies-in-practice). Technologies-in-practice can be and are changed as users experience changes in awareness, knowledge, power, motivations, time, circumstances, and the technology itself.

2.7. Research Framework

The above theories and models provide a strong theoretical base to develop a new system success model in the Web context. To evaluate the Web-based system success, the following part starts from the DeLone and McLean information systems success model. This model will then be modified based on Doll and Deng's Socio-Technical System to Value Chain, empowerment theory, Markus et al's EKP design theory, and Orlikowski's structurational model of technology.

Information systems success models can be extended because of our specific knowledge of the kinds of users and their goals and their activities. This study selects course management systems to evaluate the systems' success from both the faculty's and instructional designer's perspective. The reason for selecting faculty rather than students relates to the purpose of this study, which is to explore the active and creative role of the user in technology implementation. Particularly with CMSs, system reconfigurability is only applicable to faculty. In most cases, students do not have the authority to alter the system artifact.

E-learning has become pervasive among educational institutions of all types, from community colleges, to K-12 school districts, to private universities, and to educational systems with hundreds of thousands of students. It presents a host of new opportunities for institutions to cost-effectively expand access to education and improve educational outcomes.

Course management systems (CMS), are defined as a comprehensive software package that supports "courses that depend on the Web for some combination of delivery, testing, simulation, discussion, or other significant element". With these Web-based systems, institutions are implementing successful strategies for engaging users, increasing enrollment capacity without making major facilities investment, and serving student populations.

"Learning without limits" means enabling various faculty and students to achieve their unique e-learning objectives by providing a flexible, scalable path for growth. With different goals – such as serving diverse student populations, expanding access to learning opportunities, and attracting and retaining faculty and students – institutions are looking for flexible e-learning systems that will empower them to achieve their unique objectives (Lane).

Currently, the dominant software – WebCT, which occupies a 38% market share - provides maximum flexibility in supporting the ongoing needs of faculty as they progress from novice to advanced users. It offers the widest range of pedagogical tools and the most efficient course management capabilities to fully support faculty of all experience levels with online learning. For example, novice users can take advantage of course design wizards, which offer step-by-step guides to the most common design functions, such as setting up a discussion area, adding a syllabus, or posting a presentation. It also offers the depth of functionality and pedagogical flexibility to support even the most advanced online course designers. Instructors are able to fully customize the structure, presentation, look-and-feel, and delivery of their online courses to meet unique demands. For example, a biology faculty member could use a video microscope to capture the lifecycle of a cell, record accompanying audio commentary, and delver that learning module via streaming media in an online course.

Based on the WebCT Web site, this system has two main characteristics (1) it is reconfigurable – users will not become boxed in by e-learning technology because the CMSs are specifically designed to grow with their needs; (2) it empowers users - this software was created by educators for educators, and it is designed to empower faculty with a full range of flexibility with teaching and learning tools.

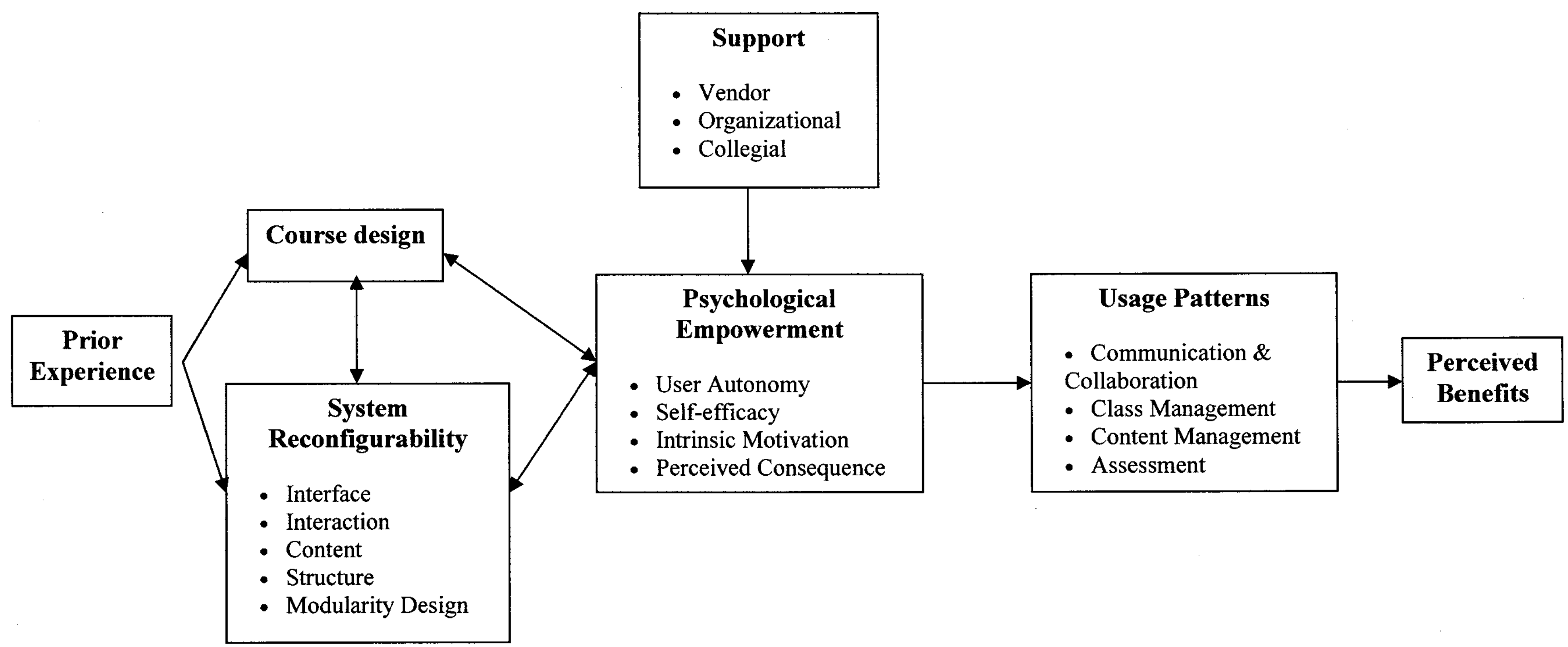
2.7.1. Research Model

A Web-based system success model is proposed to investigate the role of user empowerment in the full and effective use of the system and impact of reconfigurable system design characteristics (see Figure 2.8).

First, user's prior experience of a specific software package is an antecedent variable, because the Internet is still an advanced technology. We cannot assume the majority of the users to be familiar with the features of a particular Web-based system such as a Course Management System in e-learning context. Users' experience will help them enhance course goals in a distance learning environment, and take advantage of system reconfigurability.

Second, the model hypothesizes that Web-based work systems can be viewed as socio-technical systems where the work system and the information system should be designed together for greater effectiveness. This is based on the socio-technical theory. Doll and Deng also describe a similar interaction between work design and system design. In the e-learning application, this means course design objectives and software design characteristics, such as system reconfigurability, should be considered together.

Figure 2.8. Research Model



Third, D&M IS Success model suggests that systems design quality predicts human behavior – usage. Doll and Deng's Socio-Technical System to Value Chain reveals that user empowerment is a pivotal link in a causal chain of constructs from the design of socio-technical systems to users' effective use of the technology. Markus et al.'s EKPs system design theory contends the system should be self-deploying, or re-configurable to enable user-system interaction, that is, to enable or engage users. Users' power and control over their task – course design, and reconfigurable characteristics of the system - let users perceive themselves as having choices in how they do their work, believe that their work has inherent value, and perceive that their actions will have positive consequences for their work; thus motivating them to use the technology artifacts to improve work process and achieve goals. In distance learning environments, different faculty from different departments may require different system functions. System designers did not know the users' specific requirements at first, and which functions they would like to use frequently. The reconfigurability of the system design characteristics lets users feel autonomy and pleasure, leading users to use the system to achieve objectives.

Fourth, based on Orlikowski's structurational model of technology, it is not technology only which constrains and enables users, users may also in turn, affect technology. Empowered users have more confidence in their ability to be successful in their work; they believe that their work has inherent value, and perceive that their actions will have positive consequences for their work. These in turn, will motivate users to improve work design, and to reconfigure the system.

Markus et al. (2002) suggest using the functional prototype and encourage local knowledge sharing to support users. Support is important, because it provides users necessary resources to solve problem, and thus reduce frustrations, make them feel more confident and joy in using the software.

Finally, users have the option, at any moment, to choose to use the technology differently. Applying Orlikowski's "enactment" concept, empowered users are more likely to make active, full, extensive, and effective use of the technology, to enact the technology artifacts in their ongoing use, and this kind of usage will bring on more positive impacts in e-learning environments.

The following sections will cover the variable definition, dimensions, and literature reviews of these seven constructs.

2.7.2. Prior Experience

According to information system (IS) researchers, technology experience is a strong predictor of both attitudes and behavior toward the technology (Thompson, Higgins, & Howell, 1994). Some studies have found that experts and novices use IS differently (DeLone, 1988).

In E-commerce literature, it has long been established (e.g., Blake et al., 2003; Citrin et al., 2000; Goldsmith, 2001; GVU, 1998; Horrigan, 2000) that those with more exposure to and longer experience with the Internet have a higher probability of shopping online. Horrigan (2000) observes that those who shop online tend to be those who have more experience on the Internet.

People with prior experience should be more conversant with the operations of the systems than those with less experience. More experienced individuals may feel more comfortable with both the course design and system reconfiguration. They may feel more free to pay close attention to substantive features and may feel that they no longer need to invest as much energy in using the systems.

Unlike traditional classroom teaching, we cannot assume the majority of the faculty to be familiar and experienced with the Web-based systems. Therefore, CMSs experience probably plays a more important role in distance learning courses than traditional ground courses. Because CMS is still in its infancy, we would expect a large variation in Web-based system experience among users in the general population, and this variable may play a central role in teaching effectiveness. The few studies that have been conducted on Internet experience have concluded that this is an essential variable and behavior on the Net (Bruner & Kumar, 2000; Takacs, Reed, Wells, & Dombrowski, 1999).

Blake et al. (2005) and Thorbjornsen et al. (2002) use a single item measure of Internet experience: "On average, how many hours per week, if any, do you use the Internet?" Response were: '0,' '1-5,' '6-10,' '11-15,' '16-20,' '21 or more.' Yoh et al. (2003) measure the prior experience with two items: length of time spent using the Internet and frequency of visiting.

In this study, prior experience is defined as users' direct participation of using the software in distance learning in terms of time and frequency.

2.7.3. Course design

Task Knowledge Structures were developed to describe work tasks by people using IT tools. In socio-technical theory, Macredie and Wild (2000) define task as an activity, by agents, to bring a change of state in a given domain, that is, to take advantage of the affordance of object attributes. Task Knowledge Structures represent knowledge about goals, procedures, actions, objects, roles and plans, as well as centrality and representativeness of task elements. In distance learning environments, we measure the task design from the role or agent of faculty, and define it as the course design goals in distance learning environments.

Several hundred thousand copies of the Principles and Inventories have been distributed on two- four-year campuses in the United States and Canada. Since the Seven Principles of Good Practice were created in 1987 by Chickering and Gamson, new communication and information technologies have become major resources for teaching and learning in higher education. If the power of the new technologies is to be fully realized, they should be employed in ways consistent with the Seven Principles. Such technologies are tools with multiple capabilities. Instructional strategies can be supported by new technologies. Current CMSs, such as WebCT, Blackboard, and eCollege, provide appropriate ways to use computers, video, and telecommunication technology to advance the Seven Principles.

Principle #1: Encourage contacts between students and faculty.

Frequent student-faculty contact in and out of class is the most important factor in student motivation and involvement. Faculty concern helps students get through rough times and keep on working. Knowing a few faculty members well enhances students' intellectual commitment and encourages them to think about their own values and plans.

Course Management Systems (CMSs) that increase access to faculty members, help them share useful resources, and provide for joint problem solving and shared learning, can usefully augment contact. By putting in place a more "distant" source of information and guidance for students, such technologies can strengthen faculty interactions with all students, but especially with shy students who are reluctant to ask questions or challenge the teacher directly. It is often easier to discuss values and personal concerns in writing than orally, since inadvertent or ambiguous nonverbal signals are not so dominant. As the number of commuting part-time students and adult learners increase, technologies provide opportunities for interaction not possible when students come to class and leave soon afterward to meet work or family responsibilities.

Principle #2: Develop Reciprocity and Cooperation among Students.

Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's ideas and responding to others improves thinking and deepens understanding.

The increased opportunities for interaction with faculty noted above apply equally to communication with fellow students. Study groups, collaborative learning, group problem solving, and discussion of assignments can all be dramatically strengthened through communication tools that facilitate such activity.

The extent to which Web-based tools encourage spontaneous student collaboration was one of the earliest surprises about CMSs. A clear advantage of email and discussion boards for today's busy commuting students is that it opens up communication among classmates, even when they are not physically together.

Principle #3: Use Active Learning Techniques.

Learning is not a spectator sport. Students do not learn much just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves.

Apprentice-like learning has been supported by many traditional technologies: research libraries, laboratories, art and architectural studios, and athletic fields. Newer technologies now can enrich and expand these opportunities. For example, simulating techniques that do not themselves require computers, such as helping chemistry students develop and practice research skills in "dry" simulated laboratories before they use the riskier, more expensive real equipment.

New Technology also helps students develop insight. For example, students can be asked to design a radio antenna. Simulation software displays not only their design, but the ordinarily invisible electromagnetic waves the antenna would emit. Students change their designs and instantly see resulting changes in the waves. The aim of this exercise is not to design antennae, but to build deeper understanding of electromagnetism.

Principle #4: Give Prompt Feedback.

Knowing what you know and don't know focuses your learning. In getting started, students need help in assessing their existing knowledge and competence. Then, in classes, students need frequent opportunities to perform and receive feedback on their performance. At various points during college, and at its end, students need chances to reflect on what they have learned, what they still need to know, and how they might assess themselves.

The ways in which new technologies can provide feedback are many — sometimes obvious, sometimes more subtle. Email can be used for supporting person-to-person feedback, and some feedbacks are inherent in simulations. Web-based systems also have a growing role in recording and analyzing personal and professional performances. Teachers can use technology to provide critical observations for an apprentice. For example, a video can help a novice teacher, actor, or athlete critique his or her own performance.

Principle #5: Emphasize Time on Task.

Time plus energy equals learning. Learning to use one's time well is critical for students and professionals alike. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty.

New technologies can dramatically improve time on task for students and faculty members. Technology also can increase time on task by making studying more efficient. Teaching strategies that help students learn at home or work can save hours otherwise spent commuting to and from campus, finding parking places, and so on. Time efficiency also increases when interactions between teacher and students, and among students, fit busy work and home schedules. Students and faculty alike make better use of time when they can get access to important resources for learning without trudging to the library, flipping through card files, scanning microfilm and microfiche, and scrounging the reference room.

Principle #6: Communicate High Expectations.

Expect more and you will get it. High expectations are important for everyone — for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy.

Web-based systems can communicate high expectations explicitly and efficiently. Significant real-life problems, conflicting perspectives, or paradoxical data sets can set powerful learning challenges that drive students to not only acquire information, but sharpen their cognitive skills of analysis, synthesis, application, and evaluation.

Many faculty report that students feel stimulated by knowing their finished work will be "published" on the World Wide Web. With technology, criteria for evaluating products and performances can be more clearly articulated by the teacher, or generated collaboratively with students. General criteria can be illustrated with samples of excellent, average, mediocre, and faulty performance. These samples can be shared and modified easily. They provide a basis for peer evaluation, so learning teams can help everyone succeed.

Principle #7: Respect Diverse Talents and Ways of Learning.

Many roads lead to learning. Different students bring different talents and styles to college. Brilliant students in a seminar might be all thumbs in a lab or studio; students rich in hands-on experience may not do so well with theory. Students need opportunities to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily.

Technological resources can ask for different methods of learning through powerful visuals and well-organized print; through direct, vicarious, and virtual experiences; and through tasks requiring analysis, synthesis, and evaluation, with applications to real-life situations. They can encourage self-reflection and self-evaluation. They can drive collaboration and group problem solving. Technologies can help students learn in ways they find most effective and broaden their repertoires for learning. They can supply structure for students who need it and leave assignments more open-ended for students who don't. Fast, bright students can move quickly through materials they master easily and go on to more difficult tasks; slower students can take more time and get more feedback and direct help from teachers and fellow students. Aided by technologies, students with similar motives and talents can work in cohort study groups without constraints of time and place.

Table 2.1 summarizes the definition and related literature for each dimension of course design.

2.7.4. System Reconfigurability

Pioneered literature in manufacturing (Thomke & Hippel, 2002; Hippel & Katz, 2002) suggest "customers as innovators", because it is difficult to understand exactly what products the customers want, and have instead equipped them with tools to design and develop their own products, ranging from minor modifications to major innovations. The tools, often integrated into a package they call a "toolkit for customer innovation," deploy new technologies like computer simulation and rapid prototyping to make product development faster and less expensive. This strategy has already taken effect in Web applications, such as B2B (business to business) or B2C (business to consumer). A variety of industries use this approach. For example, in software, a number of companies let people add custom-designed modules to their standard products and then commercialize the best of those components. Open source software allows users to design, build, distribute, and support their own programs (see Figure 2.9). In other words, a novel architecture needs to be created specifically to separate problem-solving tasks requiring access to a manufacturer's solution information from those requiring access to users' need information.

"Product configurators" used by producers of mass-customized products are similar in intent, but less capable than toolkits. They invite product purchasers to configure their own unique product by selecting from lists of options that have been predesigned by the mass customizer. For example, Dell Computer invites visitors to its Web site to "design your own computer" by making choices among a list of computer components on offer, such as the kind of monitors, the size of disk drives, and the number and types of memory modules from a menu on a Dell Website.

MIS literature (Drucker, 1990) proposes the modular organization of the manufacturing process, which promises to combine the advantages of standardization and flexibility. Baldwin and Clark (1997, 2000) regard modularity as a manufacturing strategy for effectively organizing complex products and processes. They argue that it is modularity, more than any other technology that makes the rapid developments in computer industry possible.

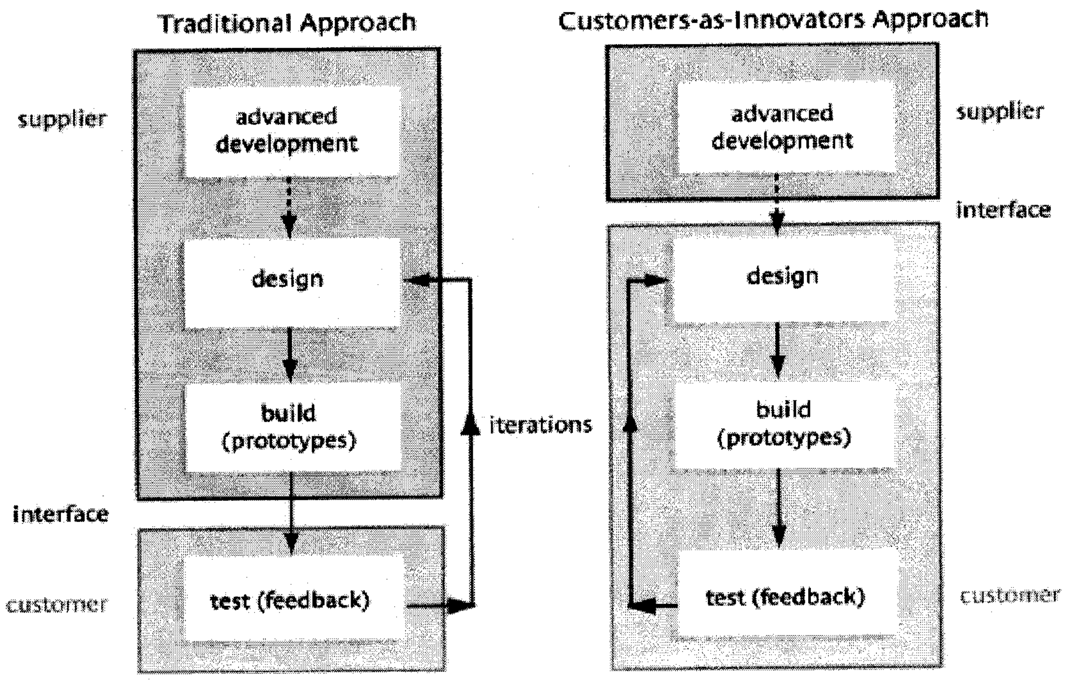
Table 2.1 Dimensions of Course Design and Related Literature

Label	Definition	Related Literature
Course design	The course design goals in distance learning environment.	Chickering & Ehrmann, 1996; Graham et al., 2001; oln.org.
Encourage contact between student and faculty	Computer-mediated communication provides faster, more open, and more reflective communication	Chickering &Gamson, 1987; Chickering & Ehrmann, 1996; Graham et al., 2001; oln.org.
Develop reciprocity and cooperation among students	Computer-mediated communication facilitates group interactions, problem solving, and building communities.	
Use active learning techniques	Technology-based simulations allow for greater interaction and student manipulation, and primary resources in digital format enhance student scholarly research	
Give prompt feedback	Computer-mediated communication provides considerable avenues for prompt reflective feedback	
Emphasize time on task	Technology provides opportunities for creating new forms of mediated environments, which provide structure and engage the students	
Communicate high expectations	Computer-mediated environment offer faculty a variety of avenues for demonstrating and conveying high expectations. Furthermore, these environments can provide dramatic shifts in "audience" which can foster higher expectations from student work	
Respect diverse talents and ways of learning	Technology provides the means for faculty to build multiple pathways to learning within the same course by allowing content and discussion to be provided in multiple ways	

Based on socio-technical theory, Macredie and Wild (2000) emphasize continual evolution of task support artifacts such as IT. They propose three approaches, which include "forecast-oriented analysis techniques", "tailorable systems", and "system architectures", to accommodate alterations to functionality gracefully. These approaches are concerned with the promotion of flexibility within socio-technical systems. Flexibility Analysis suggests that areas of possible change should be input into system development and the implications examined to ensure that the changes are easily applicable. Tailorability seeks to encourage localized development and growth of socio-technical systems, often by the users to support the changed tasks. The process of tailoring does not produce a new system, but modifies an old one, changing aspects of the whole systems traditionally viewed as stable or fixed – the tool itself. They contend that flexible software architectures that allow modifications quickly and safely have been a major aim of software engineering. This approach sets the ground for developing systems that will respond to change.

Markus et al (2002) create system design theory in emerging knowledge processes (EKPs). In distance learning environments, the requirements of users are not clearly specified. The faculty from math who teach math courses may use the system distinctly from the faculty who teach biology courses. Also, the shared knowledge is dispersed unevenly among faculty. In this situation, systems need to be designed for customers' engagement, for implicit guidance through a dialectical development process, and for componentizing everything.

Figure 2.9. A New Approach to Developing Custom Products (Source: Thomke and von Hipple, 2003)



While it is widely accepted that good Web site design should be "user-centered" (Powel, 2000), it is hard to achieve this in the real world. Programmers are very easily tempted to be technology-centered, or visually centered. Besides, it is not easy to understand user's needs. While users share common capabilities, such as memory or reaction time, each user is still a distinct individual. Sites should be built for common capabilities, and still be accountable for the differences exhibited by individuals (Powel, 2000). The best person who knows the user's needs well is the user him or her self. The engagement and open-ended attribute of the Internet make this possible.

In this study, system reconfigurability is defined as the capability of this software in designing learning environment to meet various instructional needs. It is necessary by providing users with kits of design tools that can help them to carry out the design tasks assigned to them. After Web design literature review, four elements are widely identified as an important guide for Web development: interface design, content design, structure or navigation design, and interaction design (Palmer,2002; Barnes et al., 2001; Raquel,2001; Tilson et al., 1998; Lewis, 1995). Module design is also covered.

2.7.4.1. Interface Reconfigurability

A site's visual design is often the first thing noticed. Like it or not, on the Web, looks do matter (Powel, 2000). First impressions count heavily online. But it may not be possible to force good taste or predict trends, so it is better to leave it to users if possible. User interfaces are especially important for distance learners, who have no teacher present to answer questions or clarify information (Lohr, 2000). Salas et al. (2002) also emphasize appropriate interface design in distance learning to ensure the learners' attention is on the material they are supposed to be learning. The heart and soul of a Web page is text. Whatever anyone says about the future of multimedia online, most Web pages are dominated by textual information (Powel, 2000). So the way faculty use text may significantly influence the user's experience. Second, for most people, the Web is a visual medium. Colors, images, and backgrounds are used on the Web to make sites more interesting to look at, but to also inform, entertain, or even evoke subliminal feeling of the user.

2.7.4.2. Content reconfigurability

Web sites tend to be much more content-focused than traditional software (Powel, p.13, 2000). Content provides the bricks for our virtual pyramid. Content might be text, two-dimensional images, three-dimensional images, animation, audio, video, or the interplay of any number of these content forms. Skyrme (2001) argues that characteristics for a good Web page should be compelling and excellent content. He also suggests the use of audio, images and video stimulates more sense and enhances comprehension for many users and of certain kinds of information.

As the Web moves away from a print design background, it has continued to become more and more multimedia-driven. Many sites use animation, and audio and video are becoming popular as well. However, while multimedia may improve the presentation of a site, it often comes with significant bandwidth and technology restrictions (Powel, 2000). Designers should first consider if the addition of multimedia elements will actually improve the user's ability to understand information or make the experience of visiting the site more pleasing.

In distance learning environments, the first step in developing a course Web site is to gather the materials on the content list (Horton, 2000). Some items may already be on the computer, whereas others may need to be converted to digital format from other media. Still, other materials need to be created from scratch. Developing materials for the Web means finding ways to provide valuable content within the constraints of a networked environment. Much of what faculty will do as a course Web site author will be to try to make the teaching materials suitable for networked delivery. One possible function for a course Web site is to distribute course materials. With this option, faculty do not need to translate documents from their original format into HTML in order to display them on the Web. Instead, they upload the documents onto the Web server in their native format – say, as Word or Excel files. Then they put links on the site that point to the files they uploaded. When students click a link, the file downloads onto their machines. A more ambitious choice would be to offer students access to download materials for use in other applications. For example, faculty might have a data set that they would like students to use for data analysis. They can save the data in a portable format, such as a tab-delimited text file, upload the file onto the Web server, and offer a download link to the file on their course Web sites. With this method, students can easily download, import, and work with the data in their spreadsheet or statistical analysis package. Other applications of this approach include PowerPoint presentations, and PDF documents.

One of the most important advantages of Web-based instruction is the ability to employ multiple media types to present ideas and concepts (Horton, 2000). With Web multimedia, faculty can combine text, images, sound, and moving images on a single page. For example, a Web site for a language course could offer a visual orientation using maps and photographs, listening practice using audio narratives by native speakers, and authentic texts for reading comprehension. All these elements can be integrated for greater effect.

2.7.4.3. Structure Reconfigurability

Skyrme, D.J. (2001) argues that information presented in logical sections increase readability. A site structure shapes the mental model users form of the content – what there is to be found and how to find it. An organizational structure allows users to retain a sense of context as they move through the information, so they are constantly aware of where they are, where they've been, and where they can still go (Horton, 2000).

Use of common formats helps the user quickly find sections of relevance. Adding XML tags simplifies exchange of information between database and applications. Users can also quickly connect to reference materials and related pages without revisiting pages or searching by hyperlinks. Users need help to find their way through a site. A clear site structure helps, but good navigation requires more than structure. Meaningful link names, logical grouping of buttons, clear page titles, and consistent navigational elements also influence "way finding." (Powel, p. 14, 2000).

Good navigation design helps users find the content they need. Navigation is important because it allows users to acquire more of the information they are seeking and making the information easy to find. Thus, a key challenge in building a usable Web site is to create good links and navigation mechanisms. Navigation through Web sites is accomplished by selecting links that relate pages to each other (Powel, 2000). Though the Web follows a relatively simple linking model, the form of links within Web pages varies from HTML text links within body copy, to visually rich graphical buttons such as icons. Making sure that users understand what links do is an integral part of developing a usable site. There are many ways to add links in a Web site, including text links, buttons, and image maps.

2.7.4.4. Interaction Reconfigurability

When users choose to use a technology, they are also choosing to interact with that technology (Orlikowski, 2000). A key capability of the Internet is its capacity to support greater interaction for users. Consumers using the Internet to gather information, to secure product information, and to purchase goods and services are influenced by the interaction of the Web site. An interactive site is one where the users of the site are able to interact directly with the content or with other users of the site (Powel, 2000). Truly interactive sites allow users to manipulate the content itself, and in some cases, even add their own content. A site that allows a user to post technical-support questions for other users to view would be considered interactive. Based on Horton (2000), the interactive potential of the computer is one of the principal reasons it is used as a medium for instruction.

In computer-based instruction, learners actively participate in the learning process; they are presented with an array of choices from which to construct their own path to knowledge and understanding. The Web is by its very nature interactive. Web users actively construct a path by choosing which links to follow. Some advanced forms of Web-based interaction include quizzing, online communication, and simulations.

2.7.4.5. Modularity design

Custom designs are seldom novel in all their parts. Therefore, libraries of standard modules that will frequently be useful elements in custom designs are a valuable part of a toolkit for user innovation. Provision of such standard modules enables users to focus their creative work on those aspects of their design that are truly novel. The goal is to select a style that has some elements of the desired look. Users can then proceed to develop their own desired style by adding to and subtracting from that starting point.

In manufacturing literature, Schilling (2000) defines modularity as "the degree to which a system's components can be separated and recombined". Tu et al. (2004) suggest module design as an important element of flexible manufacturing and mass customization. Markus et al. (2002) propose component design as a critical design principle in EKPs. Thomke & Hippel (2002) suggest that the toolkits must contain libraries of useful components and modules that have been pre-tested and debugged so customers can create complex custom designs rapidly.

By Course Management Systems, a Content Module is a collection of sequentially arranged pages with a table of contents, built-in navigation links, and optional interactive tools. A Content Module allows faculty to present course material in a structured, logical sequence. All of the pages in a Content Module are tracked so the faculty can monitor how students are progressing through the course material.

Table 2.2 summarizes the definition and related literature for each dimension of system reconfigurability.

2.7.5. Support

Valacich et al. (2001, 2004) contend that training and support are critical for the success of an information system. They define support as providing ongoing educational and problem-solving assistance to information system users. Training and support help people adequately use computer systems to do their primary work. Without proper training and the opportunity to ask questions and gain assistance/consultation when needed, users will misuse, underuse, or not use the information systems. They further argue that although training and support can be talked about as if they are two separate things, in organizational practice the distinction between the two is not all that clear, as the two sometimes overlap. It is clear that support mechanisms are also a good way to provide training, especially for intermittent users of a system. Intermittent users must be provided with "point of need support"; specific answers to specific questions at the time the answers are needed. A Variety of mechanisms, such as the system interface itself and online help facilities, can be designed to provide both training and support at the same time. Many other user support plans might include: help desk, online help, and bulletin boards.

In MIS literature, Igbaria et al. (1995) and Igbaria et al. (1996) identify support as an important antecedent to computer usage and find empirical evidence for this relationship. The support means the extent to which an end-user has the necessary resources to use the computer (Igbaria, Parasuraman, & Baroudi, 1996; Igbaria & Iivari, 1995) (see Table 2.3). It can be in forms of information, resources, and spiritual encouragement. In some situations, it can be the availability of within-function or cross-function training. It can also be the time to interact or collaborate with team members or the members from other groups or departments of the organization.

In Markus et al.'s (2002) EKP design theory, they emphasize the importance of designing for knowledge translation through radical iteration with functional prototypes, and integrating expert knowledge with local knowledge sharing. Many software vendors nowadays provide support through the online knowledge base, customer community, and expert answers, such as "ask Dr." in the WebCT Web site. Some universities post the functional prototypes of online course design such as video labs, or audio presentations.

Table 2.2. Dimensions of System Reconfigurability and Related Literature

Label	Definition	Related Literature
System Reconfigurability	The capability of this software in designing learning environment to meet various instructional needs.	
Interface Reconfigurability	The capability of the software to enable faculty to adjust the look and feel of the homepage.	Lohr, 2000; Powel, T.A., 2000; Salas et al., 2002.
Content Reconfigurability	The capability of the software to provide a wide range of options for faculty to load information related to course.	Powel, T.A., 2000; Skyrme, D.J., 2001;
Structure Reconfigurability	The capabilities of the software to provide many different choices of structure design with helping people find their way.	Tilson et al., 1998; Lewis, 1995; Horton, 2000; Raquel,2001; Skyrme, D.J., 2001; Palmer, 2002.
Interaction Reconfigurability	The capability of the software to enable faculty to have control over, and can exchange roles in their mutual discourse in a communication process in Web application.	Barnes et al., 2001; Raquel,2001; Palmer,2002.
Module Design	The capability of the software to use a collection of sequentially arranged pages with a table of contents, built-in navigation links, and optional interactive tools.	Markus et al., 2002; Thomke & Hippel, 2002; Hippel & Katz, 2002; Tu et al., 2004.

In Web-based systems context, the type of support required typically focuses on the application of the software to a specific task. As problems emerge, users often seek advice from colleagues who may have experience solving similar problems in the Web, or they may get assistance from management support (training, technicians). Particularly, it is convenient for users to get solution or help from a vendor though a vendor's Web site. Skyrme, D.J. (2001) emphasizes the importance of expert contact in the Web site. He suggests a direct communications channel between user and expert, which provides opportunities for clarification, feedback or ongoing dialogue.

In MIS literature, Compeau and Higgins (1995b), and Igbaria and Livari (1995) use a measure of organizational support (e.g., resources, assistance, and management support). Compeau and Higgins (1995b) use a measure of management support (i.e., computer and software resources and training). Doll and Deng use colleague support (i.e., expertise provided by colleagues who solved similar problems). Table 2.3 summarizes the definitions and related literatures.

2.7.6. Psychological Empowerment

Empowerment refers to an individual's cognitive, authoritative, and resource readiness to use an application. It is a construct used to explain organizational effectiveness (Spreitzer, 1995; 1996; Conger & Kanungo, 1988).

Psychological empowerment, termed as intrinsic task motivation (Thomas & Velthouse, 1990), is assessed through competence, self-determination, meaning, and impact (Spreitzer, 1995; 1996). Competence refers to self-efficacy specific to work – a belief in one's capability to perform work activities with skill. Compeau and Higgins

(1995a) identify that self-efficacy perceptions influence decisions about what behaviors to undertake, the effort exerted and persistence in attempting those behaviors, the emotional response of the individual performing the behaviors, and the actual performance attainments of the individual with respect to the behavior.

Self-determination is a sense of choice in initiating and regulating actions. It reflects autonomy over the initiation and continuation of work behavior and processes; making decisions about work methods, pace, and efforts are examples. Meaning refers to a fit between the requirements of a work role and a person's belief, values, and behaviors. The concept concerns the value of the task goal, judged in relation to the individual's own standards. MIS literature uses perceived usefulness to capture this dimension (Davis, 1989).

Impact is the degree to which a person influences strategic, administrative, or operating outcomes at work. The concept is the converse of learned helplessness and implies the perceived relationship between the person and his/her working environment.

This research uses autonomy, self-efficacy, and perceived impact to capture major factors of empowerment in a Web-based system context. Autonomy measures an individual's perception of having choices in initiating and regulating the application usage. Self-efficacy evaluates an individual's belief in one's ability to skillfully use the software for the process.

As in Spreitzer (1995; 1996) and Thomas and Velthouse (1990), autonomy and self-efficacy are used to measure an individual's empowerment. Different from their studies, meaning is not included to measure empowerment. The concept is modified as goal clarity. Table 2.4 provides the definition and the literature support for the these aspects.

Doll and Deng apply this concept in a computer-mediated environment, and set up a measure. They propose computer-mediated work is a unique context for the study of psychological empowerment. The psychological empowerment of employees does not insure user empowerment. Even high-level executives with substantial influence, abilities, and motivation may not be empowered computer users. They may lack the software knowledge or skills necessary to use computers in their problem solving/decision support with confidence and competence.

There are other differences between the computer-mediated work context and the normal work context. The relevant area of choice is often more constrained in computer-mediated work. Yet the constraints are often seen as imposed by the task or the software and, thus, not resented as much as constraints that are seen as the willful acts of a superior. User autonomy is judged relative to the degree of choice necessary to get the computer-mediated tasks accomplished. Finally, the focus in computer-mediated work is on the perceived impact of the user's application usage, rather than the personal impact of the individual on his/her work group or organization. These differences suggest the need to define and measure user empowerment as a concept distinct from the psychological empowerment of employees.

Table 2.3. Dimensions of Support and Related Literature

Label	Definition	Related Literature
Support	The extent to which the faculty can rely on other resources to get information to effectively use the software to accomplish the task.	Igbaria & Iivari, 1995; Igbaria, Parasuraman, & Baroudi, 1996; Powel, 2000; Valacich et al., 2001, 2004.
Vendor support	The extent to which the faculty can rely on the software vendor to solve problem, and accomplish task.	Skyrme, D.J., 2001; Valacich et al., 2001, 2004.
Organizational support	The extent to which the faculty can rely on management to accomplish the task with this software.	Compeau and Higgins, 1995b; Igbaria and Livari, 1995; Valacich et al., 2001, 2004.
Collegial support	The extent to which the faculty can rely on the expertise of colleagues who have used the software for similar tasks.	Doll and Deng

2.7.6.1. User autonomy

User autonomy is defined as the degree of choice individuals have in how they use the computer in their work. A sense of choice is inherently motivating. It enhances an individual's sense of personal control. User autonomy is narrower than job autonomy (e.g., how much choice a person has in his/her job). Not all work is Web-mediated. Some managerial or professional workers may be constrained in their use of the Internet, yet have substantial job autonomy. Although the terms self-determination and autonomy are often used interchangeably, in this study, user autonomy is used to suggest that individuals use enabling Web resources and their own discretion to make decisions (i.e., choices of methods, pace, and effort) about how they use the computer to accomplish their work goals.

In the information systems literature, Janz (1999) finds that autonomy is positively related to an individual's perception of positive growth among development professionals. Gill (1996) reports that autonomy enhances the usage of expert systems. In a study of distributed work arrangements, Venkatesh and Vitalari (1992) find that the availability of computer resources at home and the user's desire for self-determination explain the extent of at-home computer use. They argue that a sense of choice in initiating and regulating one's own actions (e.g., ability to work at one's own choice of place and pace) is the underlying motivation for a computer owner's decision to work at home.

2.7.6.2. Self-Efficacy

Self-efficacy is a belief that one can be successful in performing a specific task (Compeau and Higgins 1995[b]). Individuals with high self-efficacy set higher goals and are more committed to these goals. Internet self-efficacy is a motivating cognition because individuals derive a sense of satisfaction from accomplishing challenging goals. Self-efficacy works through enhanced effort and persistence to improve learning and performance (Marakas et al. 1998, Igbaria and Iivari 1995, Compeau and Higgins 1995[a]).

2.7.6.3. Intrinsic Motivation

Intrinsic motivation is the pleasure or inherent satisfaction derived from using the computer to perform a specific task. The Internet enables individuals to design, create, and craft new ideas and express them as diagrams/text/models that are immediately available as feedback to the individual. Seeing your ideas take shape and sharing them with others can be pleasurable.

In Web-mediated work, the software application is also the means by which individuals attain goals or purposes that are inherently valuable to them. This value attainment mechanism for motivating computer use enhances user satisfaction and productivity (Doll and Torkzadeh 1989). Davis et al. (1992) find that intrinsic motivation/enjoyment predicts usage intention and Igbaria et al. (1996) find that intrinsic motivation/playfulness predicts actual usage.

2.7.6.4. Perceived Consequences

Perceived usefulness (Davis 1989, Davis et al. 1989) is defined in terms of the perceived consequences (impact) of using the application. Applications that are perceived as enhancing the user's work productivity are considered useful. Perceived usefulness is a motivating cognition because it reflects the belief that application usage will have a positive impact on the user's work. Research on technology acceptance supports the motivational effects of perceived usefulness on computer usage (Szajna 1996, Karahanna et al. 1999, Straub et al. 1995).

This study adapts Doll and Deng's measurement of psychological empowerment in Web environments (see Table 2.4).

2.7.7. Usage Patterns

In MIS literature, there are many arguments about the measure of system usage. DeLone (1988) uses a measure of time spent and frequency. Thompson et al. (1991) suggest the intensity of job-related PC use, the frequency of PC use, and the diversity of software packages used for work, as a measure of system usage. Questioning about the subjective measures, Straub et al. (1995) suggest using both subjective and objective measures, such as "perception of own usage as heavy, moderate, light, or nonuse; estimation of number of system features used." Igbaria et al. (1989) set up a measure consisting of dimensions such as "perceived daily use of this software" and "frequency of use".

Table 2.4. Dimensions of Psychological Empowerment and Related Literature

Label	Definition	Related Literature
Psychological Empowerment	The extent to which the faculty feel confident, competence, discretion, and motivated in using this software.	Conger & Kanungo, 1988; Doll & Torkzadeh, 1989; Thomas & Velthouse, 1990; Spreitzer, 1995; 1996
User Autonomy	The degree of choice individuals have in how they use the software in their work	Venkatesh and Vitalari, 1992; Spreitzer, 1995; 1996; Gill, 1996; Janz, 1999; Doll and Deng.
Self-efficacy	An individual's belief in his/her ability to skillfully use this software for the process	Compeau & Higgins, 1995a; b; Igbaria & Iivari, 1995; Marakas et al., 1998; Compeau, Higgins, & Huff, 1999;
Intrinsic Motivation	The pleasure or inherent satisfaction derived from using the software to perform specific task	Doll & Torkzadeh, 1989; Igbaria et al., 1996; Doll and Deng.
Perceived Consequences	Perceived impacts of using the application	Davis 1989; Davis et al., 1989; Straub et al., 1995; Szajna, 1996; Karahanna et al., 1999.

Orlikowski proposed that users may take an active role in the technology. They may initialize or ignore some functions provided by the developer. In 2000, she provides a practice lens to examine how people, as they interact with a technology in their ongoing practices, enact structures which shape their emergent and situated use of technology. In focusing on human agency, she argues that people can and do continue to redefine and modify the meaning, properties, and application of technology after development.

In this study, usage patterns refer to the extent to which the software is fully used in relation to the user's instructional use. Based on the Blackboard and WebCT Web sites, course management system functionality can be classified into four categories: communication and collaboration, class management, content management, and assessment (see Table 2.5).

2.7.7.1. Communication and Collaboration

Course Management Systems provide many tools which enable users and groups on campus to collaborate and communicate more effectively. These tools enable students or faculty to distribute content, communicate and collaborate, and deliver surveys through an online environment similar to the course sites with which they are already familiar.

Specifically, the Collaboration Tool, designed for live, synchronous interaction, supports a text-based Chat environment, as well as a full Virtual Classroom. Instructors can schedule collaboration sessions using either environment. In addition to text-based chat, the Virtual Classroom provides a collaborative whiteboard, group web browsing (web touring), private question-and-answer, and breakout room capability. It can be run in a Lecture Mode or an Open Participation Mode. Users can "raise their hand" to be called on, or given full participation control. All chat sessions can be logged and archived.

2.7.7.2. Class Management

Some software packages provide useful tools for faculty to manage the class effectively. For example, in Blackboard, the Performance Dashboard provides a view of student progress and indicates whether students have reviewed specific content items. Content Tracking provides usage statistics (alterable by user or date range) for individual content items. Similarly, Course Statistics provides usage data for an entire course. Advanced System Reporting maintains a parallel database to allow System Administrators to run comprehensive reports without impacting system performance.

2.7.7.3. Content Management

Course Management Systems allow content and files to be managed, re-used and shared effectively. Individual files and content objects can be used across multiple courses, organizations and modules without the need for duplication. Users can share their files, giving both read and write access to specific individuals, groups and institution roles (i.e. all biology teachers). For users outside of the institution, content owners can create "passes" that provide access and enable collaboration for specific time periods.

2.7.7.4. Assessment

In distance learning environments, instructors can deliver online, automatically-scored assessments and surveys. They can create such assessments from scratch or draw upon personal, institutional, or commercially-available "test banks" of questions. Question types include Calculated Formula, Calculated Numeric, Hotspot, Jumbled Sentence, Likert Scale, True/False, Multiple Choice, Multiple Answer, Ordering, Matching, Fill-in-the-Blank, Short Answer, Essay, File Upload, and Binary Choice. Assessment questions can be given all at once or one at a time, can be timed or un-timed, and assessments can be taken multiple times or only once.

2.7.8. Perceived Benefits

Valacich et al. (2001, 2004) proposed some tangible benefits of Web-based system as: cost reduction and avoidance, error reduction, increased flexibility, improvement of management planning and control, and opening new market and increasing sales opportunities.

In E-commerce literature, net benefits are perceived as time savings, cost savings, expanded markets (DeLone & McLean, 2003), convenience, customer relations, and product value (Torkzadeh & Dhillon, 2002).

In distance learning literature, Sharda et al. (2004) classify learning outcomes as efficiency, effectiveness, response magnitude, and satisfaction.

Table 2.5 Dimensions of Usage Patterns and Related Literature

Label	Definition	Related Literature
Usage Patterns	The extent to which the software was fully used in relation to the user's instructional use.	Orlikowski, 2000.
Communication and Collaboration	The software is used to allow faculty and students to communicate with each other publicly, privately, and in pre-set groups.	WebCT Web site
Assessment	The software is used to assess students' understanding and mastering of the course material.	
Class Management	The software is used to manage the course effectively.	
Content Management	The software is used to design, development, and deliver online course material.	

Perceived benefits refer to the influences that the software exerts on individual work (see Table 2.7). This research views Web-based systems impact on an individual task from the perspective of faculty. It investigates how the CMSs help faculty increase task productivity, enhance course quality, and improve student learning effectiveness. The definition and the literature support of each dimension are listed in Table 2.6.

Table 2.6. Dimensions of Perceived Benefits and Related Literature

Label	Definition	Related Literature
Benefits	The influences that the application exerts on individual work.	Torkzadeh & Doll, 1999; DeLone & McLean, 2003.
Satisfaction	The extent to which the application helps the user create value.	Liker, 1998; Heckman, 1999; Sharda et al., 2004
Teaching Effectiveness	The extent to which the application helps enhance teaching effectiveness.	Sharda et al., 2004
Class Management	The extent to which the application helps to handle large classes.	
Time Saving	The extent to which the time saving for faculty in teaching.	DeLone & McLean, 2003.
Teaching Quality	The extent to which the application helps the faculty improve the quality of teaching.	
Learning Objectives	The extent to which the application helps achieve learning objectives.	Sharda et al., 2004

2.8 Hypotheses Development

In order to empirically examine the links specified in the research model, a set of hypotheses are developed in the following sections.

2.8.1. The Links between Experience and Course Design, System Reconfigurability

E-Commerce literature found that when consumer experience with the Internet increased, in general attitudes toward Web site tended to be more favorable. Users' experiences in online teaching are similar to those in online purchasing. Users with extensive prior experience would more easily develop online course and reconfigure systems than users with less experience. Experienced faculty are more skilled, and thus feel more comfortable to enhance the work design, and reconfigure the system. They will also have higher expectations of the system, set higher goals of teaching, and use the technology to achieve them. In their research of customers as innovators, Thomeke & Hippel (2002) also found that experienced customers are often willing to use a tool kit. Therefore, following hypotheses are derived:

H1a. Users' prior experience has a positive impact on course design.

H1b. Users' prior experience has a positive impact on perceived system reconfigurability.

2.8.2. The Links between Course Design and System Reconfigurability

In manufacturing literature (Thomke & Hippel, 2002; Hippel & Katz, 2002), it is found that product development is often difficult because the "need" information (what the customer wants) resides with the customer, and the "solution" information (how to satisfy those needs) lies with the manufacturer. Traditionally, suppliers have taken on most of the work and responsibility of product development. The result has been costly and time-consuming iterations between supplier and customer to reach a satisfactory solution. With the customer-as-innovators approach, a supplier provides customers with tools so that they can design and develop the application specific part of a product on their own. This shifts the location of the supplier-customer interface, and the trial-and-error iterations necessary for product development are now carried out by the customer only.

Within their fields of use, toolkits give users real freedom to innovate products via iterative trial and error. That is, users can create a preliminary design, simulate or prototype it, evaluate its functioning in their own use environments, and then iteratively improve it until satisfied.

Socio-technical theory contends that task design and system design interact with each other (Margulies & Kleiner, 1995; Manz & Stewart, 1997; Macredie & Wild, 2000; Karasti, 2001). Macredie & Wild (2000) propose the design of interactive work systems to support the task change in computer-mediated environment. Ongoing work requires flexible, tailored, or scalable information systems.

The strength of MIS and Web design has its long emphasis on user needs as a basis for design and evaluation. It is commonly accepted that system design should be user-centered. Web site design characteristics should be based on an understanding of users and their work: "A deep understanding of work is needed to make an artifact useful; an elegant design is no guarantee of utility" (Marshall, 2003). Marchionini et al. (2003)

argue human-centered design must be based on "assessing human information needs and the tasks that arise from those needs and evaluating how the Internet affects human information behaviors." They confirmed this in their longitudinal study.

Web application is a sociotechnical system, much more than technology, contents, and functionality. As Haraway (1997, p. 126) says: "The computer is a trope, a part-for-whole figure, for a world of actors and actants, and not a Thing Acting Alone. 'Computers' cause nothing, but the human and non-human hybrids troped by the figure of the information machine remake the world." So, too, the CMSs cause nothing – but stands for a network of people, practices, artifacts, information, and technology that may remake at least parts of our world.

In distance learning applications, need-related tasks systems, ever changing course processes and goals, require solution-related system, which equips the users with tools to carry out those tasks – reconfigurable CMSs. In turn, the reconfiguration characteristics of the software help faculty to enhance and upgrade their course processes and goals. Yuan et al. (2003) find a significant relationship between the using Internet and the reengineering work process. Thus, this research proposes the following hypotheses:

H2a. The higher the level of course design, the more the user reconfigures the system.

H2b. The more the user reconfigures the system, the higher the levels of course design.

2.8.3. The Links between Course Design, System Reconfigurability and Psychological Empowerment

Previous research found that work design may empower the employees (Margulies & Kleiner, 1995). Instructors' control over the processes and goals of work design, and the software reconfigurability characteristics, provide users many choices to achieve the objectives using the CMSs. Janz (1999) finds that autonomy is positively related to an individual's perception of positive growth among development professionals. The more the users initiate and relegate work design using the software, the more they will increase their confidence, enhance the perceived consequences of the technology on their work, and feel more pleasure from these actions. These actions enable them to perceive the positive impacts of using systems to get the work accomplished. Yuan et al. (2003) find a significant relationship between using the Internet for work and worker empowerment. Thus, this study hypothesizes:

H3a. The higher the levels of course design, the more the user feels empowered.

H3b. The more the user reconfigures the system, the more the user feel empowered.

In knowledge work, users play a more important role in technology use. "Technology is physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meaning they attach to it and the various features they emphasize and use" (Orlikowski, 1992). Human action is enabled and constrained by technology, but technology is also the result of human actions. Using Internet technology, people may be actively involved and consulted in designing, implementing, evaluating and improving the Web site. This user engagement is achieved through user's cognitions of the technology – psychological empowerment.

Manufacturing literature (Baron, 1988; von Hippel and Tyre, 1995) found that product development is a "learning by doing," or "iterative trial and error" process. in many cases, customers don't understand their needs until they try out prototypes to explore exactly what does, and doesn't work.

In distance learning applications, the higher the user's Internet skills, the more likely they are to re-configure the system. Instructors with high self-efficacy will set higher goals and are more committed to these goals. The more impact they perceives the technology has on their work, they more they will use the technology to enhance their work process and goals. The more they feel motivated, and the more control over the task design and system design they have, they more they will use the technology in their work. Thus, this study hypothesizes:

H3c. The more the user feels empowered, the higher the level of course design.

H3d. The more the user feels empowered, the more the user will reconfigure the system.

2.8.4. The Links between Support and Psychological Empowerment

Training and support help people adequately use computer systems to do their primary work. Without proper training and the opportunity to ask questions and gain assistance/consultation when needed, users will misuse, underuse, or not use the information systems.

Software support enhances users' skills, makes them feel more comfortable to use the system, and helps them to realize the positive influence of the system in their work. The organizations' functional prototypes, the vendor's Web knowledge base, and a telephone hotline provide various solutions to users' problems. In their empirical study, Doll and Deng find that collegial support increased user' self-efficacy in computer-mediated work. Therefore, the following hypothesis is derived:

H4. The higher the technology support, the more the user will feel empowered.

2.8.5. The Links between Psychological Empowerment and Usage Patterns

Davis et al. (1992) find that intrinsic motivation/enjoyment predicts usage intention and Igbaria et al. (1996) find that intrinsic motivation/playfulness predicts actual usage. Research on technology acceptance supports the motivational effects of perceived usefulness on computer usage (Szajna, 1996; Karahanna et al., 1999; Straub et al., 1995).

People determine how effectively information technology is used. User autonomy, Internet self-efficacy, intrinsic motivation, and perceived consequences motivate the extensive use of the systems. Doll and Deng find that user empowerment significantly affects the technology use in problem solving/decision support. Therefore, the following hypothesis is derived from this empirical test:

H5. The more the user feels empowered, the more extensively the course management system will be used.

2.8.6. The Link between Usage Patterns and Perceived Benefits

In the system-to-value chain, the IT impact on individual work is a direct consequence of computer usage. The link between information system usage and impacts has been well discussed in the studies such as Doll and Torkzadeh (1991, 1998), Doll and Deng, and DeLone and McLean (1992, 2003). Empirical studies in the field also support this linkage. In their empirical study, Yuan et al (2003) test that Internet usage significantly impacts “the ability to respond to customers,” “improve decision making,” “empower worker,” “time saving,” “improve productivity,” “cost saving,” and “reengineering work process.” Therefore, this study develops the following hypothesis:

H6. The more extensively the system is used, the more benefits the user will perceive.

Chapter 3: Research Methods

A survey design is employed to empirically test the hypotheses derived from the research model.

Measures of the constructs have to be developed to test the hypotheses. Instrument development methods include the following major phases suggested by Churchill (1979): item generation, pre-pilot study, pilot study, and large scale data collection. The research framework and the associated hypotheses will then be tested using structural equation modeling.

3.1. Measurement Instruments

Generating items that cover the domain of a construct determines the validity and reliability of an instrument (Churchill, 1979). A comprehensive literature review will be first completed to define the constructs and to identify an initial list of items. To improve content validity, a pre-pilot study will be conducted that involves some instructors and some academic experts. During the structured interviews, the definitions of prior experience, course design, system reconfigurability, psychological empowerment, support, usage patterns, and perceived benefits, and the items that were developed to measure them, will be presented. The interview results will be carefully analyzed and the research constructs and measurement items will be revised.

3.1.1. Measures for Prior Experience

Prior experience refers to direct participation of using the software in distance learning. Based on e-commerce literature (Blake et al., 2005; Thorbjornsen et al., 2002; Yoh et al., 2003), a measure consisting of 3 items is developed (see Table 3.1).

3.1.2. Measures for Course Design

Course design refers to the course design goals in distance learning environments. In education literature, it is widely accepted that seven principles guide the course design process and goals (Chickering &Gamson, 1987; Chickering & Ehrmann, 1996; oln.org). Based on the definitions specified earlier and the literature reviewed, seven items (see Table 3.2) are developed to measure the work design using course management systems. A five-point Likert type scale is used where 1=Strongly Disagree, 2=Disagree, 3= Neutral, 4=Agree, 5=Strongly Agree.

3.1.3. Measures for System Reconfigurability

System reconfigurability refers to the capability of this software in designing learning environments to meet various instructional needs. Based on Web design, e-commerce literature (Lohr, 2000; Salas et al., 2002. Tilson et al., 1998; Lewis, 1995; Raquel,2001; Palmer, 2002; Barnes et al., 2001), and Markus et al. (2002) design theory and manufacturing literature (Tu et al., 2004), five components were proposed (see Table

2.2). A thirty three item measure is developed (see Table 3.3). A five-point Likert type scale used is 1=Strongly Disagree, 2=Disagree, 3= Neutral, 4=Agree, 5=Strongly Agree.

Table 3.1. Measurement Items of Experience Used in the Pilot Study (3 items)

Label	Item Description
PE1	I have been using computer and Internet technology in my teaching for the number of year(s) ___ .
PE2	I have been using this software in my teaching for the number of year(s) ___.
PE3	I have been using the software in my teaching for the number of course(s)____.

Table 3.2. Measurement Items of Course design Used in the Pilot Study (7 items)

Label	Item Description
CD1	In distance learning, this software helps me encourage contacts between students and faculty.
CD2	In distance learning, this software helps me develop collaboration and cooperation among students learning (e.g. team work).
CDE3	In distance learning, this software helps me use active learning techniques (e.g. simulation).
CDE4	In distance learning, this software helps me give prompt feedback.
CDE5	In distance learning, this software helps me emphasize time on task.
CDE6	In distance learning, this software helps me communicate high expectations.
CDE7	In distance learning, this software helps me respect diverse talents and ways of learning.

Table 3.3 Measurement Items of System Reconfigurability Used in the Pilot Study (33 items)

Label	Item Description
	Interface reconfigurability (5 items)
ITF1	On the course homepage, this software enables me to personalize the look and feel of the homepage.
ITF2	On the course homepage, this software enables me to have some control over the appearance of the homepage.
ITF3	On the course homepage, this software enables me to edit course homepage.
ITF4	On the course homepage, this software enables me to change text style.
ITF5	On the course homepage, this software enables me to modify icon.
	Interaction reconfigurability (7 items)
IRR1	This software enables me to use various tools to contact specific group.
IRR2	This software enables me to use various tools (e.g. message, discussion board, chat room) to interact with students.
IRR3	This software enables me to use various tools to help students to interact with each other.
IRR4	This software enables me to set up multiple forums.
IRR5	This software enables me to set up forums around different topics.
IRR6	This software enables me to embed forums in appropriate content areas.
IRR7	This software enables me to have choices to activate interactive tools for interested students.
	Content reconfigurability (5 items)
CTR1	This software provides a wide range options for the course content.
CTR2	This software provides various ways to manage files.
CTR3	This software provides many choices to deliver course content efficiently (e.g. single page, email, discussion, attachment).
CTR4	This software enables me to add course content to my course at any stage of

	the course design process.
CTR5	This software enables me to add various types of files (e.g. images, Flashes, audio).
	Structure reconfigurability (7 items)
STR1	This software provides tabs I can shift from design view to student view so that I can view as a student
STR2	This software provides options for course links.
STR3	The software enables me to change navigation format.
STR4	This software enables me to set sequential viewing for students.
STR5	This software enables me to modify the layout of the webpage.
STR6	This software enables me to organize pages.
STR7	This software enables me to let students access associated course resources through different links.
	Modularity (or Unit) design (6 items)
MD1	Our online courses use Module (or Unit) Design.
MD2	Our online courses use a collection of sequentially arranged pages with a table of contents.
MD3	Our online courses use built-in navigation links.
MD4	Modules (or Units) can be rearranged by users to suit their needs.
MD5	Modules (or Units) can be incorporated into course design
MD6	Our online courses use optional interactive tools

3.1.4. Measures for Support

Support refers to the extent to which the instructors can rely on other resources to get information to effectively use the software to accomplish the task. It consists of three components (see Table 2.4). A measure consisting of eleven items is developed based on MIS literature (Hery and Stone, 1994; Compeau and Higgins, 1995b; Igbaria and Livari, 1995; Doll and Deng). Same as that of system reconfigurability, a five-point Likert type scale is used where 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly agree. See Table 3.4.

3.1.5. Measures for Psychological Empowerment

Empowerment refers to an individual's authoritative, cognitive, and resource readiness of using distance learning software. It is measured from intrinsic motivation, self-efficacy, autonomy and perceived consequences (see Table 2.5). The items are based on Doll and Deng's work. Their study provides in-depth descriptions and illustrations for psychological empowerment in computer applications. In this case, items or parts of them are adapted to distance learning settings, where appropriate.

Twelve items are thus generated to measure autonomy, self-efficacy, intrinsic motivation, and perceived consequences (see Table 3.5). Same as that of support construct, a five-point Likert type scale is used where 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly agree.

Table 3.4. Measurement Items of Support Used in the Pilot Study (11 items)

Label	Item Description
	Vendor support (6 Items)
VSU1	The software vendor has provided most of the necessary help and resources necessary to get us used to the software.
VSU2	The vendor's web forum helps when I have questions
VSU3	When I need help in application with my application of this software, I may find answers in helpdesk provided by software vendor.
VSU4	When I need help, I may turn to vendor's tool free telephone number.
VSU5	When I encounter problems, I may find solutions on vendor's Web site.
VSU6	When I encounter problems, I may get help from the vendor via email.
	Organizational support (4 items)
OSU1	My organization is really keen to see that we are happy with using this software.
OSU2	I am always supported and encouraged by my organization to use this software in my job.
OSU3	The training provided by my organization helped me get familiar with this software.
OSU4	My organization technicians helped me solve the problem in the application.
	Collegial support (3 items)
CSU1	When I have difficulty in using the software for online teaching, I can exchange information with others who know how to better use of the software for the process.
CSU2	When I have difficulty in using the software for online teaching, I can talk to other people who are more knowledgeable.
CSU3	When I have difficulty in using the software for online teaching, I can discuss with others who know how to make better use of the software for this application.

Table 3.5. Measurement Items of Psychological Empowerment Used in the Pilot Study (12 items)

Label	Item Description
	User Autonomy (3 items)
AUT1	I have considerable choices in how I use the software for online courses.
AUT2	I have significant autonomy in determining how I use software for online course.
AUT3	I have a say in how I use this software for online course.
	Self-efficacy (3 Items)
SEF1	I am confident about my ability to use the software to complete my work.
SEF2	I believe my capability of using the software for my work.
SEF3	I have mastered the skills necessary for using this software in my work.
	Intrinsic Motivation (3 items)
INM1	Using the software for online teaching is enjoyable.
INM2	Using the software for online teaching is pleasurable.
INM3	Using the software for online teaching fosters enjoyment.
	Perceived Consequences (3 items)
PCC1	I see this software as being able to increase my productivity.
PCC2	I see this software as being able to save me time.
PCC3	I see this software as being able to allow me to accomplish more work than would otherwise be possible.

3.1.6. Measures for Usage Patterns

Usage patterns refer to the extent to which the software was fully used in relation to the user's instructional use. Based on the distance learning literature and WebCT and Blackboard Web sites, four dimensions were proposed (see Table 2.9). Twenty-one items are thus generated to measure this construct (see Table 3.6). Different from others, a five-point

Likert type scale used is 1=to none or little extent, 2=to some extent, 3=to a moderate extent, 4=to a great extent, 5=to a very great extent.

3.1.7. Measures for Perceived Benefits

Perceived benefits refer to the influences that software exerts on individual work and/or organizational performance. Based on MIS literature (Torkzadeh & Doll, 1999; DeLone & McLean, 2003), and distance learning literature (Sharda et al., 2004), six items are generated to measure this construct. Same as that of empowerment, a five-point Likert type scale used is 1=Strongly Disagree, 2=Disagree, 3= Neutral, 4=Agree, 5=Strongly Agree.

Table 3.6. Measurement Items of Usage Patterns Used in the Pilot Study (21 items)

Label	Item Description
	Communication and Collaboration (5 items)
CAC1	I use the software to help students communicate with each other.
CAC2	I use the software to help students communicate with the instructor.
CAC3	I use the software to help students collaborate with each other.
CAC4	I use the software to help me communicate with my students.
CAC5	I use the software to help me coordinate student groups.
	Class management (9 items)
CLM1	I use this software to help track number of students' hit on a page.
CLM2	I use this software to help assign grades.
CLM3	I use this software to help check my grading.
CLM4	I use this software to help view student roster.
CLM5	I use this software to help deny or access a specific webpage.
CLM6	I use this software to help track students' participation.
CLM7	I use this software to help students track their grades.
CLM8	I use this software to help students track the status of their assignments.
CLM9	I use this software to help students track progress.
	Content management (6 items)
CTM1	I use this software to help create online course content.
CTM2	I use this software to help make my course materials available to students.
CTM3	I use this software to help deliver online course content.
CTM4	I use this software to help share the course content with other faculty.
CTM5	I use this software to help reuse the course content.
CTM6	I use this software to help backup and restore course content.
	Assessment (4 items)
ASS1	I use the software to help assess my students' understanding of the course

	material.
ASS2	I use the software to help assess my students' mastering of the course material.
ASS3	I use this software to help students take self test.
ASS4	I use the software to help students evaluate other group members' performance.

Table 3.7. Measurement Items of Perceived Benefits Used in the Pilot Study (5 items)

Label	**Item Description**
BE1	In general, this software enhances my teaching effectiveness.
BE2	This software enables me to handle a large class effectively.
BE3	This software helps my students to achieve their learning objectives.
BE4	This software improves my teaching quality.
BE5	This software improves my productivity.

3.2. Data Analysis Methods

The effective instruments are useful only when they contain several measurement characteristics: construct reliability, validity, convergent validity, discriminant validity, and predictive validity. Reliability values indicate the degree to which operational measures are free from random error and measure the construct in a consistent manner. After purification, Cronbach's (1951) alpha will be calculated to assess the reliability for each scale. Alpha values greater than 0.80 are very good for basic research (Nunnally, 1978). Construct validity refers to an effective instrument that covers the content domain of each construct (Nunnally, 1978). Convergent validity is about the extent to which there is consistency in measurements across multiple operationalizations (Campbell and Fisk, 1959). Discriminant validity refers to the independence of the dimensions (Bagozzi and Phillips, 1991), that is, the extent to which measures of the constructs are distinctly different from each other. Predictive validity seeks to find support for the validity of the construct, by investigating whether it exhibits relationships with other constructs that are in accordance with theories. This will be assessed by correlating composite measures of the constructs.

3.2.1. Purifying Items for the Scales (Using SPSS)

The measurement items have to be purified before a factor analysis is conducted (i.e., to eliminate garbage items). The need to purify the items/indicators of a construct is described by Churchill (1979). He contends that when a factor analysis is done before purification, more dimensions tend to be produced than can be conceptually identified, thus confounding the interpretation of the factor analysis.

Items are eliminated if their corrected-item total correlation (i.e., the correlation of an item with the sum of the other items in its category) is less than 0.50. The domain-sampling model suggests that all items, if they belong to the domain of a concept, have an equal amount of common core (Churchill, 1979). If all items of a measure are drawn from the domain of a single construct, responses to those items should be highly inter-correlated. The corrected-item total correlation (CITC) provides a measure for this purpose.

The purification process begins with a CITC analysis. For each scale, the hypothesized items are pooled together to test the reliability of each item. CITC is used to decide whether or not to keep an item. If the corrected item-total correlation is less than .50, then the item is removed from the scale. The process is repeated till all corrected item-total correlations are greater than .50. However, in the process of eliminating the items, the scale's reliability should increase. Otherwise, the items should be kept and the process should stop.

3.2.2. Checking the Factorial Structure for Each Construct (using SPSS)

The purified items hypothesized to measure a variable are then analyzed to examine the factorial structure of the variable. DeVellis (1991) provides three reasons for using factor analysis. One of the primary functions of a factor analysis is to help an investigator determine how many latent variables underlie a set of items. A second purpose, which follows from the first, is to provide a means of explaining variation among relatively many original measurement items using relatively few newly created variables (i.e., factors). This amounts to condensing information so that variation can be accounted for by using a smaller number of variables. A third purpose is to define the substantive content or meaning of the factors (i.e., latent variables) that account for the variation among a larger set of items. This is accomplished by identifying groups of items that covary with one another and appear to define meanings that underlie latent variables. If anticipated item groupings are identified prior to factoring, a factor analytic solution that is consistent with these groupings provides some evidence of factorial validity (Comrey, 1988).

The items in each scale of a variable are assumed to be the indicators of the same scale. If the factor analysis reveals more than one factor, theory has to be employed to determine whether or not to eliminate the additional factor or conclude that the construct is more complex than originally anticipated (Weiss, 1970). Items that are not factorially pure (item-factor loading on more than one factor at 0.40 or above) or items that have item-factor loadings below 0.60 are considered as candidates for elimination.

The number of factors to extract in this research is based on Kaiser's Eigen values that should be equal to or greater than 1 (e.g., Nunnally, 1978). This rule suggests that only factors that explain more variance than the average amount explained by one of the original items be retained. The logic behind Kaiser's method is that if the worst factor explains more variance than an original item, then one is achieving some degree of condensation, that is, the ability to explain variation with a set of factors smaller than the original number of items (DeVellis, 1991). Direct Oblimin Rotation in SPSS is used for factor rotation. For simplification purpose, if the value of an item-factor loading is less than 0.30, then the value will not be listed.

3.2.3. Checking the Model-Data Fit for the Scales (Using LISREL)

A measurement model using items purified through steps 1 and 2 is specified in LISREL to examine the unidimensionality and the correlated error terms of the scale. Model-data fit is evaluated by Chi-square, degrees of freedom, p-value, Steiger and Lind's (1980) root mean square error of approximation (RMSEA), Bentler and Bonnett's (1980) non-normed fit index (NNFI), and Bentler's (1980) comparative fit index (CFI). A non-significant p-value indicates that the measurement model fits the data well. Otherwise, RMSEA below 0.50 suggests good model-data fit; between 0.50 and 0.80 suggests acceptable model-data fit. NNFI and CFI indices greater than 0.90 suggest adequate model-data fit. NNFI and CFI indices greater than .95 suggest good model-data fit. Criteria for the evaluation of model-data fit can be found in Byrne (1998) and Hu and Bentler (1995). Loadings on the second-order factor above 0.60 are considered acceptable (Bagozzi and Yi 1988).

3.2.4. The Discriminant Validity Test (Using LISREL)

Next, a Chi-square test described by Bagozzi and Phillips (1982) is used to assess the discriminant validity between pairs of constructs/scales. Using LISREL, models of pairs of latent constructs and their indicators are run with the correlation between the latent constructs fixed at 1.0 and also with the correlation between the latent constructs free to assume any value. The difference in Chi-square values for the fixed and free solutions indicates whether a unidimensional, rather than a two-dimensional, model accounts for the intercorrelations among the observed items in each pair. The Chi-square difference equal to or greater than 3.84 for one degree of freedom indicates discriminant validity between the scales.

3.2.5 Test for Multicollinearity

Multicollinearity is a problem that arises when there exists moderate to high intercorrelations among predictor variables (IVs) to be used in a regression analysis. The underlying problem of multicollinearity is that if two variables are highly correlated, they are essentially containing the same – or at least much of the same – information and are therefore measuring the same thing (Sprinthall, 2000). Not only does one gain little by adding to regression analysis variables that are measuring the same thing, but multicollinearity can cause real problems for the analysis itself.

Multicollinearity should be addressed by the researcher prior to the execution of the regression analysis (Mertler and Vannatta, 2002). The simplest method for diagnosing multicollinearity is to examine the correlation matrix for the predictor variables, looking for moderate to high intercorrelations. However, it is preferable to use one of two statistical methods to assess multicollinearity. First, tolerance statistics can be obtained for each IV. Tolerance is a measure of collinearity among IVs, where possible values range from 0 to 1. A value for tolerance close to zero is an indication of multicollinearity. Typically, a value of 0.1 serves as the cutoff point – if the tolerance value for a given IV is less than 0.1, multicollinearity is a distinct problem (Norusis, 1998). A second method is to examine values for the variance inflation factor for each predictor. The variance inflation factor (VIF) for a given predictor "indicates whether there exists a strong linear association between it and all remaining predictors" (Stevens, 1992). Although there is no steadfast rule of thumb, values of VIF that are greater than 10 are generally a cause for concern (Stevens, 1992).

3.2.6. The Predictive Power of the Scales (using SPSS)

The predictive power of the scales is evidenced by the correlations between the scales. A stepwise linear regression method is used to check the predictive power of the scales. All variables to the left of the focus variables are entered as independent variables for a regression equation.

3.3. The Pilot study

The purpose of a pilot study is to collect the initial data, to purify the measurement items, to verify the factorial structure of the measurement scales, to examine the model-data fit of each measurement scale, and to investigate the predictive power of the scales. The pilot study provides an opportunity to refine the instruments before proceeding with a large-scale study.

First, the items are reviewed and modified through a series of activities that use institutional and academic experts. Where any expert/practitioner suggests that the domain of a construct be more adequately covered, the researcher modifies the items and/or generates additional items to capture the phenomena. At this stage, four distance learning instructors or instructional designers from the University of Toledo and Bowling Green State University were selected. Four researchers from the University of Toledo were also asked.

Later, the pilot study was conducted with the modified questionnaire. The respondents of the pilot study are faculty, instructor and instructional designers who have been using Course Management Systems for distance learning or Web-assisted courses in recent years.

3.3.1. The Data Collection Process

The data were collected from a Midwestern university. The Distance and eLearning Division of this institution sponsored this survey. The online questionnaire was sent out to 560 faculty, instructors, and instructional designers by the director of this division (see Appendix 2). There were 56 responses in three weeks, representing a ten percent (10%) response rate.

Tables 3.8 and 3.9 illustrate the demographics of the sample by property of the application and colleges.

Table 3.8. Responses Classified by Property of Use in the Pilot Study

Table 3.8. Responses	Cases	Percentage
Distance Learning	30	53.57
Web-assisted	21	37.5
Both	5	8.93
Total	56	100.0

Table 3.9. Responses Classified by Colleges in the Pilot Study

College	Cases	Percentage
Arts & Sciences	18	32.1
Business Administration	3	5.4
Education	8	14.3
Engineering	3	5.4
Health & Human Services	9	16.1
Pharmacy	5	8.9
Distance Learning	3	5.4
Other	7	12.5
Total	56	100.0

3.3.2. The Results of the Pilot Study

The measurement items for each dimension are purified through SPSS. Items with CITC less than 0.50 are removed from further analysis. The remaining items are then analyzed with LISREL to check the items with correlated error terms. If the error term of an item is correlated with that of another item, one of them should be removed.

After each scale has been purified, the scales of a variable are pooled together to check the factorial structure of the variable. Normally, Eigen value (>1) is used to extract factors. In the case where the number of extracted factors is not the same as the number suggested in theory, factor number is used to extract factors. Direct oblimin rotation is used for factor rotation.

3.3.2.1. Result of Prior Experience

For Prior Experience, the reliability of two items (PE1 and PE2) is only 0.4305. This might come from the use of "hard" measures – the exact values for response. Thus, this measurement needs to be redesigned.

3.3.2.2. Result of Course Design

One factor is obtained for Course Design (see Table 3.2.1). Total variance explained is 58.30%.

3.3.2.3. Result of System Reconfigurability

First, two factors are obtained for System Reconfigurability dimension (see Table 3.2.2). They are interface reconfigurability, and interaction reconfigurability. The Eigen values for interaction reconfigurability and interface reconfigurability are 5.00 and 0.96 respectively. The total variance explained is 74.49%.

One factor is obtained from the modularity design (see Table 3.2.3). The total variance explained is 60.31%.

The content reconfigurability and structure reconfigurability scales load into one factor (see Table 3.2.4). The total variance explained is 67.12%.

Next, a Chi-square test described by Bagozzi and Phillips (1982) is used to assess the discriminant validity between pairs of original hypothesized two constructs. The Chi-square difference of almost zero indicates no discriminant validity between the scales. This variable is re-named as information reconfigurability, consistent with Information Quality in DeLone and McLean's IS Success Model.

3.2.4. Result of Support

For support, three factors are derived: vendor support, organizational support, and collegial support (see Table 3.2.5). The Eigen values for collegial support, vendor support, and organizational support are 3.83, 2.31, and 1.42 respectively. The total variance explained is 84.09%.

3.2.5. Result of Psychological Empowerment

For psychological empowerment, four factors are obtained as hypothesized: intrinsic motivation, self-efficacy, user autonomy, and perceived consequences (see Table 3.2.6). The Eigen values for intrinsic motivation, self-efficacy, user autonomy, and perceived consequences are 6.50, 1.79, 1.12, and 0.64 respectively. The total variance explained is 83.79%.

3.2.6. Result of Usage Patterns

For usage patterns dimension, items are analyzed separately for a better factorial structure (see Table 3.2.7 to 3.2.10). Overall, four factors are derived: communication and collaboration, class management, content management, and assessment.

3.2.7. Result of Perceived Benefits

For perceived benefits, one factor is obtained (see Table 3.2.11). The total variance explained is 76.11%.

3.3.3. Suggested Items from the Pilot Study

Tables 3.3.1 through 3.3.11 show the measurement items suggested from the pilot study. The first column is the label of each item; the second column reports the corrected-item-total correlation (CITC), and the third column describes each item. At the top of each group (scale) is the label of the scale with the reliability in parenthesis.

3.3.3.1. Suggested Items for Course Design

For course design, all original seven items remain. The CITC values range from 0.5026 (CD5) to 0.7418 (CD6).The value of reliability is 0.8755. A lower CITC value of CD5 indicates this item may need to be reworded (see Table 3.3.1).

3.3.3.2. Suggested Items for System Reconfigurability

For system reconfigurability, the CITC values range from 0.6034 (IRR5) to 0.9059 (ITF2). The values of reliability range are 0.8876 for Interface reconfigurability and 0.8750 for Interaction reconfigurability (see Table 3.3.2).

3.3.3.3. Suggested Items for Modularity Design

For modularity design, the CITC values range from 0.4705 (MD1) to 0.7338 (MD5). The reliability of this construct is 0.7552 (see Table 3.3.3). The low reliability value and low CITC values indicate that this scale needs to be re-considered; either re-word some items, or add some new items.

3.3.3.4. Suggested Items for Information Reconfigurability

For information reconfigurability, the CITC values range from 0.6664 (STR5) to 0.8260 (STR6). The reliability is 0.9329 (see Table 3.3.4).

3.3.3.5. Suggested Items for Support

The CITC values of support range from 0.6954 (OSU2) to 0.9104 (VSU6). The values of reliability range from 0.8609 for organizational support to 0.9149 for collegial support (see Table 3.3.5).

3.3.3.6. Suggested Items for Psychological Empowerment

For psychological empowerment, the CITC values range from 0.6712 (PCC2) to 0.8636 (AUT3). The values of reliability range from 0.8446 for self-efficacy to 0.9025 for intrinsic motivation (see Table 3.3.6).

3.3.3.7. Suggested Items for Usage Patterns

For usage patterns, the CITC values range from 0.6522 (CLM1) to 0.8874 (ASS1). The values of reliability range from 0.8300 for content management to 0.9028 for assessment (see Table 3.3.7 to 3.3.10).

3.3.3.8. Suggested Items for Perceived Benefits

For perceived benefits, the CITC values range from 0.7422 (BE5) to 0.7980 (BE3). The value of reliability is 0.8888 (see Table 3.3.11).

3.3.4. Discriminant Validity

Table 3.4 reports the reliability and the discriminant validity of each scale. The numbers in the cells on diagonal are the reliability of the scale. The reliability ranges from 0.76 for Modularity Design (except Prior Experience) to 0.93 for Information Reconfigurability, indicating each scale is reliable. The number in the cells off diagonal are the correlation coefficient between the corresponding scales. The values range from -.001 for vendor support with modularity design to .837 for Information Reconfigurability with Interaction Reconfigurability. One asterisk (*) associated with the number indicates that the correlation is significant at a 0.05 level while two asterisks (**) associated with the number indicate that the correlation is significant at a 0.01 level. The numbers in parenthesis are the Chi-square differences with one degree of freedom for the corresponding scales. The Chi-square differences are from 10.03 for content management with communication and collaboration to 160.26 for benefits with interface reconfigurability. All the numbers are greater than 3.84, which indicate discriminant validity for all scales.

Table 3.4 also reports the mean and standard deviation of each scale as shown at the bottom of the table. It reports the number of items generated from literature, the number of items suggested by the pilot study, of those suggested items the number of reworded items, the number of items added for the large-scale study, and the total number of items used for the large-scale study.

3.3.5. Predictive Power of the Scales

Before running the regression analysis, multicollinearity is tested. Tables 3.5.1 illustrates the values of Tolerance and VIF for each IV when DV is benefits. In conclusion, all the Tolerance values are greater than 0.1, and all VIF values are smaller than 10, which exclude the multicollinearity among predictor variables.

Table 3.5.2 illustrates the predictive power of each scale and the R-square of each criterion. The criteria are listed on the right-hand side of the table. The R-squares of the criteria range from 0.318 for Collegial Support to 0.813 for Benefits, suggesting that at least 31.8 percent of the variance is explained for each criterion. For each row, the shaded cells indicate that they are not included as predictors. The numbers in the cells indicate that the corresponding scales are entered into the equation to predict the corresponding criterion and the values in the cell is the standard beta coefficient of the regression analysis.

3.3.6. Instruments for Large-scale Data Collection

The measurement instruments are evaluated based on the results of the pilot study before the large-scale study. Some scales are re-conceptualized, new items are added, and/or existing items are modified, wherever appropriate. All items are coded with a three or four-digit prefix for identification purposes. These codes are shown later in the large-scale data analysis section.

After the pilot study, a total of 82 items are recommended for the large-scale study (see Tables 3.6.1 through 3.6.12). For each scale, the first column shows the labels used in the pilot study. The second column indicates the status of the item. A space means that the item is from the pilot study; an "R" indicates that the item is reworded based on the results of the pilot study; and an "A" represents that the item is newly generated for the large-scale study. The third column shows the labels used for the large-scale study. The fourth column is the description of each item.

3.3.7. Dropped Items

Some items were dropped based on the methods specified in section 2.2.1, 2.2.2, and 2.2.3. Table 3.7 lists all the items dropped and related reasons. CITC means corrected item-total correlation is less than 0.50; FL means the value of an item-factor loading is either less than 0.30 or the item is cross loading with another item; Fit refers to the correlated error terms when checking the Model-Data fit for the scales using LISREL.

For some items with strong theory support, it was still kept although it would have been deleted based on the above three processes.

3.4. The Large-Scale Study

A large-scale study is conducted to assess the performance of the instrument scales and the associations between prior experience, course design, system reconfigurability, support, psychological empowerment, usage patterns, and benefits.

To encourage other institutions to get involved in this research, and help them be familiar with the study, introduction slides and results of the pilot study were posted on a Web page. Several institutions in the state of Ohio have been contacted. When an institution agrees to participate, the requesting email message with the questionnaire link (see Appendix 3) is distributed through the director of the distance or e-learning division. Six schools have participated in the study. The total faculty and instructional designers surveyed were 3130. 348 responses have been received, representing a 11.12% responding rate.

The structural path analysis will be conducted to investigate the relationships among prior experience, course design, system reconfigurability, support, psychological empowerment, usage patterns, and benefits. SPSS and LISREL are used to examine the reliability and validity of each construct (Bollen, 1989). Should any model include too many items that lead to an unidentified model, partial or full aggregated model will be used instead.

Chapter 4: The Results of the Large-Scale Study

Sample characteristics are reported in Tables 4.1.1 through 4.1.3. Of all the software packages surveyed, 56.3% are Blackboard, 25.9% are WebCT, 12.4% are Angel, 4.3% are eCollege, and 1.1% are others (see Table 4.1.1). Overall, 39.7% of the faculty or instructional designers use the software for Web-assisted courses, 26.1% use it for distance learning courses, 31.3% use it for both Web-assisted and distance learning courses, and 2.9% use it for other purposes (see Table 4.1.2). Among the 348 respondents, the majority (91.1%) is faculty or instructors, 2.3% are instructional designers, 5.7% take the role of both faculty and instructional designer, and 0.9% belong to other types (see Table 4.1.3).

Table 4.1.1. Software Packages in the Sample of the Large Scale Study

Software	# of Cases	Percent
Blackboard	196	56.3
WebCT	90	25.9
Angel	43	12.4
eCollege	15	4.3
Other	4	1.1
Total	348	100.0

Table 4.1.2. Software Applications in the Sample of the Large Scale Study

Application	# of Cases	Percent
Web-assisted	138	39.7
Distance Learning	91	26.1
Both DL and WA	109	31.3
Other	10	2.9
Total	348	100.0

Table 4.1.3. Respondents in the Sample of the Large Scale Study

Application	# of Cases	Percent
Faculty or Instructor	317	91.1
Instructional Designer	8	2.3
Both	20	5.7
Other	3	0.9
Total	348	100.0

4.1. Large Scale Measurement Results

The data from 348 responses are analyzed with several objectives in mind: purification, simplicity of a factor structure, reliability, brevity, convergent validity, discriminant validity, and predictive validity. The measurement items are purified before a structure analysis is conducted. This is important especially when instruments are revised after the pilot study. "Garbage" items that do not have a common core in the data analysis will produce additional dimensions that may not be conceptually identified in the factor analysis (Churchill, 1979). The details of the method have been described in Chapter 3. Sections 4.1.1 through 4.1.7 report the analysis results for each variable in the research model.

4.1.1. Prior Experience

In Appendix 2, Table 4.2.1 provides initial results of SPSS for the scale of prior experience. The alpha value is 0.7680, which indicates the scale is reliable. The measurement item LPE1 has a low CITC value of 0.3373 and is thus excluded for further analysis. One factor is obtained for Prior Experience with item-factor loading greater than 0.768 (see Table 4.2.2 in Appendix 2)

A LISREL measurement model is constructed with the hypothesized measurement items. Figure 4.1 shows the result. This diagram reports the names of the measurement items, the construct/scale name, and the standardized solution of the measurement model. The bottom shows the model's Chi-square value, degree of freedom (df), P-value, and RMSEA.

In this case, the measurement model does not show the modification index. Cronbach's alpha is then calculated (see Table 4.2.3). The reliability alpha is as high as 0.8109. Overall, three items are proposed for measuring the prior experience variable.

Table 4.3.1 shows the data-model fit index for the scale of prior experience. This scale is saturated. The p-value is one and the degree of freedom is zero. This is true for all saturated models.

Prior experience is able to predict course design, system reconfigurability, psychological empowerment, usage patterns, and benefits scales to a certain degree (see Table 4.4). To be specific, prior experience has a strong predictive power for the psychological empowerment but almost no explanation for the support. The standardized beta coefficients range from .067 to .364.

Table 4.2.3 provides the measurement scale of prior experience for future studies.

4.1.2. Course Design

Table 4.5.1 provides initial results for the scale of course design. The alpha value is 0.8760, which indicates the scale is reliable. The corrected item-total correlation (CITC) values range from .5835 for LCD5 to .7293 for LCD1. The results suggest that all the measurement items could be retained for further analysis. One factor is obtained for Course Design with item-factor loading greater than 0.693 (see Table 4.5.2).

A LISREL measurement model is constructed with the hypothesized measurement items. Figure 4.2.1 shows the initial result. This measurement model suggests a modification index. The error term of some items are correlated with those of other items. The removal of one or more of the correlated items for the scale can improve the model's data-model fit index.

The removal of measurement items is based on the following rules (1) the item with high correlated error term will be removed from the model; (2) the item with a low item-factor loading will be removed from the model; (3) for competing items, the item with better theory support will be kept in the model. The measurement model is regarded as satisfactory if its P-value is equal to or greater than 0.05 or its RMSEA index is less than 0.10. Competing models are kept as alternatives for further factorial analysis.

Figure 4.2.2 shows the alternative measurement model of course design. Related model-data fit index before and after modification were shown in Table 4.3.1 and Table 4.3.2. It is found that EVCI was reduced substantially – from 0.45 to 0.14, which indicates a much better model after the modification.

Cronbach's alpha is then calculated (see Table 4.5.2). The reliability alpha is as high as 0.8354. Overall, five items are proposed for measuring the course design variable.

Course design is able to predict system reconfigurability, psychological empowerment, usage patterns, and benefits scales to a certain degree (see Table 4.4). To be specific, course design has a strong predictive power for the system reconfigurability but a relatively weak explanation for the benefits. The standardized beta coefficients range from .121 to .502.

4.1.3. System Reconfigurability

Table 4.6.1 provides initial results of SPSS for each scale of system reconfigurability. The alpha values for interface reconfigurability, interaction reconfigurability, content reconfigurability, structure reconfigurability, and modularity design are .9133, .9009, .8522, .8660, and .9075 respectively. The values indicate that each scale is reliable. The correlated item-total correlation (CITC) values for all scales are high, ranging from .5971 for LSTR5 (a measurement item of structure reconfigurability) to .8561 for LITF2 (a measurement item for interface reconfigurability).

An exploratory factor analysis is conducted on all 23 items. The analysis uses principle components as the means of extraction, and direct oblimin as the method of rotation (Table 4.6.2). The ratio of respondents to items is 17.4, which is far above the general guidelines. The factorial structure of the system reconfigurability automatically generates five factors. It shows that the Eigen values for the scales of interaction reconfigurability, interface reconfigurability, module design, structure reconfigurability, and content reconfigurability are 9.641, 2.827, 1.670, 1.502, and 1.172 respectively. The cumulative variance explained by the five scales is 73.09%.

Overall, the factor analysis provides a clean structure for system reconfigurability. All measurement items demonstrate good item-factor loadings. For simplicity, Table 4.6.2 shows only the values of item-factor loadings that are equal to or greater than 0.30. The results indicate that all items load well on their respective factor of system reconfigurability. Only item LSTR2 (a measurement item of structure reconfigurability) cross loads with factor 2 – Interface Reconfigurability. In general, the results suggest that each item measures only the hypothesized factor, not the other factors. This result confirms the Web site design theory that five components (interface, interaction, content, and structure, plus module) are basic aspects of Web site design.

All the five measurement items of interface reconfigurability load on a single factor (i.e., column 2 in Table 4.6.2) and the item-factor loadings are greater than 0.730. The five items of interaction reconfigurability load together with item-factor loadings greater than 0.678 (see column 1 in Table 4.6.2). All measurement items of content reconfigurability also load together with the item-factor loadings above 0.661 (see column 5 in Table 4.6.2). The four items of structure reconfigurability load on a single factor and all loadings are greater than 0.645. Finally, four items of modularity design load together with the item-factor loadings above 0.792. Overall, the factor pattern matrix is simple; all of the items load high on their respective factors and low on others.

Next, a LISREL measurement model is constructed for each scale with the hypothesized measurement items. Figure 4.3.1 shows the initial results of each scale of system reconfigurability. Many modification indices are suggested for interface reconfigurability, interaction reconfigurability, and content reconfigurability. Figure 4.3.2 shows the alternative measurement model(s) for the modified scale of system reconfigurability. Figure 4.4.3 shows the second-order factor measurement model of system reconfigurability.

Cronbach's alpha is then calculated for all factors (see Table 4.6.3). The interface reconfigurability scale (LITF) has four items and a reliability alpha of 0.9082. The Interaction reconfigurability (LIRR) has four items and a reliability alpha of 0.8711. The content reconfigurability scale (LCTR) has an alpha of 0.8022 for four items. The structure reconfigurability scale (LSTR) with four items has an alpha of 0.8660. The modularity design has four items and a reliability of 0.9075. Overall, the reliabilities for the five scales are pretty high (greater than 0.80).

Table 4.3.1 and Table 4.3.2 show the data-model fit index for each scale of system reconfigurability before and after the modification. After the modification, the Chi-square values for the interface reconfigurability, interaction reconfigurability, content reconfigurability, structure reconfigurability, and modularity design are 9.65,1.47, 17.47, 19.37, and 4.39 respectively. The p-values are 0.00803, 0.47835, 0.00019, 0.00006, and 0.11156 respectively. The values of RMSEA, ECVI, NNFI, and CFI indicate that they have good data-model fit. For the second-order factor measurement model, the Chi-square value is 525.64 with 165 degrees of freedom, p-value is 0.00000, RMSEA, NNFI, CFI, and EVCI are 0.079, 0.96, 0.97 and 1.77 respectively (see Table 4.3.3). The indices indicate a good model data fit.

LISREL methodology is employed to test the discriminant validity between pairs of constructs in the five-factor solution (Bagozzi & Phillips, 1982). Ten models showing pairs of latent variables and their observable variables are run: (1) with the correlation between the latent variables fixed at 1.0 and (2) with the correlation between the latent variables free to assume any value. The difference in Chi-square values for the fixed and free solutions indicates whether a uni-dimensional model will be sufficient to account for the inter-correlations among the observed variables in each pair. The difference between the Chi-square values (one degree of freedom) for the fixed and free solutions for the ten (10) pairs are listed in Table 4.7.

Due to the multiple comparisons, the alpha value is adjusted (alpha is divided by the number of comparisons). For ten (10) comparisons, the Chi-square value for any pair must be equal to or greater than approximately 7.8794 for a significant level at 0.05 and 10.8274 for a significant level at 0.01 (Cohen & Cohen, 1983: 167). The smallest Chi-square difference of all pairs is 278.55, which is the value for interaction reconfigurability with content reconfigurability. The results suggest that the scales of system reconfigurability have discriminant validity.

For the remaining variables, only the results will be reported without repeating the methodology.

The descriptive statistics and the correlations between the factors are also reported in Table 4.7. The correlations are derived from SPSS output. It is noticeable that the correlations for all ten pairs are significant at 0.01. Considering the discriminant validity tests, however, the results suggest that all the scales are distinct, although some of them are highly correlated.

Five scales of system reconfigurability are able to predict course design, support, psychological empowerment, usage patterns, and benefits (Table 4.4). Overall, system reconfigurability has a strong predictive power for the course design but weak explanation for benefits. The standardized beta coefficients range from -.242 to .364.

Overall, 20 items and five scales (see Table 4.6.3) are proposed for measuring the system reconfigurability. All scales are reliable and behave well.

4.1.4. Support

Table 4.8.1 reports an initial result of data purification for each scale of the support variable. The reliability values vary from .8226 for organizational support to .9226 for collegial support. The corrected item-total correlation (CITC) values range from .6074 for LVSU5 to .8640 for LCSU2. The results suggest that all the measurement items could be retained for further analysis.

An exploratory factor analysis is conducted on the 12 items proposed after the data purification and the results are listed in Table 4.8.2. The criterion used to extract factors is that an Eigen value is greater than one. Based on the criterion, three factors are derived from the data. The Eigen values for the three factors are 4.365, 2.617, and 1.204 for organizational support, vendor support, and collegial support respectively. The cumulative variance explained by the three factors is 74.42%. All items loaded on their respective factors and there are no items with cross-loadings greater than 0.3. In general, all items have loadings greater than 0.70.

The item-factor loadings of the four items measuring the organizational support are high, ranging from 0.74 to 0.87. The items measuring the vendor support are loaded together. The item-factor loadings are high, ranging from 0.70 to 0.92. The item-factor loadings of the measurement items of the collegial support are pretty high, ranging from 0.91 to 0.96. Overall, the factor pattern matrix is simple; all of the items load high in their respective factors and low on others.

A LISREL measurement model is constructed for each scale with the hypothesized measurement items. Figure 4.4.1 shows the initial results for each scale of support. Some modification indices are suggested for vendor support. Based on the same rules of item removal discussed in previous sections, item three was removed. Figure 4.4.2 shows the alternative measurement model for vendor support. The second order factor measurement model is shown in Figure 4.4.3.

Cronbach's alpha is computed for all factors (see Table 4.8.3). The vendor support scale (LVSU) has four measurement items and a reliability alpha of 0.8712. The organizational support scale (LOSU) has four indicators and a reliability alpha of 0.82. The collegial support scale (LCSU) has an alpha of 0.92 for three measurement items. In summary, the reliabilities for the scales are high (greater than 0.80).

Table 4.3.1 and 4.3.2 show the data-model fit index for each scale of support before and after modification. The Chi-square values are 5.82 and 6.62 for the vendor support and organizational support respectively. The values of RMSEA, ECVI, NNFI, and CFI indicate that they have a good data-model fit. The p-values are 0.05453 and 0.03655. The collegial support scale is saturated. For the second-order factor measurement model, the Chi-square value is 58.60 with 41 degrees of freedom, p-value is 0.03666, RMSEA, NNFI, CFI, and EVCI are 0.035, 0.98, 0.99 and 0.31 respectively (see Table 4.3.3). The indices indicate a very good model data fit.

The discriminant validity is evaluated by the difference between the Chi-square values (one degree of freedom) for the fixed and free solutions for the 3 pairs listed in Table 4.7. For 3 comparisons, the Chi-square value for any pair must be equal to or greater than approximately 5.7311 for a significant level at 0.05 and 8.6155 for a significant level at 0.01 (Cohen & Cohen, 1983). All the Chi-square differences for the tests are greater than 251.66 which is the value of organizational support and collegial support. The high difference values indicate that the three scales have discriminant validity.

The correlations between the scales and descriptive statistics are shown in Table 4.7. The correlations for all pairs are significant at 0.01. However, the results of the discriminant validity test suggest that the scales of support are distinct constructs.

Support has a relatively strong predictive power for the usage patterns, psychological empowerment, and system reconfigurability, but no explanations for the course design and benefits. The standardized beta coefficients range from -.115 to .193 (Table 4.7).

Overall, 11 measurement items and three scales (see Table 4.8.3) are proposed for the support variable. All scales have good reliability.

4.1.5. Psychological Empowerment

Table 4.9.1 reports an initial result of data purification for each scale of the psychological empowerment variable. The reliability values vary from .8791 for user autonomy to .9664 for intrinsic motivation. The corrected item-total correlation (CITC) values range from .6995 for LAUT1 to .9567 for LINM2. The results suggest that all the measurement items could be retained for further analysis.

An exploratory factor analysis is conducted on the 12 items proposed after the data purification, and the results are listed in Table 4.9.2. The criterion used to extract factors is to fix the number of factors as four. The Eigen values for the four factors are

6.500, 1.826, 1.635, and 0.930 for intrinsic motivation, user autonomy, self efficacy, and perceived consequence respectively. The cumulative variance explained by the three factors is 87.42%. All items loaded on their respective factors, and there are no items with cross-loadings greater than 0.40. In general, all items have loadings greater than 0.70.

The item-factor loadings of the four items measuring the intrinsic motivation are very high, ranging from 0.86 to 0.97. The items measuring the user autonomy are loaded together. The item-factor loadings are high, ranging from 0.72 to 0.97. The item-factor loadings of the measurement items of the self efficacy are high, ranging from 0.88 to 0.93. The item-factor loadings of the measurement items of the perceived consequence are very high, ranging from 0.94 to 0.95. Overall, the factor pattern matrix is simple; all of the items load high in their respective factors and low on others.

A LISREL measurement model is constructed for each scale with the hypothesized measurement items. All four scales are saturated. Figure 4.5 shows the second-order factor measurement model for support variable with four dimensions.

Table 4.3.2 shows the data-model fit index for each scale of psychological empowerment. All scales are saturated. For the second-order factor measurement model, the Chi-square value is 139.77 with 50 degrees of freedom, p-value is 0.00000, RMSEA, NNFI, CFI, and EVCI are 0.072, 0.98, 0.98 and 0.56 respectively (see Table 4.3.3). The indices indicate a very good model data fit.

The discriminant validity is evaluated by the difference between the Chi-square values (one degree of freedom) for the fixed and free solutions for the 4 pairs listed in section 5 of Table 4.7. For 6 comparisons, the Chi-square value for any pair must be equal to or greater than approximately 6.9603 for a significant level at 0.05 and 9.8849 for a significant level at 0.01 (Cohen & Cohen, 1983). All the Chi-square differences for the tests are greater than 268.52, which is the value between self-efficacy and intrinsic motivation. The high difference values indicate that the three scales have discriminant validity.

The correlations between the scales and descriptive statistics are shown in Table 4.7. The correlations for all pairs are significant at 0.01. However, the results of the discriminant validity test suggest that the scales of support are distinct constructs.

Psychological empowerment has a strong predictive power for the support, course design, benefits, usage patterns, and system reconfigurability. It has a relatively strong predictive power for benefits, but a weak predictive power for course design. The standardized beta coefficients range from -.122 to .512 (Table 4.7).

Overall, 12 measurement items and three scales (see Table 4.9.3) are proposed for the support variable. All scales have good reliability.

4.1.6. Usage Patterns

Table 4.10.1 reports an initial result of data purification for each scale of the usage patterns variable. The reliability values vary from .8306 for class management to .8740 for communication and collaboration. The corrected item-total correlation (CITC) values range from .4651 for LASS4 to .8505 for LASS1. The results suggest that all the measurement items could be retained for further analysis.

An exploratory factor analysis is conducted on the 19 items and the results are listed in Table 4.10.2. The criterion that is used to extract factors is that Eigen value is greater than one. Based on the criterion, four factors are derived from the data. The Eigen values for the four factors are 6.903, 1.591, 1.476 and 1.208 for communication and collaboration, content management, assessment, and class management respectively. The cumulative variance explained by the four factors is 69.86%. Some cross loadings are found. LASS4 is loaded on both communication & collaboration and assessment. LCAC3 cross loaded on both communication and collaboration and class management. LCAC1 is cross loaded on both class management and content management. The results indicate the items need to be further purified.

A LISREL measurement model is constructed for each scale with the hypothesized measurement items. Figure 4.6.1 shows the initial results for each scale of usage patterns. Some modification indices are suggested for communication and collaboration, class management, and content management. Based on the same rules of item removal discussed in previous sections, Figure 4.6.2 shows the alternative measurement models for each scale of usage patterns. The second-order factor measurement model was shown in Figure 4.6.3.

Cronbach's alpha is computed for all factors (see Table 4.10.3). The communication and collaboration scale (LCAC) has four measurement items and a reliability alpha of 0.8519. The class management scale (LCLM) has four indicators and a reliability alpha of 0.7920. The content management scale (LCTM) has an alpha of 0.8008 for four measurement items. The assessment scale (LASS) has an alpha of 0.8651 for three measurement items. In summary, the reliabilities for the scales are high.

Table 4.3 shows the data-model fit index for each scale of usage patterns. The Chi-square values are 18.52, 11.37, 11.16, and 15.58 for the communication and collaboration, class management, content management and assessment respectively. The values of RMSEA, ECVI, NNFI, and CFI indicate that they have a good data-model fit. The p-values are 0.154, 0.116, 0.115, and 0.140 for four scales respectively. For the second-order factor measurement model, the Chi-square value is 470.66 with 100 degrees of freedom, p-value is 0.00000, RMSEA, NNFI, CFI, and EVCI are 0.103, 0.94, 0.95 and 1.56 respectively (see Table 4.3.3). The indices indicate a very good model data fit.

The discriminant validity is evaluated by the difference between the Chi-square values (one degree of freedom) for the fixed and free solutions for the 6 pairs listed in Table 4.7. For 6 comparisons, the Chi-square value for any pair must be equal to or greater than approximately 6.9603 for a significant level at 0.05 and 9.8849 for a significant level at 0.01 (Cohen & Cohen, 1983). All the Chi-square differences for the tests are greater than 344.43, which is the value between communication & collaboration with class management. The high difference values indicate that the four scales have discriminant validity.

The correlations between the scales and descriptive statistics are shown in section 4 of Table 4.7. The correlations for all pairs are significant at 0.01 (>.327). However, the results of the discriminant validity test suggest that the scales of support are distinct constructs.

Usage patterns have a weak predictive power for the benefits. The standardized beta coefficients for class management and content management range from 0.082 to .090 (Table 4.7).

Overall, 15 measurement items and three scales (see Table 4.9.3) are proposed for the usage patterns variable. All scales have good reliability.

4.1.7. Perceived Benefits

Table 4.11.1 provides initial results for each scale of perceived benefits. The alpha value is 0.8920, which indicates the scale is reliable. The corrected item-total correlation (CITC) values range from .5878 for LBE2 to .8271 for LBE1. The results suggest that all the measurement items could be retained for further analysis. One factor is generated (see Table 4.11.2).

A LISREL measurement model is constructed with the hypothesized measurement items. Figure 4.7.1 shows the initial result. This measurement model suggests a modification index. The error term of some items are correlated with those of other items. The removal of one or more of the correlated items for the scale can improve the model's data-model fit index. The alternative measurement model is shown in Figure 4.7.2.

Cronbach's alpha is then calculated (see Table 4.11.3). The reliability alpha is as high as 0.8602. Overall, four items are proposed for measuring the benefits variable.

Table 4.3 shows the data-model fit index for the scale of perceived benefits. The Chi-square value is 18.08. The p-value is 0.00012. The values of RMSEA, NNFI, CFI are 0.152, 0.94, and 0.98 respectively. EVCI was reduced from 0.34 to 0.098, which indicates the modified model represents better model data fit.

4.2. Causal Model and Hypotheses Testing

Linear structural equation modeling (LISREL) was used to explore the relationships between prior experience, course design, system reconfigurability, support, psychological empowerment, usage patterns, and perceived benefits. In structural modeling, it is preferable to have several indicators of a construct as opposed to a single indicator (Hair et al., 1995). In this case, composite measures were used as indicators for each construct.

First, composite measures (System Reconfigurability, Support, Psychological Empowerment, and Usage Patterns) were created by summing the score of each item of a scale. Second, these composite measures were used as observable indicators of the exogenous latent construct and the endogenous latent constructs.

System reconfigurability has five variables (LITF – interface reconfigurability, LIRR – interaction reconfigurability, LCTR – content reconfigurability, LSTR – construct reconfigurability, and LMD – modularity design). Support has three variables (LVSU – vendor support, LOSU – organizational support, and LCSU – collegial support). Psychological empowerment has four variables (LAUT – User autonomy, LSEF – self-efficacy, LINM – intrinsic motivation, and LPCC – perceived consequence). Usage patterns has four variables (LCAC – communication & collaboration, LCLM – class management, LCTM – content management, and LASS – assessment).

The first LISREL analysis was done to test the one-way relationship between all constructs (see Figure 4.8.1). The second LISREL analysis was done to test the two-way relationship between Course Design, System Reconfigurability, and Psychological Empowerment (see Figure 4.8.2).

To be congruent with the hypothesized model in Figure 4.8.1, prior experience is treated as an exogenous variable. The endogenous variables include course design, system reconfigurability, support, empowerment, usage patterns, and benefits. The terms exogenous variable and endogenous variable are synonymous with independent and dependent variables respectively. These terms are introduced here (and will be used in the rest of the chapter) to emphasize that endogenous variables have their causal antecedents specified within the model under consideration, whereas the cause of exogenous variables are outside the model, and not of present interest.

Figure 4.8.1. One-Way Relationship Structural Model

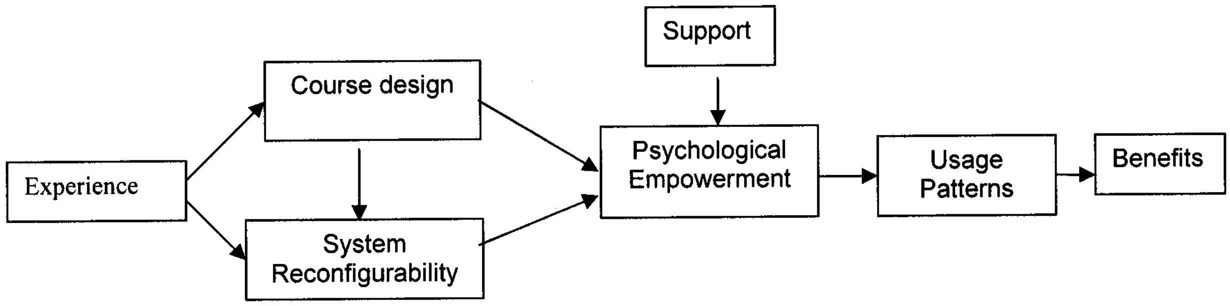
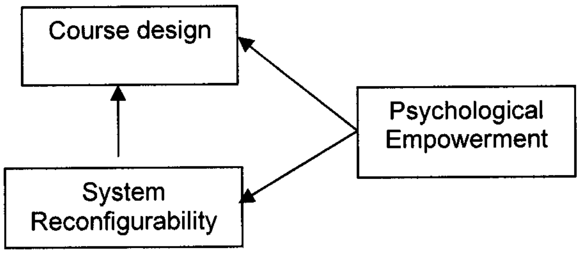


Figure 4.8.2. Two-Way Relationship Structural Model



If the model fits the data adequately, the magnitudes and t-values of the Gamma and Beta coefficients will be evaluated to test the research hypotheses. A t-value is the ratio of an estimated parameter to its standard error (Marsch & Hocevar, 1985). A value that is greater than 1.96 is significant at $p<0.05$. A t-value that is greater than 2.33 is significant at $p<0.01$.

To assess the fit of the model to the data, various fit statistics are computed. These include the Chi-square, root mean square error of approximation (RMSEA), non-normed fit index (NNFI), and comparative fit index (CFI). The Chi-square statistic is a global test of a model's ability to reproduce the sample variance/covariance matrix, but it is sensitive to sample size and departures for multivariate normality (Bollen, 1989). Thus, the Chi-square statistic must be interpreted with caution in most applications (Joreskog & Sorbom, 1993). Nonsignificant Chi-square values are desirable and provide evidence of good fit. Two widely used incremental fit indices are the Bentler and Bonnet's (1980) non-normed-fit-index (NNFI) and Bentler's (1990) comparative-fit-index (CFI). NNFI is a relative comparison of the proposed model to the null model. CFI avoids the underestimation of fit often noted in small samples for normed fit index (NFI) (Bentler, 1990). Values are greater than 0.90 can be considered indicative of good fits for both indices.

4.2.1. The Results of the Structural Analysis

The correlation matrix (see Table 4.12) has showed that all coefficients are ranged from .291 for prior experience with course design, to .755 for empowerment to benefits, indicating that the seven variables are significantly related to each other.

Table 4.12. Descriptive Statistics and Correlation for variables in the Structural Model

Variables	1	2	3	4	5	6	7
1. Prior Experience	1						
2. Course Design	.291**	1					
3. System Reconfigurability	.307**	.685**	1				
4. Support	.160**	.519**	.626**	1			
5. Psychological Empowerment	.353**	.637**	.697**	.703**	1		
6. Usage Patterns	.322**	.604**	.583**	.411**	.585**	1	
7. Benefits	.298**	.576**	.570**	.492**	.755**	.555**	1
Mean	3.83	3.67	3.71	3.65	3.87	3.24	3.86
Standard Deviation	0.90	0.76	0.59	0.57	0.71	0.88	0.84

To further assess the relationship, LISREL methodology is used to conduct an exploratory path analysis. The results of fitting the model to the data (see Figure 4.9.1) indicate that the model has a good model-data fit (Chi-square=1470.27, df = 342; p = 0.00000). The root mean square error of approximation (RMSEA) is 0.098. The non-normed fit index (NNFI) and the comparative fit index (CFI) are 0.93 and 0.94 respectively.

Figure 4.9.1 shows the t-value of the basic model, which provides the evidence for hypotheses.

H1a. Users' prior experience has a positive impact on course design.

H1b. Users' prior experience has a positive impact on perceived system reconfigurability.

Prior experience is hypothesized to be an antecedent to course design and system reconfigurability. The data support the relationship as manifested by the significant positive t-values: 5.09 for course design, and 2.44 for system reconfigurability, which mean rich prior experience will enhance course design objectives and system reconfigurability. Thus, H1a and H1b (see Table 4.13) were evidenced.

H2a. The higher the level of course design, the more the user reconfigure the system.

A positive and significant (t = 9.20) relationship is found between course design and system reconfigurability, indicating that higher course design objectives require higher level of system reconfigurability. So H2a is evidenced from the dataset (see Table 4.13).

H3a. The higher the levels of course design, the more the user feels empowered.

H3b. The more the user reconfigures the system, the more the user feel empowered.

It was postulated that both course design and system reconfigurability lead to psychological empowerment. A positive and significant (t = 2.39) Beta coefficient is found between course design and psychological empowerment, indicating higher course design objectives let users feel empowered. So does the relationship between system reconfigurability and psychological empowerment with a T-value of 3.25. Therefore, hypotheses H3a and H3b are evidenced from the dataset.

H4. The higher the technology support, the more the user will feel empowered.

It was hypothesized that support would have a significant impact on psychological empowerment. The relationship between support and psychological empowerment is found to be positive and significant (t = 3.25). This indicates that a higher of level of support will let users feel empowered. So H4 is not rejected.

H5. The more the user feel empowered, the more extensively the course management system will be used.

Psychological empowerment is assumed to have a positive impact on usage patterns. Their relationship is positive and significant ($t = 9.59$), which indicates that empowered people will use the system more fully. Therefore, H5 is not rejected (see Table 4.13).

H6. The more extensively the system is used, the more benefits the user will perceive.

Usage patterns will lead to benefits. This is confirmed by the positive and significant ($t = 11.50$) relationship between usage patterns and benefits (see Table 4.13).

To test the two-way relationship (see Figure 4.8.2) between and among course design, system reconfigurability, support, and empowerment, a second structural model is analyzed. Figure 4.9.2 shows the evidence for the related hypotheses.

H2b. The more the user reconfigures the system, the higher the levels of course design.

It was postulated that system reconfigurability will have a positive impact on course design. This is confirmed by the positive and significant relationship between system reconfigurability and course design ($t = 4.44$). H2b is not rejected.

H3c. The more the user feel empowered, the higher the level of course design.

H3d. The more the user feel empowered, the more the user will reconfigure the system.

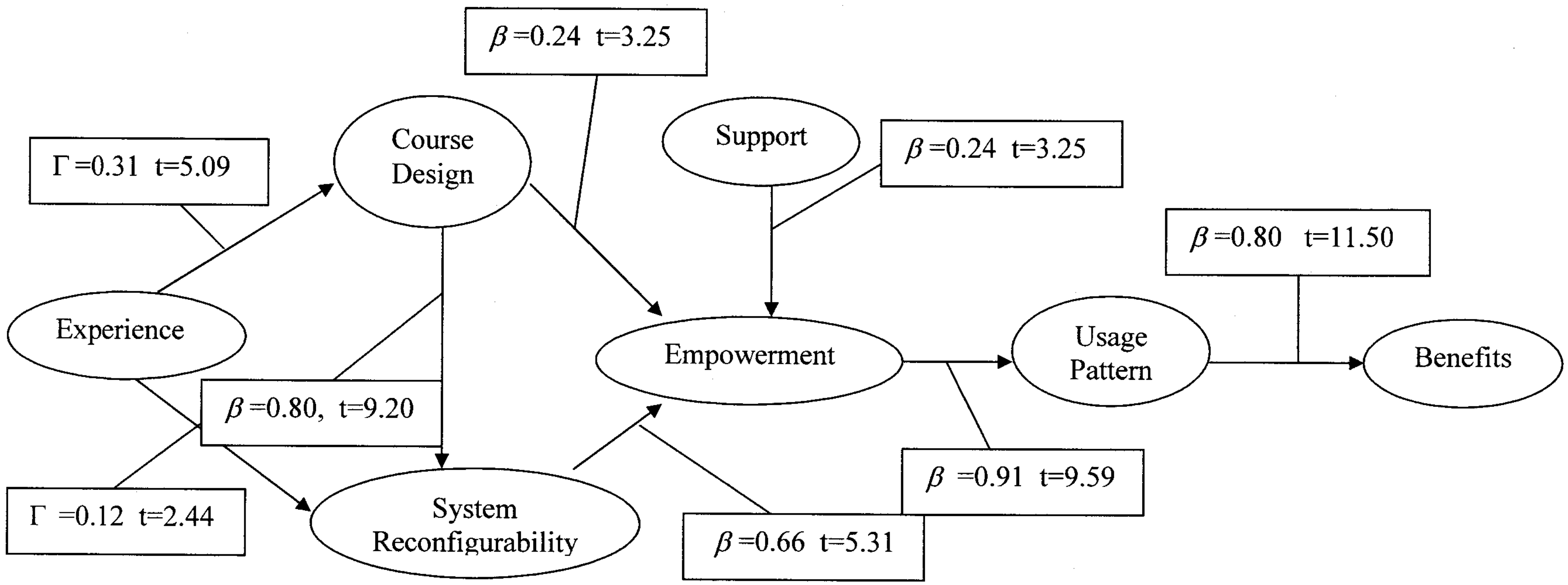
Psychological empowerment was postulated to have a positive impact on course design, and system reconfigurability. A positive but non-significant ($t = 0.97$)

relationship was found between empowerment and course design, indicating empowered people might not have higher course design goals. The relationship between empowerment and system reconfigurability is positive and significant ($t = 9.89$), which indicates empowered users will be more likely to perceive higher levels of system reconfigurability. Therefore, H3d is not rejected, while H3c is rejected.

Overall, among the eleven hypotheses proposed in Chapter two, ten are supported. One (H3c) was not supported. The results confirm the original model, and support most of the hypotheses. Prior experience affects course design and system reconfigurability. Course design affects system reconfigurability and psychological empowerment. System reconfigurability affects course design and psychological empowerment. Psychological empowerment affects system reconfigurability and usage patterns, but does not affect course design. Support affects psychological empowerment. Usage patterns affects perceived benefits.

The reason that hypothesis H3c was not supported might be caused by the instrument of course design. Based on pedagogy literature, this study developed the measurement of course design based on the Seven Principles. It seems many faculty are not familiar with these principles. Thus, they did not apply these principles in their teaching. This indicates a more appropriate instrument needs to be developed for course design objectives.

Figure 4.9.1. Solutions of Structural Model (One-Way Relationship)



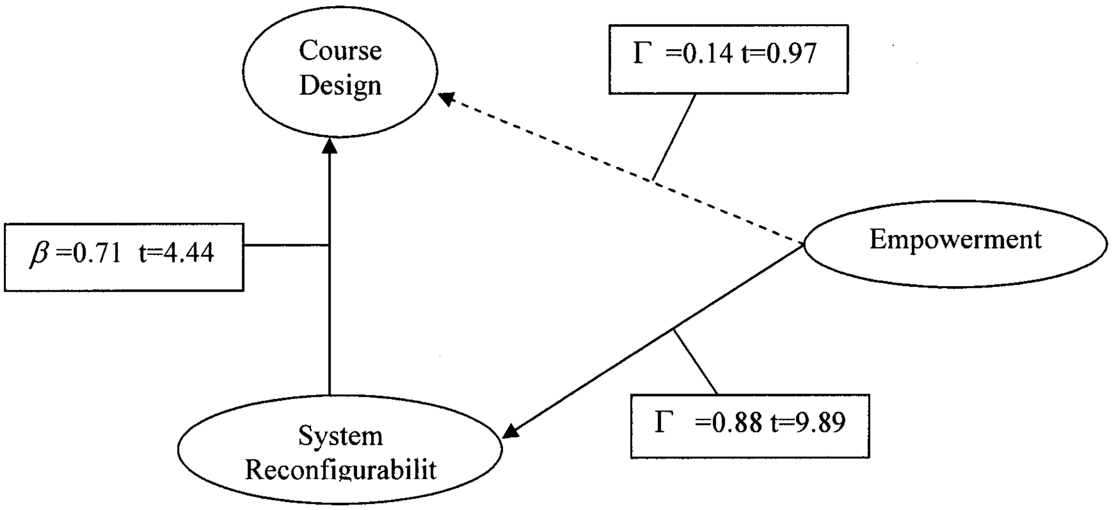
FIT STATISTICS:
- Chi-square with 342 df = 1470.27 (P = 0.00000)
- Root Mean Square Error of Approximation (RMSEA) = 0.098
- Non-Normed Fit Index (NNFI) = 0.93
- Comparative Fit Index (CFI) = 0.94

Table 4.13. Test Results of the Hypotheses

Hypothesis	Result	T-Value
H1a: Prior Experience → Course Design	Not rejected	5.09
H1b: Prior Experience → System Reconfigurability	Not rejected	2.44
H2a: Course Design → System Reconfigurability	Not rejected	9.20
H3a: Course Design → Empowerment	Not rejected	2.39
H3b: System Reconfigurability → Empowerment	Not Rejected	3.25
H4: Support → Empowerment	Not Rejected	3.25
H5: Empowerment → Usage Patterns	Not rejected	9.59
H6: Usage Patterns → Benefits	Not rejected	11.50

H2B: System Reconfigurability → Course Design	Not Rejected	4.44
H3C: Empowerment → Course Design	Rejected	0.97
H3D: Empowerment → System Reconfigurability	Not rejected	9.89

Figure 4.9.2. Solutions of Structural Model (Two-Way Relationship)



FIT STATISTICS:

- Chi-square with 74 df = 283.16 (P = 0.00000)
- Root Mean Square Error of Approximation (RMSEA) = 0.090
- Non-Normed Fit Index (NNFI) = 0.96
- Comparative Fit Index (CFI) = 0.97

Chapter 5: Summary, Recommendations and Conclusion

5.1. Summary

This section will be divided into two parts: (1) a brief summary of the contribution and value of this research; (2) a presentation of recommendations and implications for future research.

The full benefits of technology can not be realized if users do not adopt the new technology and fully use it to achieve their work tasks. But what factors affect technology adoption and implementation is a critical research topic, especially for Web-based systems. The objectives of this study are three fold (1) In a quest for dependent variables in website research, whether traditional information system success model can be extended to Web site context? (2) How the Web-based system and work system interact to empower users? And what design characteristics lead to psychological empowerment? (3) How people interpret, re-configure, and use the technology, and with what consequences in specific conditions? To answer these questions, this research was built upon the information systems literature on system success (i.e., DeLone and McLean's IS Success Model), and adapts this IS success model to the Distance Learning Context.

In e-learning environments, the design and implementation of a distance learning course is an emerging process of deliberations (i.e., knowledge work). Faculty craft their own work process (design goals) and reconfigure distance learning software to enact their courses. In turn, distance learning requires active human agents. Another concern is faculty are not empowered by distance learning technology unless they feel empowered. Thus, psychological empowerment of faculty is important. We propose the interpretive flexibility of distance learning systems can empower faculty. At last, realizing the potential of this technology requires new institutional support services to assist users (i.e., technology changes institutional properties).

Given the above special nature of Course Management Systems and e-learning context, DeLone and McLean's information systems success model (1992, 2003) was adapted based on the following theories: the situated and emergent nature of the distance learning course design process - Orlikowski's theory of technology structuration (1992, 2000); the reconfigurable nature of the distance learning technology - Markus et al's theory of Emergent Knowledge Processing (2002); and the user as an active human agent - Psychological empowerment theory (Thomas and Velthouse,1990).

A theoretical framework on the examination of Web-based system success is provided that identifies user's prior experience, course design objectives, system reconfigurability, support, psychological empowerment, usage patterns, and perceived benefits in a e-learning context from a faculty perspective. A major contribution of this research has been the development of a reliable instrument that supports future research in the areas of evaluation of Web-based systems (i.e., prior experience, system reconfigurability, support, and usage patterns). Twelve variables (five for system reconfigurability, three for support, and four for usage patterns) have been developed to measure Web-based system application constructs. The relationships between the constructs have also been explored. This enables research in the evaluation of Web-based systems, which has been receiving increasing attention, but was in need of more empirical research. The comparison of traditional Information System success measurement variables and new measurement variables of Course Management Systems (CMSs) is demonstrated in Table 5.1.

Table 5.1. Comparison between Traditional IS Success Measurements and CMSs Success Measurements

Traditional IS Success Measurements	CMSs Success Measurements
System Quality	System Reconfigurability (interface, interaction, content, structure, and modularity design)
Service Quality	Support (vendor, organizational, collegial)
Work Design*	Course design goals
Cognitions (intention to use)	Psychological Empowerment (user autonomy, self-efficacy, intrinsic motivation, perceived consequences)
Hours or frequency of use	Distance learning Usage Patterns (Communication & Collaboration, Class Management, Content Management, Assessment)
Net benefits	Instructor perceived distance learning benefits

Structural equation model analysis based on the sample of 348 faculty and instructional designers indicate the adaptation of traditional information systems success model into the Web application is a successful one with very good model-data fit index. The results support that (1) user's prior experience has positive effect on both course design objectives and system reconfigurability; (2) course design and system design interact with each other to let the users feel empowered; (3) support has positive impact on user empowerment; (4) empowered users are more likely to reconfigure the system, and use the software functions more fully, which lead to higher levels of perceived benefits; (5) psychological empowerment has no significant effect on course design goals.

This study also provides valuable benchmarking tools for distance learning. E-learning has grown rapidly in the past several years. But how to measure the e-learning success is still a brand new topic. The interest for this research is high among practitioners in distance learning teaching. The feedbacks to the results of this research from distance and e-learning divisions in many institutions have been quite good. The results will also be presented in the panel study of 2006 WebCT conference.

Finally, this research is an empirical research of e-learning practices which cover four major Course Management Systems (Blackboard, WebCT, e-College, and Angel). The data was drawn from 348 faculty and instructional designers within seven institutions in the state of Ohio. As of now (May 2006), this researcher is not aware of any research in e-learning which covers a broad range of software and institutions. This research adopted a sound methodology, and the research framework was developed based on academic theories, which resulted in a more precise measurement of the underlying constructs of technology application, and examined their inter-relationships that affect the distance learning teaching outcomes.

5.2. Recommendations for Future Research

Recommendation 1: Future research should validate the measurement instruments using a wide range of organizations.

One limitation of this study is the self-selection of respondents and convenience sample. The respondents were selected from traditional colleges and universities in the state of Ohio. Due to the exploratory nature of this study, these instruments should be revalidated with different organizations and institutions using Course Management Systems at least nationwide. For example, the pure online teaching institutions, and organizations which use online programs to train employees should be included to validate the instrument.

Recommendation 2: Future research should conduct factorial invariance tests.

The general applicability of measurement instruments may be supported by factorial invariance tests. Using the instruments developed in this research, one may test for their factorial invariance across different types of organizations (e.g., traditional college, pure online education college, and industries which use software for employee training), across different software packages (i.e., Blackboard vs. WebCT). The instruments are developed to be widely applicable, and the factor structure is expected to be similar across different groups.

Marsh and Hocevar (1985) provide a detailed account to carry factorial invariance tests using LISREL methodology. Such tests are relevant to researchers who use factor analysis in theory development. The value of one factor is greatly enhanced if the same factor can be replicated in random samples from the same population and identified in responses from different populations (Gorsuch, 1997). Although it is rarely tested, an implicit assumption in comparison of different groups is that the underlying construct being measured is the same for the two groups, and this is an issue of factorial invariance (Marsch & Hocevar, 1985). To conduct factorial invariance tests, it is necessary to collect sufficient data for each of the groups for comparison. The factor structure of one group is essentially compared with the factor structure of other groups.

Recommendation 3: Future research should incorporate the student body into the study.

The main objective of e-learning is to serve learners or students in most cases. In the future, the model could be modified, and the instrument could be edited to examine how the Course Management Systems motivate learners and achieve perceived benefits to them.

Recommendation 4: Future study should include dimensions on organizational impacts.

In this study, the main respondents are faculty or instructional designers who are not appropriate to answer questions about organizational impact of a technology. However, management of organizations desirous of exploiting the opportunities offered by this market need to continually assess if their investments are yielding desired returns. In practice, it is very important to examine the organizational impacts. Future research will be expected to include dimensions on this aspect and select right respondents.

Recommendation 5: The results of this study should be carefully generalized in the examination of other Web-based systems.

This research selects a special type of Web-based system – Course Management System to test the theoretical model. Due to the knowledge worker nature of the users, the results should be carefully generalized in the application of other information systems. Future research will be strongly encouraged to generalize this model into other types of Web-based systems.

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Appendix 1. Tables and Figures in Chapter 3 for the Pilot Study

Table 3.2.1. Factorial Analysis of Course Design during the Pilot Study

Component Matrix

	Component
	1
CD7	0.823
CD6	0.821
CD1	0.792
CD4	0.771
CD2	0.758
CD3	0.738
CD5	0.623

Table 3.2.2. Factorial Analysis of System Reconfigurability during the Pilot Study

Pattern Matrix

	Component	
	1	2
IRR3	0.865	
IRR7	0.828	
IRR5	0.813	
IRR2	0.739	
IRR1	0.574	-0.386
ITF3		-0.933
ITF2		-0.887
ITF1		-0.732

Component Correlation Matrix

Component	1	2
1. Interface Reconfigurability	1	
2. Interaction Reconfigurability	0.644**	1

Table 3.2.3. Factorial Analysis of Modularity Design during the Pilot Study

Component Matrix

	Component
	1
MD5	0.872
MD3	0.782
MD6	0.739
MD1	0.704

Table 3.2.4. Factorial Analysis of Information Reconfigurability during the Pilot Study

Component Matrix

	Component
	1
STR6	0.875
CTR4	0.867
CTR1	0.857
CTR5	0.846
STR2	0.833
CTR3	0.820
STR3	0.799
STR5	0.735
CTR2	0.727

Table 3.2.5. Factorial Analysis of Support during the Pilot Study

Pattern Matrix

	Component		
	1	2	3
CSU3	0.947		
CSU1	0.944		
CSU2	0.813		
VSU6		0.957	
VSU4		0.936	
VSU5		0.879	
OSU3			0.948
OSU4			0.892
OSU2			0.806

Component Correlation Matrix

Component	1	2	3
1. Vendor Support	1		
2. Organizational Support	.117	1	
3. Collegial Support	.207	.424**	1

Table 3.2.6. Factorial Analysis of Psychological Empowerment during the Pilot Study

Pattern Matrix

	Component			
	1	2	3	4
INM2	0.890			
INM3	0.730			
INM1	0.685		-0.321	
SEF3		0.916		
SEF2		0.890		
SEF1		0.701	-0.309	
AUT3			-0.909	
AUT2			-0.848	
AUT1			-0.541	
PCC1				0.940
PCC2				0.791
PCC3				0.651

Component Correlation Matrix

Component	1	2	3	4
1. Intrinsic Motivation	1			
2. Self-efficacy	.409**	1		
3. User Autonomy	.719**	.437**	1	
4. Perceived Consequences	.714**	.334*	.586**	1

Table 3.2.7. Factorial Analysis of Communication and Collaboration during the Pilot Study

Component Matrix

	Component
	1
CAC2	0.911
CAC4	0.908
CAC5	0.834

Table 3.2.8. Factorial Analysis of Class Management during the Pilot Study

Component Matrix

	Component
	1
CLM9	0.904
CLM6	0.863
CLM7	0.798
CLM1	0.780
CLM5	0.762

Table 3.2.9. Factorial Analysis of Content Management during the Pilot Study

Component Matrix

	Component
	1
CTM2	0.900
CTM3	0.869
CTM6	0.840

Table 3.2.10. Factorial Analysis of Assessment during the Pilot Study

Component Matrix

	Component
	1
ASS1	0.960
ASS2	0.954
ASS3	0.844

Table 3.2.11. Factorial Analysis of Benefits during the Pilot Study

Component Matrix

	Component
	1
BE3	0.896
BE1	0.882
BE2	0.858
BE5	0.853

Table 3.3.1. Measurement Items of Course Design Suggested from the Pilot Study (total 7 items)

Label	CITC	Item Description
		alpha = 0.8755
CD1	.6992	In distance learning, this software helps me encourage contacts between students and faculty.
CD2	.6579	In distance learning, this software helps me develop collaboration and cooperation among students learning (e.g. team work).
CD3	.6431	In distance learning, this software helps me use active learning techniques (e.g. simulation).
CD4	.6727	In distance learning, this software helps me give prompt feedback
CD5	.5026	In distance learning, this software helps me emphasize time on task.
CD6	.7418	In distance learning, this software helps me communicate high expectations.
CD7	.7264	In distance learning, this software helps me respect diverse talents and ways of learning.

Table 3.3.2. Measurement Items of System Reconfigurability Suggested from the Pilot Study (total 10 items)

Label	CITC	Item Description
		Interface Reconfigurability (alpha = .8876)
ITF1	.8180	On the course homepage, this software enables me to personalize the look and feel of the homepage.
ITF2	.9059	On the course homepage, this software enables me to have some control over the appearance of the homepage.
ITF3	.6650	On the course homepage, this software enables me to edit course homepage.
		Interaction Reconfigurability (alpha = .8750)
IRR1	.7338	This software enables me to use various tools to contact specific
IRR2	.7604	This software enables me to use various tools (e.g. message, discussion board, chat room) to interact with students.
IRR3	.8014	This software enables me to use various tools to help students to interact with each other.
IRR5	.6034	This software enables me to set up forums around different topics.
IRR7	.6648	This software enables me to have choices to activate interactive tools for interested students.

Table 3.3.3. Measurement Items of Modularity Design Suggested from the Pilot Study (total 4 items)

Label	CITC	Item Description
		alpha = 0.7552
MD1	.4705	Our online courses use Module (or Unit) Design.
MD3	.5927	Our online courses use built-in navigation links.
MD5	.7338	Modules (or Units) can be incorporated into course design
MD6	.5011	Our online courses use optional interactive tools

Table 3.3.4. Measurement Items of Information Reconfigurability Suggested from the Pilot Study (total 7 items)

Label	CITC	Item Description
		alpha = 0.9329
CTR1	.8188	This software provides a wide range options for the course
CTR2	.6673	This software provides various ways to manage files.
CTR3	.8158	This software provides many choices to deliver course content efficiently (e.g. single page, email, discussion, attachment).
CTR4	.7905	This software enables me to add course content to my course at
CTR5	.7642	This software enables me to add various types of files (e.g. images, Flashes, audio).
STR3	.7755	The software enables me to change navigation format.
STR5	.6664	This software enables me to modify the layout of the webpage.
STR6	.8260	This software enables me to organize pages.
STR7	.7408	This software enables me to let students access associated course resources through different links.

Table 3.3.5. Measurement Items of Support Suggested from the Pilot Study (total 9 items)

Label	CITC	Item Description
		Vendor Support (alpha = .9157)
VSU4	.8289	When I need help, I may turn to vendor's tool free telephone number.
VSU5	.7593	When I encounter problems, I may find solutions on vendor's Web site.
VSU6	.9104	When I encounter problems, I may get help from the vendor via email.
		Organizational Support (alpha = .8609)
OSU2	.6954	I am always supported and encouraged by my organization to use this software in my job.
OSU3	.7874	The training provided by my organization helped me get familiar with this software.
OSU4	.7393	My organization technicians helped me solve the problem in the application.
		Collegial Support (alpha = 0.9149)
CSU1	.7845	When I have difficulty in using the software for online teaching, I can exchange information with others who know how to better use of the software for the process.
CSU2	.8457	When I have difficulty in using the software for online teaching, I can talk to other people who are more knowledgeable.
CSU3	.8636	When I have difficulty in using the software for online teaching, I can discuss with others who know how to make better use of the software for this application.

Table 3.3.6. Measurement Items of Psychological Empowerment Suggested from the Pilot Study (total 12 items)

Label	CITC	Item Description
		Intrinsic Motivation (alpha = .9025)
INM1	.8003	Using the software for online teaching is enjoyable
INM2	.8524	Using the software for online teaching is pleasurable
INM3	.7722	Using the software for online teaching fosters enjoyment
		Self-efficacy (alpha = .8446)
SEF1	.7379	I am confident about my ability to use the software to complete
SEF2	.6985	I believe my capability of using the software for my work
SEF3	.7542	I have mastered the skills necessary for using this software in
		User Autonomy (alpha = 0.8934)
AUT1	.7845	I have considerable choices in how I use the software for online courses
AUT2	.8457	I have significant autonomy in determining how I use software for
AUT3	.8636	I have a say in how I use this software for online course
		Perceived Consequences (alpha = 0.8641)
PCC1	.8556	I see this software as being able to increase my productivity
PCC2	.6712	I see this software as being able to save me time
PCC3	.7110	I see this software as being able to allow me to accomplish more work than would otherwise be possible

Table 3.3.7.. Measurement Items of Communication and Collaboration Suggested from the Pilot Study (total 3 items)

Label	CITC	Item Description
		alpha = 0.8649
CAC2	.7660	I use the software to help students communicate with the instructor.
CAC4	.7671	I use the software to help me communicate with my students.
CAC5	.6560	I use the software to help me coordinate student groups.

Table 3.3.8. Measurement Items of Class Management Suggested from the Pilot Study (total 3 items)

Label	CITC	Item Description
		alpha = 0.8784
CLM1	.6522	I use this software to help track number of students' hit on a page.
CLM5	.6335	I use this software to help deny or access a specific webpage.
CLM6	.7680	I use this software to help track students' participation.
CLM8	.6800	I use this software to help students track the status of their
CLM9	.8303	I use this software to help students track progress.

Table 3.3.9. Measurement Items of Content Management Suggested from the Pilot Study (total 3 items)

Label	CITC	Item Description
		alpha = 0.8300
CTM2	.7525	I use this software to help make my course materials available to students.
CTM3	.6887	I use this software to help deliver online course content.
CTM6	.6517	I use this software to help backup and restore course content.

Table 3.3.10 Measurement Items of Assessment Suggested from the Pilot Study (total 3 items)

Label	CITC	Item Description
		alpha = 0.9028
ASS1	.8874	I use the software to help assess my students' understanding of the course material.
ASS2	.8662	I use the software to help assess my students' mastering of the
ASS3	.6898	I use this software to help students take self test.

Table 3.3.11 Measurement Items of Benefits Suggested from the Pilot Study (total 4 items)

Label	CITC	Item Description
		alpha = 0.8888
BE1	.7690	In general, this software enhances my teaching effectiveness.
BE2	.7514	This software enables me to handle a large class effectively.
BE3	.7980	This software helps my students to achieve their learning objectives.
BE5	.7422	This software improves my productivity.

Table 3.4 The Reliability and the Discriminant Validity of the Scales for the Pilot Study

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Prior Experience (1)		.4305																	
Course Design (2)		-.15 (6)	.88																
Interface Reconfigurability (3)		-.192 (7)	.646** (97)	.89															
Interaction Reconfigurability (4)		-.165 (6)	.783** (26)	.694 ** (61)	.88														
Modularity Design (5)		.065 (15)	.535** (30)	.477 ** (64)	.518** (38)	.76													
Information Reconfigurability (6)		-.29 (13)	.766** (24)	.818 ** (35)	.837** (18)	.581** (16)	.93												
Empowerment	Intrinsic Motivation (7)	-.145 (7)	.628** (59)	.555 ** (70)	.570** (78)	.365** (96)	.698** (71)	.90											
	Self-efficacy (8)	.150 (18)	.468** (49)	.387 ** (74)	.387** (64)	.489** (33)	.431** (50)	.409** (68)	.84										
	User Autonomy (9)	-.190 (13)	.695** (37)	.716 ** (49)	.665** (62)	.446** (61)	.793** (28)	.719** (38)	.437* * (56)	.89									
	Perceived Consequences (10)	-.080 (29)	.609** (40)	.457 ** (154)	.457** (101)	.274* (105)	.478** (88)	.714** (28)	.334* (69)	.586** (57)	.86								
Support	Vendor (11)	-.174 (8)	.219 (167)	.146 (98)	.118 (194)	-.001 (153)	.221 (73)	.286* (277)	.097 (118)	.124 (191)	.189 (93.92)	.92							
	Organizational (12)	-.032 (17)	.534** (54)	.519 ** (51)	.631** (25)	.289* (107)	.553** (63)	.374** (63)	.014 (116)	.515** (58)	.329* (61.06)	.117 (69)	.86						

	Collegial (13)	.051 (25)	.393** (117)	.431 ** (64)	.435** (19)	.388** (46)	.463** (9)	.265* (106)	.112 (196)	.384** (122)	.153 (77)	.207 (127)	.424** (63)	.91					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Usage Patterns	Communication & Collaboration (14)	-.105 (77)	.512** (27)	.562 ** (55)	.522** (51)	.512** (20)	.553** (25)	.428** (107)	.442** (61)	.492** (59)	.380** (83.28)	.178 (143)	.365** (59)	.458** (60)	.86				
Usage Patterns	Class Management (15)	-.114 (26)	.585** (117)	.514 ** (74)	.571** (135)	.397** (94)	.602** (120)	.500** (184)	.402** (50)	.564** (75)	.445** (63.82)	.226 (177)	.493** (113)	.328* (65)	.805** (10)	.88			
Usage Patterns	Content Management (16)	-.028 (33)	.568** (41)	.590 ** (89)	.533** (88)	.563** (23)	.620** (53)	.356** (60)	.340* (128)	.627** (72)	.354** (108.52)	.002 (151)	.452** (46)	.431** (111)	.721** (10)	.655** (25)	.83		
Usage Patterns	Assessment (17)	-.231 (7)	.625** (78)	.398 ** (82)	.507** (125)	.374** (59)	.543** (142)	.438** (75)	.266* (63)	.266* (64)	.484** (48.04)	.237 (99)	.460** (50)	.375** (98)	.661** (79)	.728** (108)	.670** (40)	.90	
Benefits (18)		-.108 (35)	.671** (55)	.365 ** (160)	.435 (148)	.242 (107)	.551** (99)	.719** (31)	.324* (59)	.666** (50)	.806** (6.5)	.215 (144)	.331* (67)	.144 (119)	.337* (64)	.435* (138)	.358* (57)	.502 * (112)	.89
Mean		4.6	3.7	4.2	3.9	3.8	3.9	3.7	4.0	4.0	3.6	3.0	4.0	4.1	3.6	3.1	3.9	3.1	3.8
Standard Deviation		2.5	0.8	.7	.7	.7	.8	1.1	.9	1.0	1.1	.9	1.0	0.7	1.1	1.2	1.1	1.4	0.9
# of Initial Items		3	7	5	7	6	12	3	3	3	3	6	4	3	5	9	6	4	5
# of Items Recommended			5	4	5	3	9	3	3	3	3	4	4	3	5	4	5	4	4
# of reworded Items			2	1		1										1			1
# of New Items		4						1	1	1									
Total items for large scale study		4	7	5	5	4	9	4	4	4	3	4	4	3	5	5	5	4	5

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 3.5.2 The Predictive Power of the Scales and the R-square of the Criteria for the Pilot Study

Experience	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Criteria	R-square
	.467	-.323	-.365		.418						.328	.446					Benefits	.813
																	Assessment (17)	.538
				.245					-.337		.368						Content Management (16)	.576
							.287										Class Management (15)	.479
								.254		.270							Communication & Collaboration (14)	.500
					.696												Intrinsic Motivation (13)	.542
.277	.308			.255			-.418										Self-efficacy (12)	.478
	.270				.605												User Autonomy (11)	.676
	.628																Perceived Consequences (10)	.395
																	Vendor Support (9)	.179
.193			.491							-.412							Organizational Support (8)	.550
																	Collegial Support (7)	.318
	.315								.283		.310	-.201					Information Re-configurability(6)	.785
	.324							.235		.324							Modularity Design (5)	.435
	.476						.310										Interaction Re-configurability (4)	.721
											.378						Interface Re-configurability (3)	.619
			.374									.266					Course Design (2)	.743

Table 3.5.1 Coefficients Table for Multicollinearity

	Collinearity Statistics	
	Tolerance	VIF
Usage Patterns	.455	2.195
Psychological Empowerment	.347	2.881
Course Design	.279	3.580
Information Reconfigurability	.146	6.837
System Reconfigurability	.166	6.037
Modularity Design	.574	1.743
Service Quality	.570	1.755
Prior Experience	.862	1.161

Table 3.6.1 Measurement Scales of Prior Experience Used in the Large-Scale Study (4 items)

PLabel	S	LLabel	Item Description
	A	LPE1	I feel that I am an experienced user of the Internet.
	A	LPE2	I feel that I am an experienced user of this software.
	A	LPE3	I have been using this software in my teaching for many years.
	A	LPE4	I have been using this software in my teaching for many courses.

Table 3.6.2 Measurement Scales of Course Design Used in the Large-Scale Study (7 items)

PLabel	S	LLabel	Item Description
			In distance learning, this software helps
CD1		LCD1	me encourage contacts between students and faculty
CD2		LCD2	me develop collaboration and cooperation among students
CD3		LCD3	me use active learning techniques (e.g. simulation)
CD4	R	LCD4	me provide feedback to students frequently and quickly
CD5	R	LCD5	students complete task in a timely manner.
CD6		LCD6	me communicate high expectations
CD7		LCD7	respect diverse talents and ways of learning

Table 3.6.3 Measurement Scales of System Reconfigurability Used in the Large-Scale Study (10 items)

PLabel	S	LLabel	Item Description
			Interface Reconfigurability (5 items)
			This software enables me to
ITF1		LITF1	personalize the look and feel of the homepage.
ITF2		LITF2	have some control over the appearance of the homepage.
ITF3		LITF3	edit course homepage.
ITF5		LITF4	modify icon on the webpage.
ITF4	R	LITF5	change text font, size, and other style on the course homepage.
			Interaction Reconfigurability (6 items)
			This software enables me to use
IRR1		LIRR1	various tools (e.g. message, discussion board, chat room) to contact specific group
IRR2		LIRR2	various tools (e.g. message, discussion board, chat room) to interact with students.
IRR3		LIRR3	various tools to help students to interact with each other.
IRR5		LIRR4	set up forums around different topics.
IRR7		LIRR5	have choices to activate interactive tools for interested students.

Table 3.6.4 Measurement Scales of Modularity Design Used in the Large-Scale Study (4 items)

PLabel	S	LLabel	Item Description
			This software enables me to
MD1	R	LMD1	use Module (or Unit) Design (that is a self-contained package like quizzes, assignments, etc.)
MD3		LMD2	use built-in navigation links.
MD5		LMD3	incorporate Modules (or Units) into course design
MD6	R	LMD4	use optional interactive tools

Table 3.6.5 Measurement Scales of Information Reconfigurability Used in the Large-Scale Study (9 items)

PLabel	S	LLabel	Item Description
CTR1		LCTR1	This software provides a wide range options for the course content.
CTR2		LCTR2	This software provides various ways to manage files.
CTR3		LCTR3	This software provides many choices to deliver course content efficiently (e.g. single page, email, discussion, attachment).
CTR4		LCTR4	This software enables me to add course content to my course at any stage of the course design process.
CTR5		LCTR5	This software enables me to add various types of files (e.g. images, Flashes, audio).
STR3		LSTR1	The software enables me to change navigation format.
STR5		LSTR2	This software enables me to modify the layout of the webpage.
STR6		LSTR3	This software enables me to organize pages.
STR7		LSTR4	This software enables me to let students access associated course resources through different links.

Table 3.6.6 Measurement Scales of Support Used in the Large-Scale Study (11 items)

PLabel	S	LLabel	Item Description
			Vendor Support (4 items)
VSU4		LVSU1	When I need help, I may turn to vendor's tool free telephone number.
VSU5		LVSU2	When I encounter problems, I may find solutions on vendor's Web site.
VSU6		LVSU3	When I encounter problems, I may get help from the vendor via email.
VSU2	R	LVSU4	When I have questions, I may find answers from the vendor's Web site forum.
VSU1		LVSU5	This software vendor has provided most of the necessary help and resources necessary to get us used to the software
			Organizational Support (4 items)
OSU2		LOSU1	I am always supported and encouraged by my organization to use this software in my job.
OSU3		LOSU2	The training provided by my organization helped me get familiar with this software.
OSU4		LOSU3	My organization technicians helped me solve the problem in the application.
OSU1		LOSU4	My organization is really keen (?) to see that we are happy with using this software.
			Collegial Support (4 items)
CSU1		LCSU1	When I have difficulty in using the software for online teaching, I can exchange information with others who know how to better
CSU2		LCSU2	When I have difficulty in using the software for online teaching, I can talk to other people who are more knowledgeable.
CSU3		LCSU3	When I have difficulty in using the software for online teaching, I can discuss with others who know how to make better use of the software for this application.

Table 3.6.7 Measurement Scales of Psychological Empowerment Used in the Large-Scale Study (12 items)

PLabel	S	LLabel	Item Description
			Intrinsic Motivation (4 items)
INM1		LINM1	Using the software for online teaching is enjoyable
INM2		LINM2	Using the software for online teaching is pleasurable
INM3		LINM3	Using the software for online teaching fosters enjoyment
			Self-efficacy (4 items)
SEF1		LSEF1	I am confident about my ability to use the software to complete online teaching.
SEF2		LSEF2	I believe my capability of using the software for online teaching
SEF3		LSEF3	I have mastered the skills necessary for using this software in online teaching
			User Autonomy (4 items)
AUT1		LAUT1	I have considerable choices in how I use the software for online teaching.
AUT2		LAUT2	I have significant autonomy in determining how I use software for online teaching
AUT3		LAUT3	I have a say in how I use this software for online teaching
			Perceived Consequences (3 items)
PCC1			I see this software as being able to increase my productivity
PCC2			I see this software as being able to save me time
PCC3			I see this software as being able to allow me to accomplish more work than would otherwise be possible

Table 3.6.8 Measurement Scales of Communication and Collaboration Used in the Large-Scale Study (5 items)

PLabel	S	LLabel	Item Description
CAC2		LCAC1	I use the software to help students communicate with me.
CAC4		LCAC2	I use the software to help me communicate with my students.
CAC5		LCAC3	I use the software to help me coordinate student groups.
CAC1		LCAC4	I use the software to help students communicate with each other.
CAC3		LCAC5	I use the software to help students collaborate with each other.

Table 3.6.9 Measurement Scales of Class Management Used in the Large-Scale Study (5 items)

PLabel	S	LLabel	Item Description
CLM1		LCLM1	I use this software to track number of students' hit on a page.
CLM5	R	LCLM2	I use this software to permit my students get access to a specific webpage.
CLM6		LCLM3	I use this software to track students' participation.
CLM8		LCLM4	I use this software to help students track the status of their assignments.
CLM9		LCLM6	I use this software to help students track progress.

Table 3.6.10 Measurement Scales of Content Management Used in the Large-Scale Study (5 items)

PLabel	S	LLabel	Item Description
CTM2		LCTM1	I use this software to make my course materials available to students.
CTM3		LCTM2	I use this software to deliver online course content.
CTM6		LCTM3	I use this software to backup and restore course content.
CTM5		LCTM4	I use this software to reuse the course content.
CTM1		LCTM5	I use this software to create online course content.

Table 3.6.11 Measurement Scales of Assessment Used in the Large-Scale Study (4 items)

PLabel	S	LLabel	Item Description
ASS1		LASS1	I use the software to assess my students' understanding of the course material.
ASS2		LASS2	I use the software to assess my students' mastering of the
ASS3		LASS3	I use this software to help students take self test.
ASS4		LASS4	I use the software to help students evaluate other group members' performance.

Table 3.6.12 Measurement Scales of Benefits Used in the Large-Scale Study (4 items)

PLabel	S	LLabel	Item Description
BE1		LBE1	In general, this software enhances my teaching effectiveness.
BE2		LBE2	This software enables me to handle a large class effectively.
BE3		LBE3	This software helps my students to achieve their learning objectives.
BE5		LBE4	This software improves my productivity.
BE4	R	LBE5	This software improves my students learning.

Table 3.7 Dropped Items

Label	Item Description	Reason
PE1	I have been using computer and Internet technology in my teaching for the number of year(s) ___ .	Hard measures. Wide range. Inappropriate for measuring the experience in DL environment.
PE2	I have been using this software in my teaching for the number of year(s) ___.	
PE3	I have been using the software in my teaching for the number of courses____.	
IRR4	This software enables me to set up multiple forums.	Too general
IRR6	This software enables me to embed forums in appropriate content areas.	Bit confused with "embedded" and "appropriate"
MD2	Our online courses use a collection of sequentially arranged pages with a table of contents.	Too professional
MD4	Modules (or Units) can be rearranged by users to suit their needs.	Professional
STR1	This software provides tabs I can shift from design view to student view so that I can view as a student.	Too complicated expressing
STR2	This software provides options for course links.	May not be the case
STR4	This software enables me to set sequential viewing for students.	Confused wording with "sequential viewing"
VSU1	The software vendor has provided most of the necessary help and resources Necessary to get us used to the software.	Complicated and long sentence
VSU3	When I need help in application with my application of this software, I may find answers in helpdesk provided by software vendor.	Complicated and long sentence
CLM2	I use this software to help assign grades.	May not be the case

CLM3	I use this software to help check my grading.	May not be the case
CLM4	I use this software to help view student roster.	May not be the case
CLM7	I use this software to help students track their grades.	May not be the case
CTM4	I use this software to help share the course content with other faculty.	May not be the case

Appendix 2. Tables and Figures in Chapter 4 of Large-Scale Study

Table 4.2.1. The Initial Reliability Analysis of Prior Experience

Prior Experience (alpha = .7680) (.8109 if LPE1 deleted)	
Measurement Items	Corrected Item-Total Correlation
LPE1	**.3373**
LPE2	.6200
LPE3	.7107
LPE4	.6891

Table 4.2.2. Factorial Analysis Results of Prior Experience during the Large-Scale Study

Component Matrix

	Component
	1
LPE3	0.900
LPE4	0.890
LPE2	0.768

Figure 4.1. The Initial Measurement Results of Prior Experience

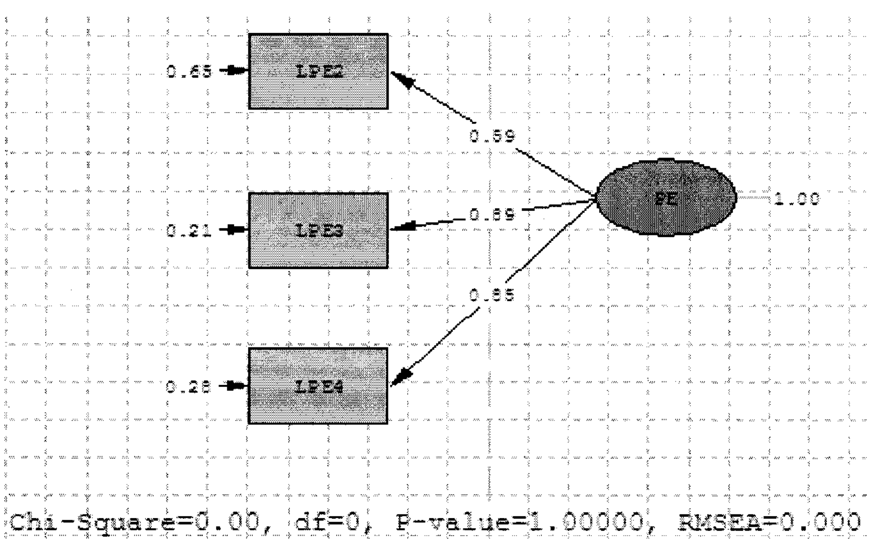


Table 4.2.3. Measurement Scales of Prior Experience Recommended for Future Studies (3 items)

Label	CITC	Item Description
		alpha = 0.8109
LPE2	.5468	I feel that I am an experienced user of this software.
LPE3	.7560	I have been using this software in my teaching for many years.
LPE4	.7426	I have been using this software in my teaching for many courses.

Table 4.5.1. The Initial Reliability Analysis of Course Design Objectives

Course Design Objectives (alpha = .8760)	
Measurement Items	Corrected Item-Total Correlation
LCD1	.7293
LCD2	.6840
LCD3	.5981
LCD4	.6670
LCD5	.5835
LCD6	.6624
LCD7	.6782

Table 4.5.2. Factorial Analysis Results of Course Design during the Large-Scale Study

Component Matrix

	Component
	1
CD1	0.818
CD2	0.783
CD7	0.775
CD4	0.766
CD6	0.761
CD3	0.707
CD5	0.693

Table 4.3.1. The Data-Model Fit Index of the Scales (Before modification)

		Chi-square	Degree of freedom	p-value	RMSEA	NNFI	CFI	EVCI	# of Items
Prior Experience		0	0	1	0	0.91	0.94	0.45	3
Course Design		127.03	14	0.00000	0.153	0.91	0.94	0.45	4
System Reconfigurability	Interface Reconfigurability	47.53	5	0.00000	0.157	0.95	0.98	0.19	5
	Interaction Reconfigurability	131.31	5	0.0000	0.270	0.85	0.92	0.44	5
	Content Reconfigurability	63.60	5	0.00000	0.184	0.90	0.95	0.24	4
	Structure Reconfigurability	19.37	2	0.00006	0.158	0.93	0.98	0.10	4
	Modularity Design	4.39	2	0.11156	0.059	0.99	1.00	0.059	4
Empowerment	Intrinsic Motivation	0	0	1.00	0.000				3
	Self-efficacy	0	0	1.00	0.000				3
	User Autonomy	0	0	1.00	0.000				3
	Perceived Consequences	0	0	1.00	0.000				3
Support	Vendor	55.98	5	0.00000	0.171	0.96	0.97	0.22	5
	Organization	6.62	2	0.03655	0.082	0.98	0.99	0.065	4
	Collegial	0	0	1.00	0.000				3
Communication and Collaboration		164.84	5	0.00000	0.304	0.70	0.85	0.53	5
Class Management		269.22	5	0.0000	0.390	0.32	0.66	0.83	5
Content Management		123.14	5	0.00000	0.261				4
Assessment		15.58	2	0.00041	0.140	0.95	0.98	0.091	4
Benefits		94.78	5	0.00000	0.227	0.89	0.94	0.33	5

Table 4.3.2. The Data-Model Fit Index of the Scales (After Modification)

		Chi-square	Degree of freedom	p-value	RMSEA	NNFI	CFI	EVCI	# of Items
Prior Experience		0	0	1.00	0.000				3
Course Design		27.44	5	0.00005	0.114	0.95	0.97	0.14	5
System Reconfigurability	Interface Reconfigurability	9.65	2	0.00803	0.105	0.98	0.99	0.074	4
	Interaction Reconfigurability	1.47	2	0.47835	0.000	1.00	1.00	0.052	4
	Content Reconfigurability	17.17	2	0.00019	0.148	0.92	0.97	0.096	4
	Structure Reconfigurability	19.37	2	0.00006	0.158	0.93	0.98	0.10	4
	Modularity Design	4.39	2	0.11156	0.059	0.99	1.00	0.059	4
Empowerment	Intrinsic Motivation	0	0	1.00	0.000				3
	Self-efficacy	0	0	1.00	0.000				3
	User Autonomy	0	0	1.00	0.000				3
	Perceived Consequences	0	0	1.00	0.000				3
Support	Vendor	5.82	2	0.05453	0.074	0.99	1.00	0.063	4
	Organization	6.62	2	0.03655	0.082	0.98	0.99	0.065	4
	Collegial	0	0	1.00	0.000				3
Communication and Collaboration		18.52	2	0.00009	0.154	0.93	0.98	0.099	4
Class Management		11.37	2	0.00339	0.116	0.94	0.98	0.079	4
Content Management		11.16	2	0.00378	0.115	0.95	0.98	0.078	4
Assessment		15.58	2	0.00041	0.140	0.95	0.98	0.091	4
Perceived Benefits		18.08	2	0.00012	0.152	0.94	0.98	0.098	4

Table 4.3.3. The Data-Model Fit Index of the Second-order Factor Measurement Model

	Chi-square	Degree of freedom	p-value	RMSEA	NNFI	CFI	EVCI	# of Items
System Reconfigurability	525.64	165	0.00000	0.079	0.96	0.97	1.77	20
Support	58.60	41	0.03666	0.035	0.98	0.99	0.31	11
Psychological Empowerment	139.77	50	0.00000	0.072	0.98	0.98	0.56	12
Usage Patterns	470.66	100	0.00000	0.103	0.94	0.95	1.56	16

Table 4.4. The Predictive Power of the Scales and the R-square of the Criteria

LPE	LCD	System Reconfigurability					Support			Psychological Empowerment				Usage Patterns				Criteria	R-square
		LITF	LIRR	LCTR	LSTR	LMD	LVSU	LOSU	LCSU	LAUT	LSEF	LINM	LPCC	LCAC	LCLM	LCTM	LASS		
.067	.121	.069	-.100		.103					.117			.512		.082	.090		Benefits	.696
	.186		.214	.183	-.242			.108		.248								Assessment	.315
.18	.159			.182	.136		-.115			.151		.110						Content Management	.389
	.281		.116	.128						.198								Class Management	.398
.078	.253			.116						.175								C&C	.386
	.290				.204	.121	.094	.131	.150									Intrinsic Motivation	.522
.364			.200	.193	.130			.085										Self-efficacy	.464
	.139	.159		.150	.237			.193										User Autonomy	.398
	.220				.297		.120											Perceived Consequences	.351
				.175						.134		-.122	.155					Vendor	.180
					.146					.167		.225						Organization	.274
					.152					.150		.112						Collegial	.243
	.278								.091	.117	.098	.157	.157					Content	.522
	.217						.154				.229	.148						Structure	.355
	.227						.152				.230	.156						Modularity	.367
.089	.502										.240							Interaction	.501
	.198						.112					.241						Interface	.243
.068			.364		.126					.230	-.117	.084						Course Design	.588

Table 4.7. The Reliability and the Discriminant Validity of the Scales

		LPE	LCD	System Reconfigurability					Support			Psychological Empowerment				Usage Patterns				LBE
				LITF	LIRR	LCTR	LSTR	LMD	LVSU	LOSU	LCSU	LAUT	LSEF	LINM	LPCC	LCAC	LCLM	LCTM	LASS	
LPE		.8109																		
LCD		.291**	.8420																	
		322.67																		
System Reconfigurability	LITF	.185**	.405**	.9082																
		358.32	723.63																	
	LIRR	.361**	.649**	.346**	.8711															
		302.61	258.82	759.02																
	LCTR	.249**	.603**	.383**	.569**	.8022														
		339.44	310.67	440.29	278.55															
	LSTR	.176**	.491**	.586**	.420**	.527**	.8660													
		298.71	585.33	647.71	470.13	296.89														
	LMD	.207**	.484**	.420**	.484**	.498**	.512**	.9075												
		330.56	472.84	538.91	320.77	357.63	297.52													
Support	LVSU	.029	.305**	.232**	.266**	.274**	.292**	.319**	.8712											
		376.33	410.65	268.34	377.82	391.67	438.66	527.51												
	LOSU	.145**	.348**	.267**	.260**	.416**	.351**	.298**	.126*	.8226										
		285.25	342.12	491.67	423.54	329.36	603.28	278.37	597.91											
	LCSU	.065	.323**	.243**	.266**	.404**	.374**	.312**	.247**	.530**	.9226									
		392.64	306.69	254.36	357.68	260.72	311.76	415.18	543.89	251.66										
Psychological Empowerment	LAUT	.216**	.466**	.399**	.383**	.522**	.393**	.437**	.152**	.436**	.351**	.8791								
		401.04	278.97	277.25	301.73	251.32	397.65	332.76	318.37	417.40	501.59									
	LSEF	.511**	.416**	.255**	.510**	.467**	.362**	.454**	.171**	.316**	.277**	.499**	.8806							
		198.7	235.57	212.85	287.73	298.66	257.91	277.97	319.31	378.35	423.37	433.97								
	LINM	.242**	.621**	.367**	.498**	.599**	.507**	.453**	.327**	.433**	.407**	.519**	.513**	.9468						
		243.36	118.77	604.25	276.05	265.86	313.24	278.26	237.9	277.06	323.57	296.35	268.52							
	LPCC	.203**	.477**	.259**	.341**	.522**	.381**	.366**	.287**	.330**	.322**	.373**	.383**	.635**	.9468					
		355.21	638.37	367.45	355.28	291.03	342.66	380.27	422.39	521.79	362.01	515.36	522.53	727.88						
Usage Patterns	LCAC	.278**	.545**	.300**	.472**	.465**	.371**	.416**	.159**	.288**	.214**	.348**	.400**	.502**	.379**	.8519				
		263.17	198.75	245.36	353.68	269.06	289.33	432.65	386.36	275.36	291.56	266.87	238.39	212.68	435.82					
	LCLM	.279**	.559**	.291**	.493**	.445**	.370**	.423**	.166**	.282**	.201**	.336**	.401**	.502**	.351**	.945**	.7920			
		298.13	214.65	346.81	257.32	279.23	320.1	266.51	463.90	372.55	396.46	422.85	265.33	214.79	328.35	344.43				
	LCTM	.178**	.445**	.231**	.427**	.261**	.329**	.388**	.167**	.268**	.200**	.417**	.419**	.466**	.376**	.521**	.529**	.8008		
		223.04	234.26	275.48	219.76	325.66	258.92	219.36	297.33	416.37	323.65	287.34	341.45	366.83	402.78	421.03	446.28			

LASS	.178**	.445**	.231**	.427**	.261**	.329**	.388**	.167**	.268**	.200**	.257**	.302**	.438**	.283**	.542**	.549**	.512**	.8651	
	301.29	235.57	312.8	282.93	315.26	416.57	327.91	288.65	328.34	287.65	348.26	513.07	223.45	372.58	433.67	468.71	477.24		
LBE	.298**	.576**	.355**	.405**	.575**	.425**	.432**	.263**	.353**	.311**	.442**	.436**	.660**	.762**	.491**	.464**	.505**	.408**	.8920
	410.33	376.99	433.57	387.62	390.06	433.57	325.07	369.25	412.47	452.86	472.51	328.79	203.58	171.23	336.94	274.51	236.40	368.72	
Mean	3.83	3.67	3.72	3.86	4.02	3.31	3.62	2.71	4.00	3.90	3.99	4.14	3.64	3.72	3.24	3.12	3.91	2.68	3.86
Std. Deviation	0.90	0.76	0.87	0.76	0.67	0.78	0.78	.88	.79	.85	.80	.72	1.03	1.05	1.02	1.06	0.96	1.16	0.84
Initial # of Items	4	7	5	5	5	4	4	5	4	3	3	3	3	3	5	5	5	4	5
Recommended #	3	5	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4	4	4

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Figure 4.2.1 The Initial Measurement Results of Course Design Objectives

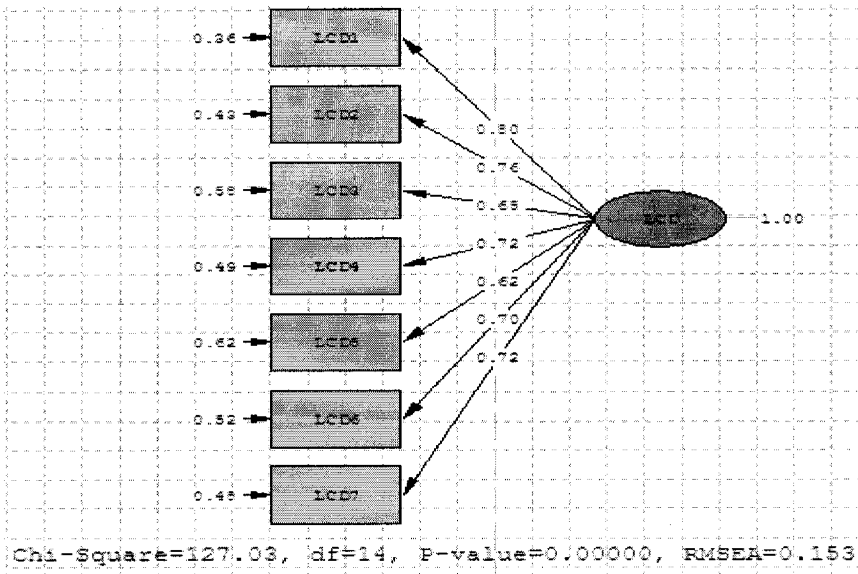


Figure 4.2.2 The Alternative Measurement Solutions for Course Design Objectives

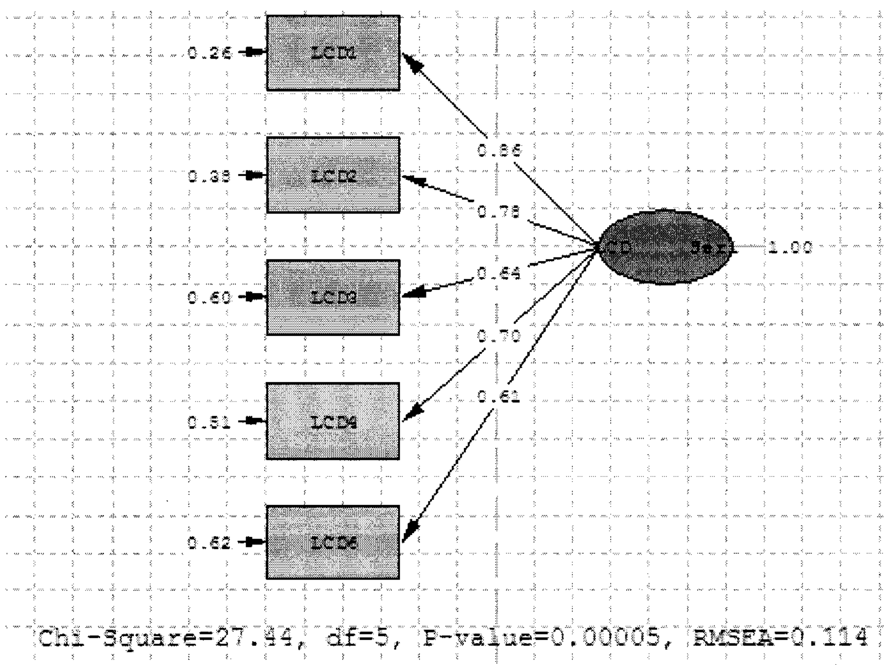


Table 4.5.3. Measurement Scales of Course Design Recommended for Future Studies (5 items)

Label	CITC	Item Description
		alpha = 0.8420
		In distance learning, this software helps me
LCD1	.7470	encourage contacts between students and faculty
LCD2	.6916	develop collaboration and cooperation among students
LCD3	.5879	use active learning techniques (e.g. simulation)
LCD4	.6396	give prompt feedback
LCD6	.5745	communicate high expectations.

Table 4.6.1. The Initial Reliability Analysis of System Reconfigurability

Interface Reconfigurability (alpha = .9133)	
Measurement Items	Corrected Item-Total Correlation
LITF1	.8064
LITF2	.8561
LITF3	.7841
LITF4	.7521
LITF5	.7070

Interaction Reconfigurability (alpha = .9009)	
Measurement Items	Corrected Item-Total Correlation
LIRR1	.7934
LIRR2	.7828
LIRR3	.8032
LIRR4	.7697
LIRR5	.6356

Content Reconfigurability (alpha = .8522)	
Measurement Items	Corrected Item-Total Correlation
LCTR1	.7343
LCTR2	.6341
LCTR3	.7484
LCTR4	.6287
LCTR5	.5971

Structure Reconfigurability (alpha = .8660)	
Measurement Items	Corrected Item-Total Correlation
LSTR1	.7393
LSTR2	.7553
LSTR3	.7119
LSTR4	.6627

Modularity Design (alpha = .9075)	
Measurement Items	Corrected Item-Total Correlation
LMD1	.8107
LMD2	.7884
LMD3	.8375
LMD4	.7294

Table 4.6.2. Factorial Analysis Results of System Reconfigurability during the Large-Scale Study

Pattern Matrix

	Component				
	1	2	3	4	5
LIRR4	.904				
LIRR3	.871				
LIRR1	.820				
LIRR2	.780				
LIRR5	.678				
LITF1		.909			
LITF2		.908			
LITF3		.843			
LITF4		.774			
LITF5		.730			
LMD3			-.907		
LMD1			-.860		
LMD2			-.850		
LMD4			-.792		
LCTR1				-.767	
LCTR2				-.756	
LCTR3				-.712	
LCTR4				-.699	
LCTR5				-.645	
LSTR1					-.812
LSTR2		.327			-.687
LSTR4					-.684
LSTR3					-.628

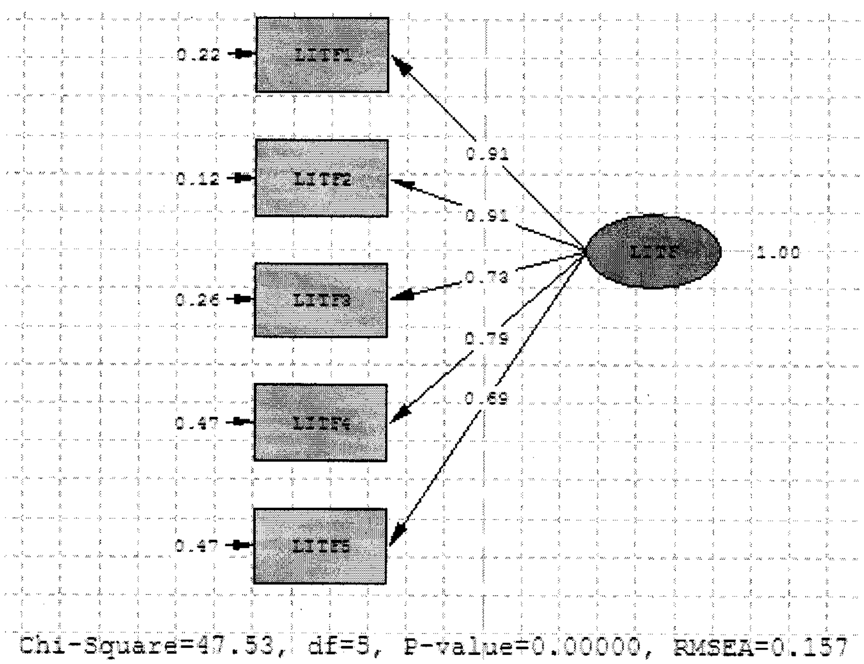
Component Correlation Matrix

Component	1	2	3	4	5
1. Interface Reconfigurability	1				
2. Interaction Reconfigurability	.346**	1			
3. Content Reconfigurability	.383**	.569**	1		
4. Structure Reconfigurability	.586**	.420**	.527**	1	
5. Modularity Design	.420**	.484**	.498**	.512**	1

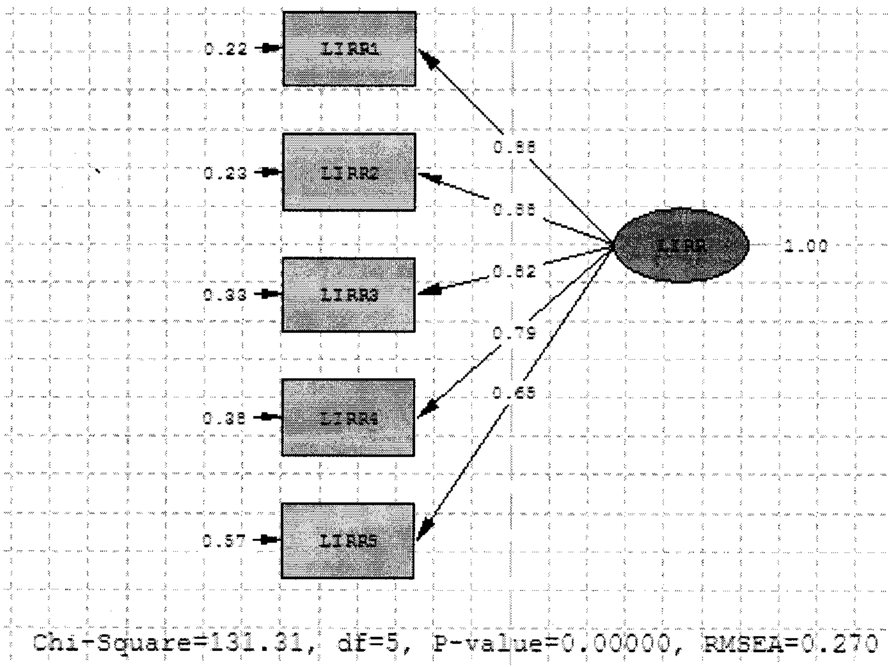
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4.3.1 The Initial Measurement Results of System Reconfigurability

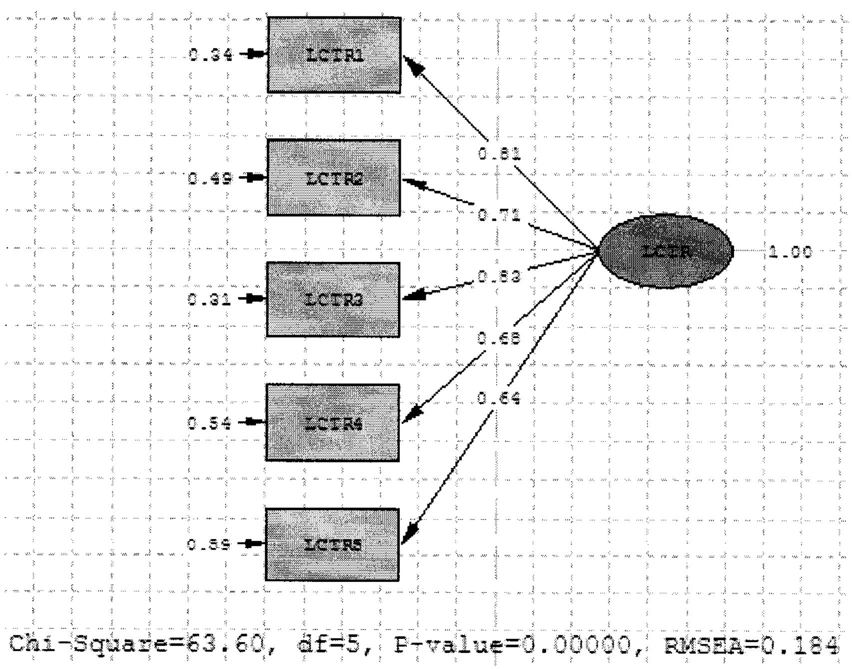
Interface Reconfigurability



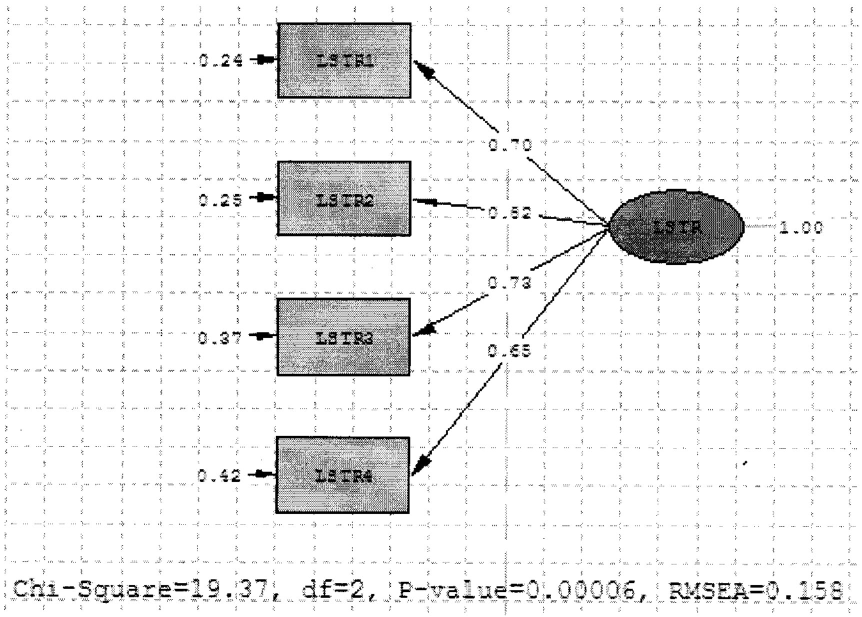
Interaction Reconfigurability



Content Reconfigurability



Structure Reconfigurability



Modularity Design

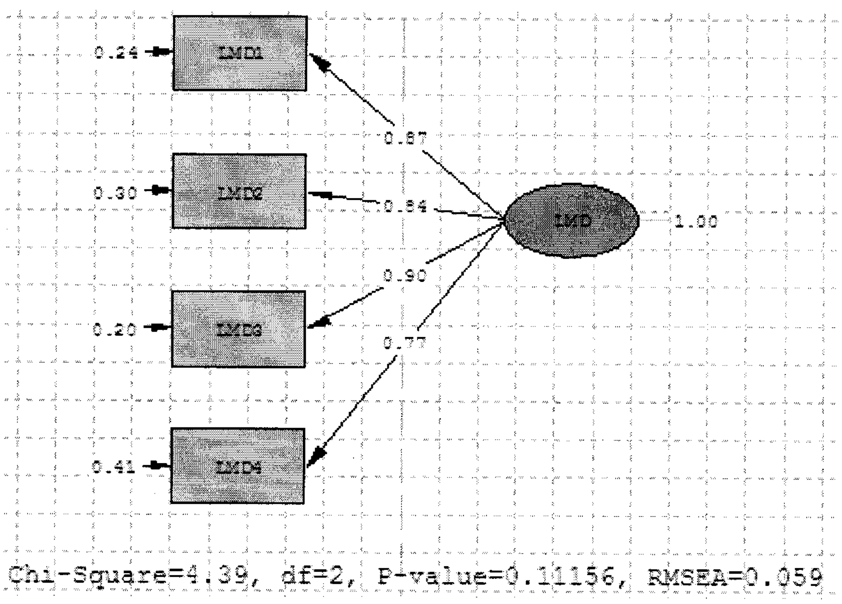
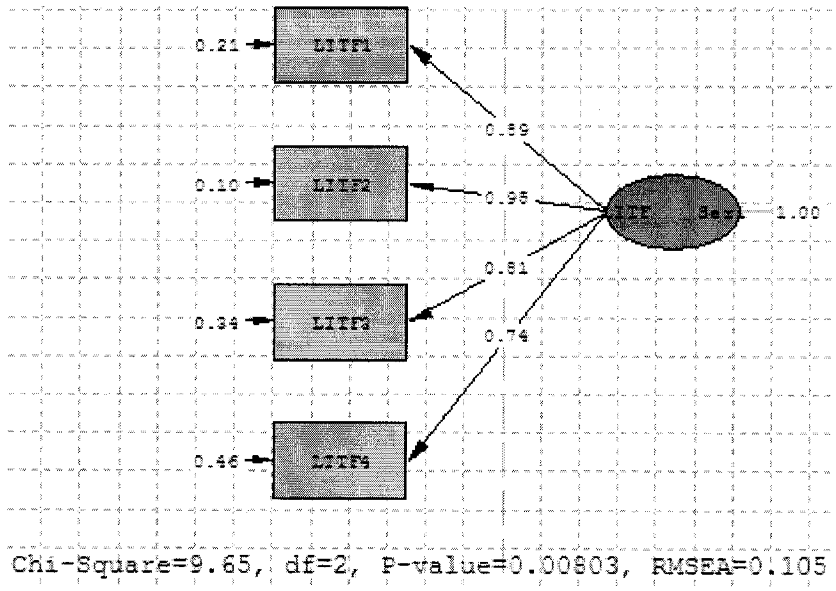
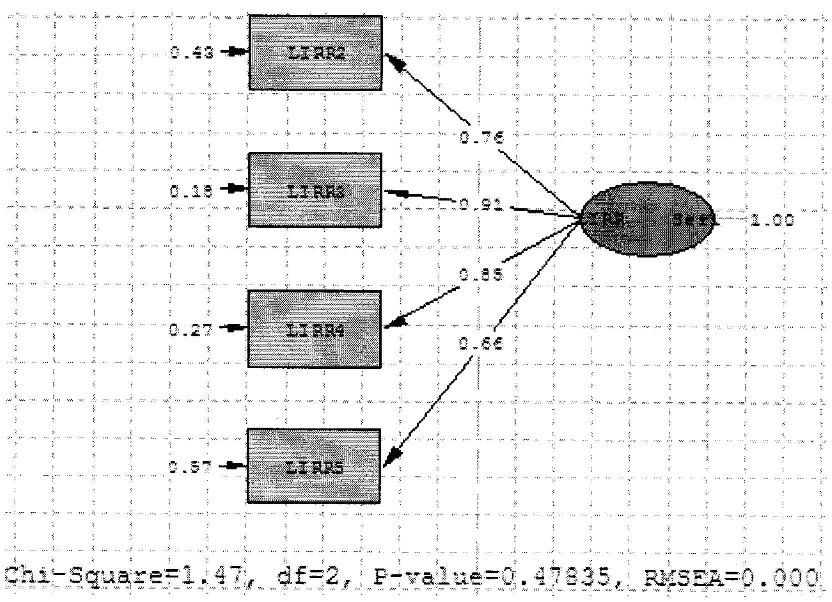


Figure 4.3.2 The Alternative Measurement Solutions for System Reconfigurability

Interface Reconfigurability



Interaction Reconfigurability



Content Reconfigurability

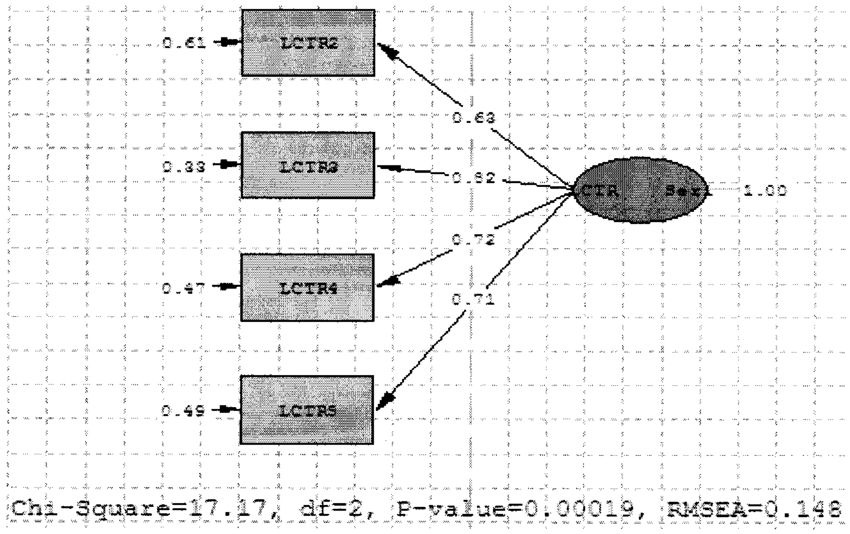


Figure 4.3.3. Second-order Factor Measurement Model of System Reconfigurability

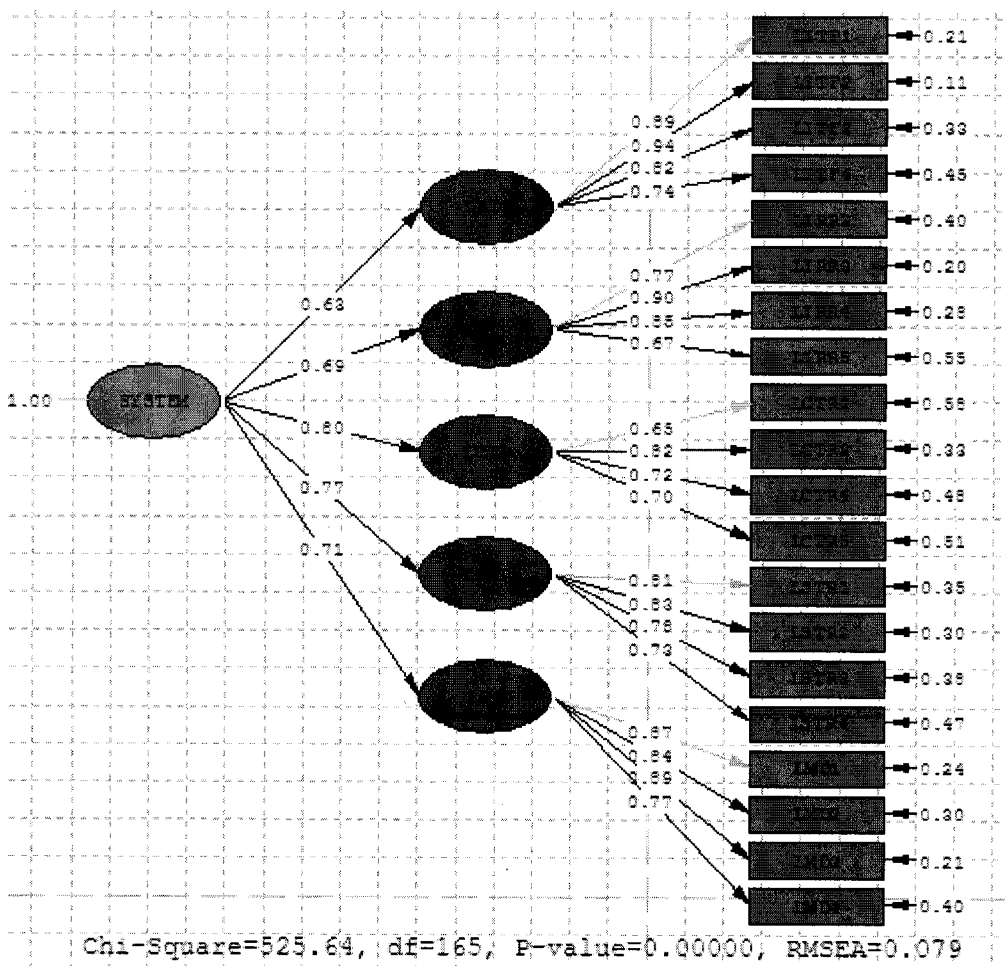


Table 4.6.3. Measurement Scales of System Reconfigurability Recommended for Future Studies (20 items)

Label	CITC	Item Description
		Interface Reconfigurability (alpha = .9082)
		This software enables me to
LITF1	.8152	personalize the look and feel of the homepage.
LITF2	.8688	have some control over the appearance of the homepage.
LITF3	.7864	edit course homepage.
LITF4	.7158	Modify icon on the course homepage.
		Interaction Reconfigurability (alpha = .8711)
		This software enables me to
LIRR2	.7062	use various tools (e.g. message, discussion board, chat room) to interact with students.
LIRR3	.8123	use various tools to help students to interact with each other.
LIRR4	.7699	set up forums around different topics.
LIRR5	.6244	have choices to activate interactive tools for interested students.
		Content Reconfigurability (alpha = .8022)
LCTR2	.5458	This software provides various ways to manage files.
LCTR3	.7090	This software provides many choices to deliver course content efficiently (e.g. single page, email, discussion, attachment).
LCTR4	.6236	This software enables me to add course content to my course at any stage of the course design process.
LCTR5	.6160	This software enables me to add various types of files (e.g. images, Flashes, audio).
		Structure Reconfigurability (alpha = .8660)
		This software enables me to

LSTR1	.7062	The software enables me to change navigation format.
LSTR2	.8123	This software enables me to modify the layout of the webpage.
LSTR3	.7699	This software enables me to organize pages.
LSTR4	.6244	This software enables me to let students access associated course resources through different links.
		Modularity Design (alpha = .9075)
		This software enables me to
LMD1	.8107	use Module (or Unit) Design (that is a self-contained package like quizzes, assignments, etc.).
LMD2	.7884	use built-in navigation links.
LMD3	.8375	incorporate Modules (or Units) into course design.
LMD4	.7294	use optional interactive tools.

Table 4.8.1. The Initial Reliability Analysis of Support

Vendor Support (alpha = .9060)	
Measurement Items	Corrected Item-Total Correlation
LVSU1	.7747
LVSU2	.8387
LVSU3	.8458
LVSU4	.7968
LVSU5	.6074

Organization Support (alpha = .8226)	
Measurement Items	Corrected Item-Total Correlation
LOSU1	.5787
LOSU2	.6491
LOSU3	.6782
LOSU4	.6951

Collegial Support (alpha = .9226)	
Measurement Items	Corrected Item-Total Correlation
LCSU1	.8112
LCSU2	.8640
LCSU3	.8575

Table 4.8.2. Factorial Analysis of Support during the Large-Scale study

Pattern Matrix

	Component		
	1	2	3
LOSU3	.865		
LOSU4	.835		
LOSU2	.768		
LOSU1	.742		
LVSU2		-.921	
LVSU3		-.917	
LVSU4		-.882	
LVSU1		-.867	
LVSU5		-.708	
LCSU1			-.958
LCSU2			-.907
LCSU3			-.906

Component Correlation Matrix

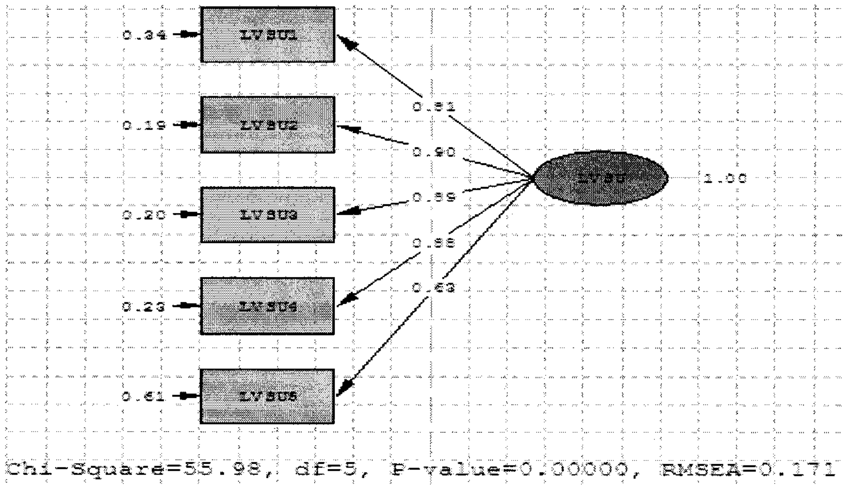
Component	1	2	3
1. Vendor Support	1		
2. Organizational Support	.117	1	
3. Collegial Support	.247**	.530**	1

*. Correlation is significant at the 0.05 level (2-tailed).

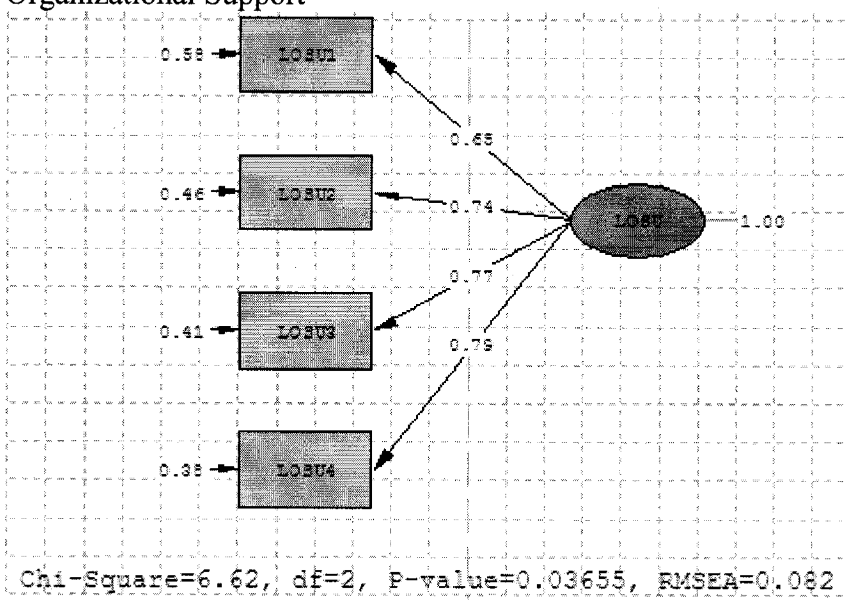
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4.4.1 The Initial Measurement Results of Support

Vendor Support



Organizational Support



Collegial Support

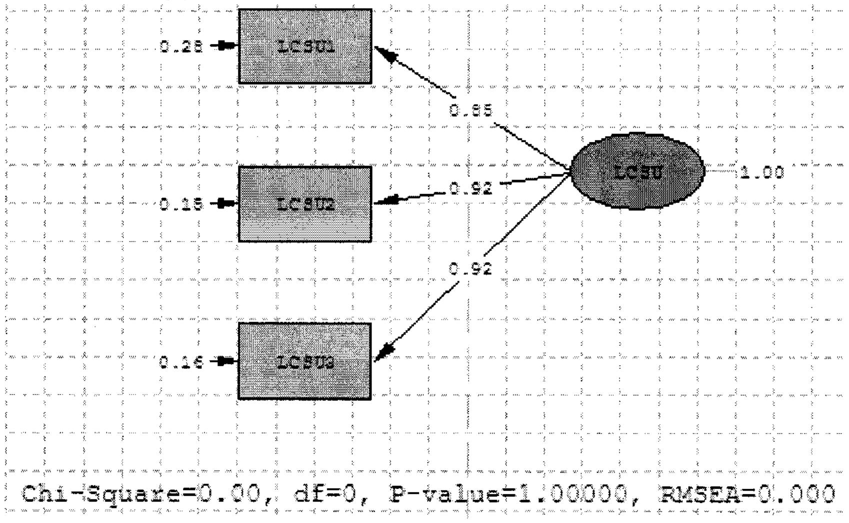


Figure 4.4.2 The Alternative Measurement Solution for Vendor Support

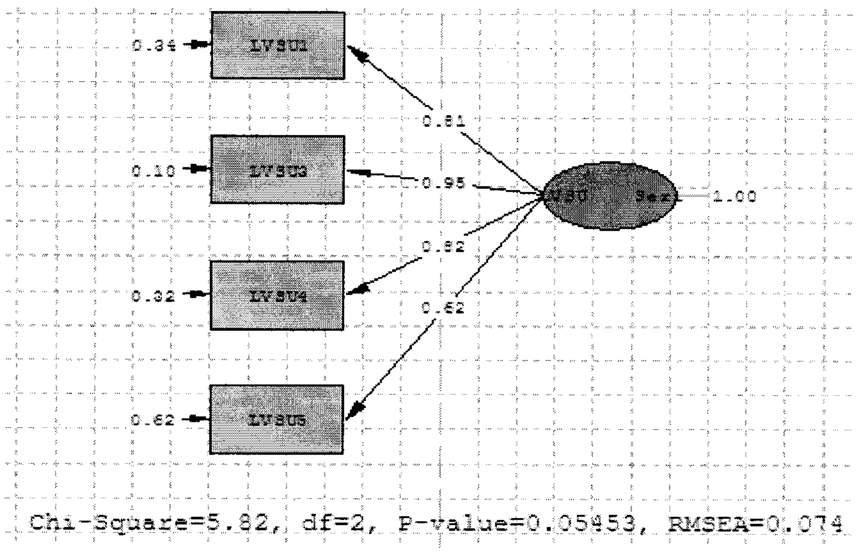


Figure 4.4.3. The Second-order Factor Measurement Model for Support

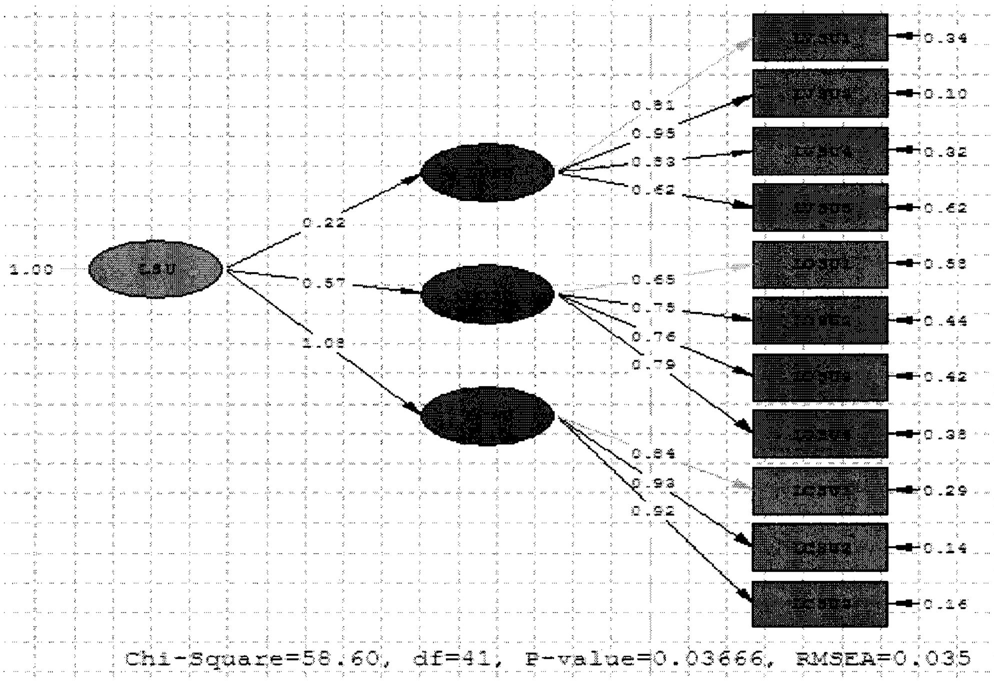


Table 4.8.3. Measurement Scales of Support Recommended for Future Studies (20 items)

Label	CITC	Item Description
		Vendor Support (alpha = .8712)
LVSU1	.7564	When I need help, I may turn to vendor's tool free telephone number.
LVSU3	.8329	When I encounter problems, I may get help from the vendor via email.
LVSU4	.7426	When I have questions, I may get help from the vendor via email.
LVSU5	.5985	The software vendor has provided most of the help and resources necessary to get us used to the software.
		Organizational Support (alpha = .8226)
LOSU1	.5787	I am supported and encouraged by my organization to use this software in my job.
LOSU2	.6491	The training provided by my organization helped me get familiar with this software.
LOSU3	.6782	My organization technicians helped me solve the problem in the application.
LOSU4	.6951	My organization is really keen to see that we are happy with using this software.
		Collegial Support (alpha = .9226)
		When I have difficulty in using the software, I can
LCSU1	.8112	exchange information with others who know how to better
LCSU2	.8640	talk to other people who are more knowledgeable.
LCSU3	.8575	discuss with others who know how to make better use of the software for this application.

Table 4.9.1. The Initial Reliability Analysis of Psychological Empowerment

Autonomy (alpha = .8791)	
Measurement Items	Corrected Item-Total Correlation
LAUT1	.6995
LAUT2	.8202
LAUT3	.7902

Self-efficacy (alpha = .8806)	
Measurement Items	Corrected Item-Total Correlation
LSEF1	.8205
LSEF2	.8170
LSEF3	.7176

Intrinsic Motivation (alpha = .9664)	
Measurement Items	Corrected Item-Total Correlation
LINM1	.9185
LINM2	.9567
LINM3	.9090

Perceived Consequence (alpha = .9468)	
Measurement Items	Corrected Item-Total Correlation
LPCC1	.8514
LPCC2	.9165
LPCC3	.9004

Table 4.9.2. Factorial Analysis Results of Psychological Empowerment during the Large-Scale Study

Pattern Matrix

	Component			
	1	2	3	4
LINM2	.993			
LINM1	.974			
LINM3	.858			
LAUT2		.972		
LAUT3		.930		
LAUT1		.720		
LSEF1			-.929	
LSEF3			-.902	
LSEF2			-.876	
LPCC2				.953
LPCC3				.945
LPCC1				.940

Component Correlation Matrix

Component	1	2	3	4
1. Intrinsic Motivation	1			
2. Self-efficacy	.513**	1		
3. User Autonomy	.519**	.499**	1	
4. Perceived Consequences	.635**	.384**	.373**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4.5 The Second-order Factor Measurement Model of Psychological Empowerment

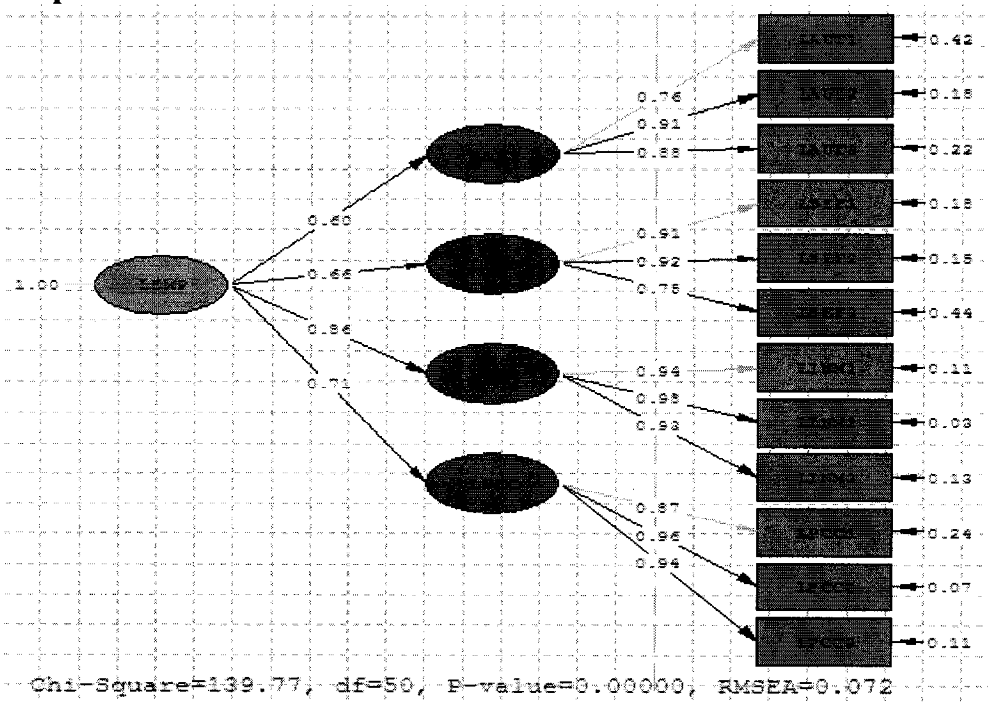


Table 4.10.1. The Initial Reliability Analysis of Usage Patterns

Communication & Collaboration (alpha = .8740)	
Measurement Items	Corrected Item-Total Correlation
LCAC1	.5758
LCAC2	.6826
LCAC3	.6831
LCAC4	.8036
LCAC5	.7769

Class Management (alpha = .8306)	
Measurement Items	Corrected Item-Total Correlation
LCLM1	.5890
LCLM2	.5325
LCLM3	.7341
LCLM4	.6448
LCLM5	.6480

Content Management (alpha = .8397)	
Measurement Items	Corrected Item-Total Correlation
LCTM1	.5963
LCTM2	.6687
LCTM3	.6484
LCTM4	.6907
LCTM5	.6636

Assessment (alpha = .8651)	
Measurement Items	Corrected Item-Total Correlation
LASS1	.8505
LASS2	.8450
LASS3	.7266
LASS4	.4615

Table 4.10.2. Factorial Analysis Results of Usage Patterns during the Large-Scale Study

Pattern Matrix

	Component			
	1	2	3	4
LCAC5	.879			
LCAC4	.864			
LCAC2	.828			
LASS4	.592		-.390	
LCAC3	.439			.384
LCTM3		.856		
LCTM4		.812		
LCTM1		.766		
LCTM2		.717		
LCTM5		.624		
LASS3			-.727	
LASS2			-.652	
LASS1			-.639	
LCLM4				.805
LCLM5				.796
LCLM3				.702
LCLM1				.682
LCLM2				.528
LCAC1		.321		.351

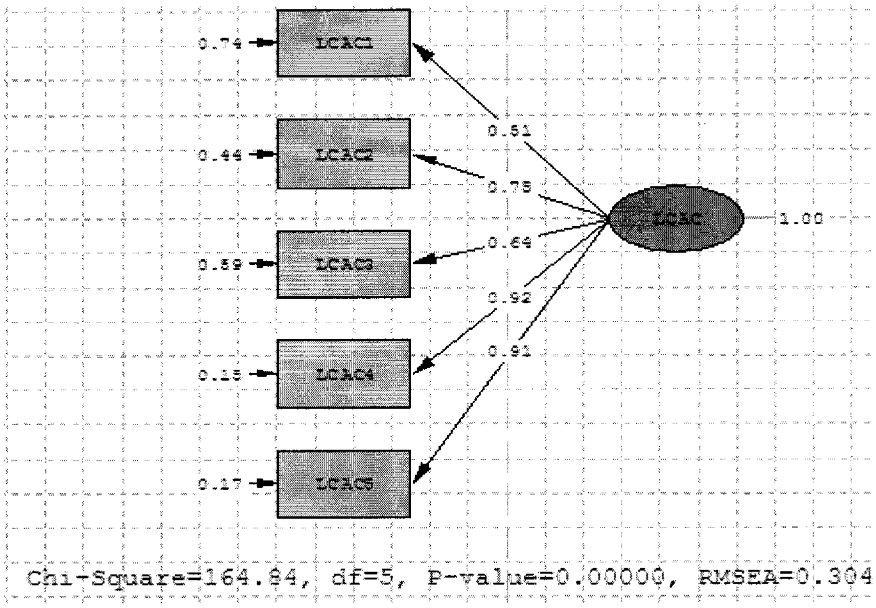
Component Correlation Matrix

Component	1	2	3	4
1. Communication & Collaboration	1			
2. Class Management	.945**	1		
3. Content Management	.521**	.529**	1	
4. Assessment	.542**	.549**	.512**	1

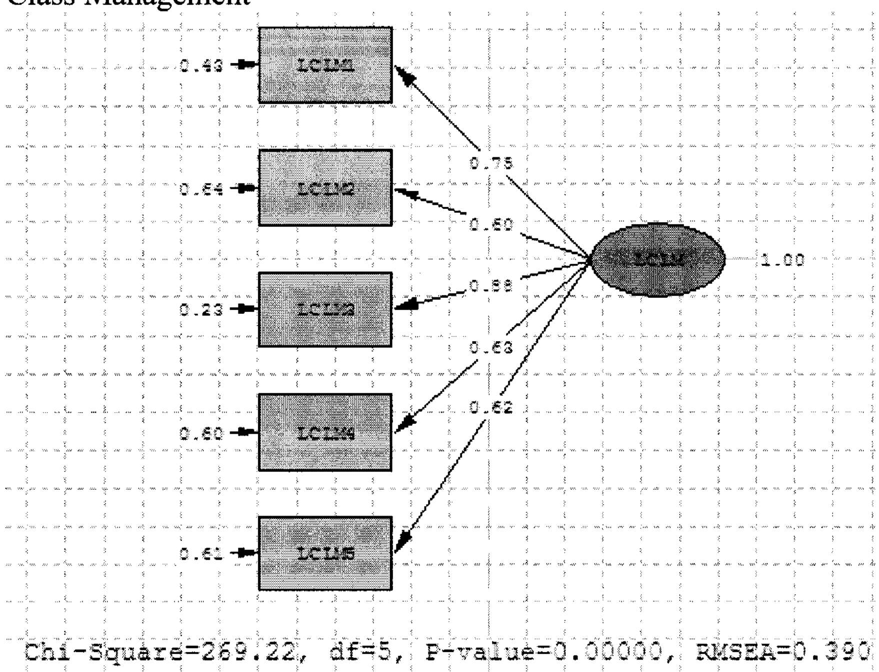
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4.6.1. The Initial Measurement Results of Usage Patterns

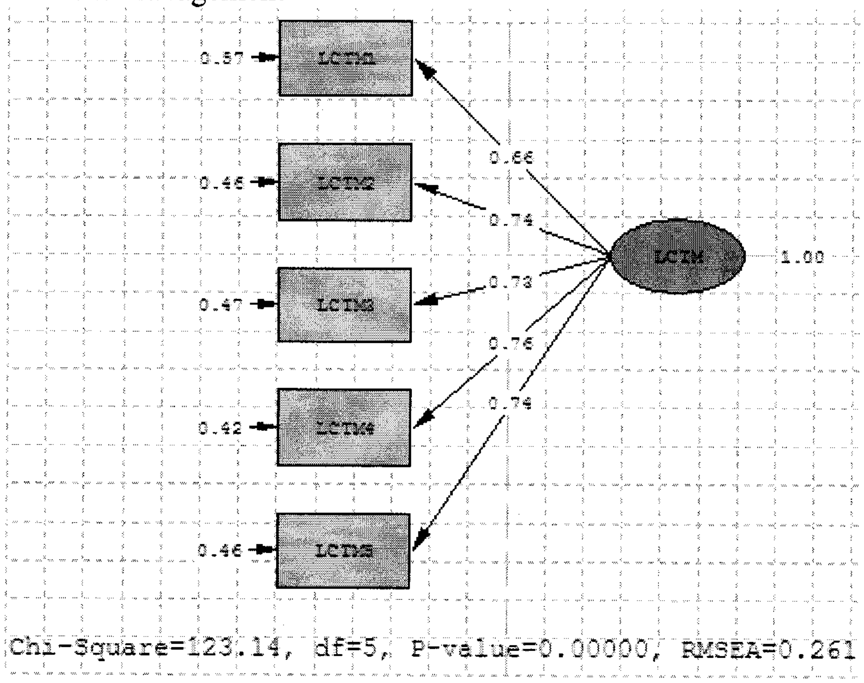
Communication and Collaboration



Class Management



Content Management



Assessment

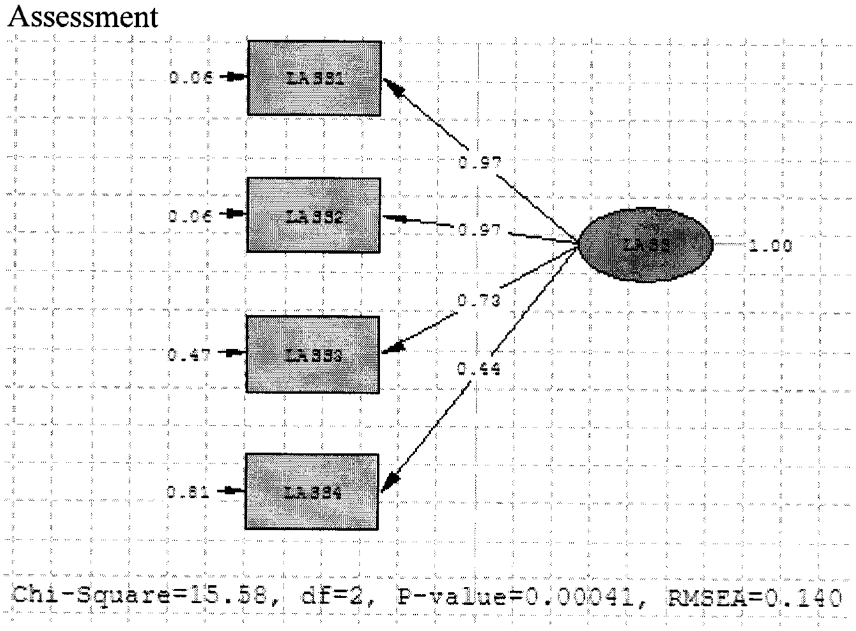
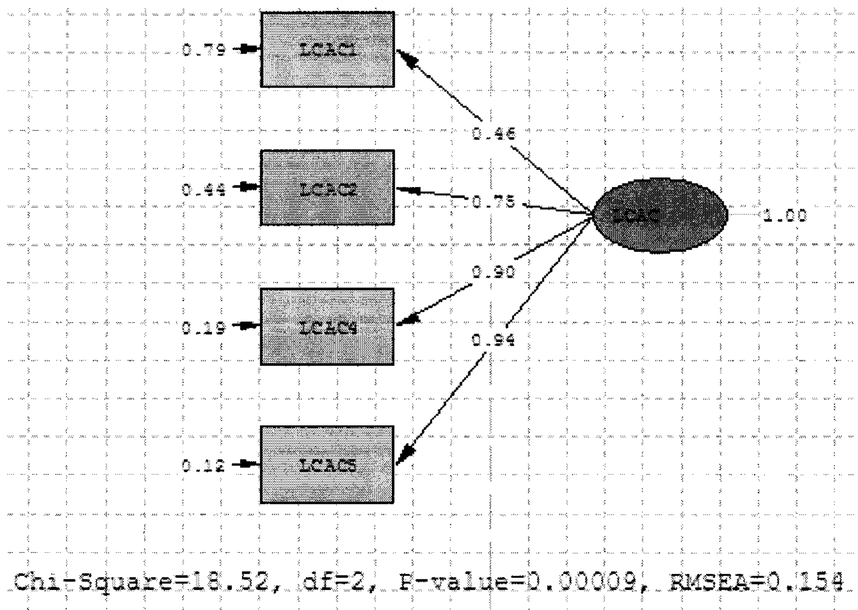
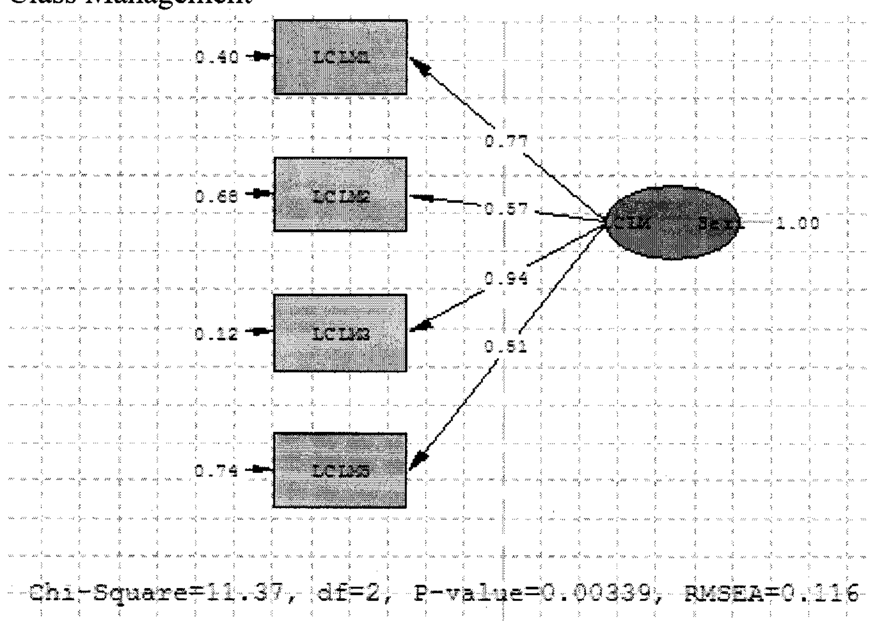


Figure 4.6.2. The Alternative Measurement Solutions for Usage Patterns for Future Studies

Communication and Collaboration



Class Management



Content Management

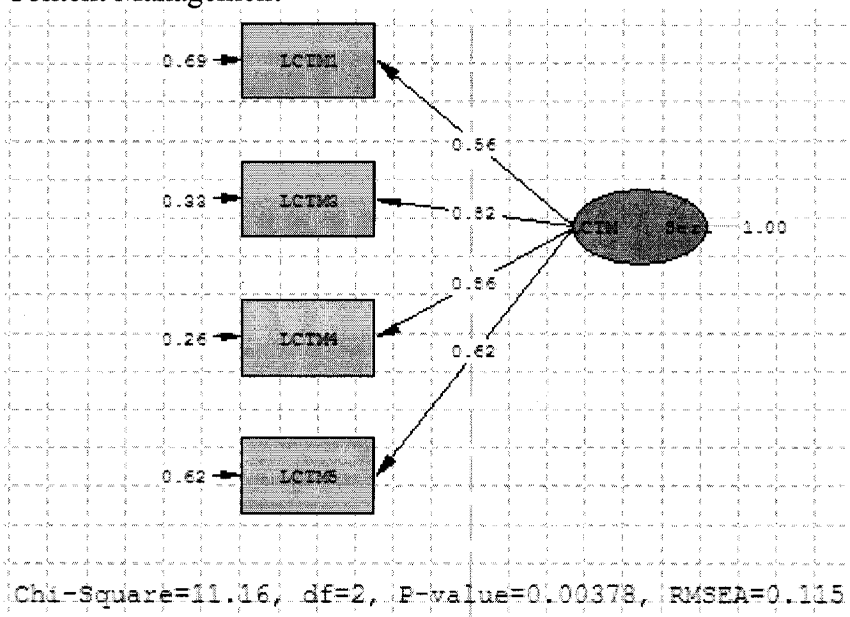


Figure 4.6.3. The Second-order Factor Measurement Model of Usage Patterns

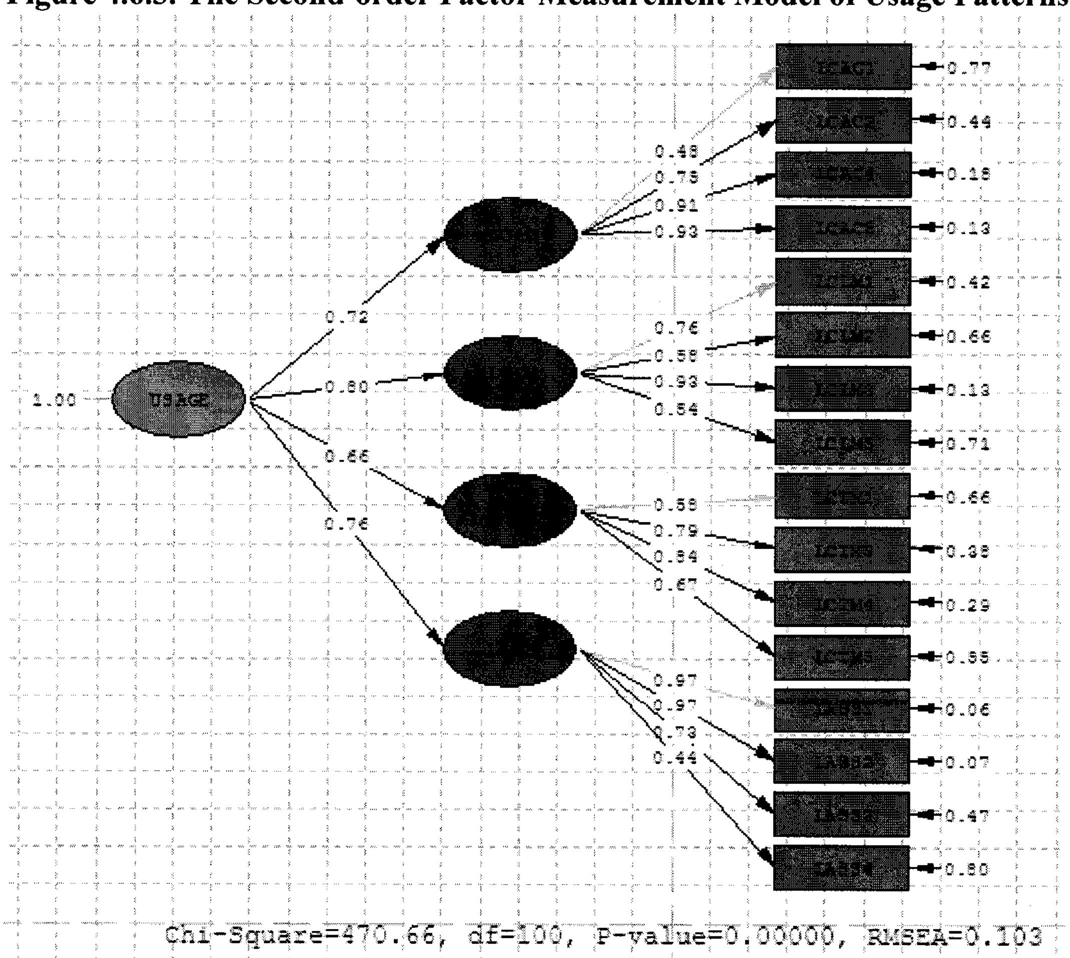


Table 4.10.3. Measurement Scales of Usage Patterns Recommended for Future Studies (15 items)

Label	CITC	Item Description
		Communication and Collaboration (alpha = .8519)
		I use the software to help
LCAC1	.4607	students communicate with each other.
LCAC2	.7100	me communicate with my students.
LCAC4	.8082	students communicate with each other.
LCAC5	.8138	students collaborate with each other.
		Class Management (alpha = .7920)
		I use this software to
LCLM1	.6412	help track number of students' hit on a page.
LCLM2	.5508	permit my students get access to a specific webpage.
LCLM3	.7560	track students' participation.
LCLM5	.4706	help students track progress.
		Content Management (alpha = .8008)
		I use this software to
LCTM1	.5349	make my course materials available to students.
LCTM3	.6829	backup and restore course content.
LCTM4	.7205	help share the course content with other faculty.
LCTM5	.5782	create online course content.
		Assessment (alpha = .8651)
		I use this software to

LASS1	.8505	assess my students' understanding of the course material.
LASS2	.8450	assess my students' mastering of the course material.
LASS3	.7266	help students take self test.
LASS4	.4615	help students evaluate other group members' performance.

Table 4.11.1. The Initial Reliability Analysis of Benefits

Benefits (alpha = .8920)	
Measurement Items	Corrected Item-Total Correlation
LBE1	.8271
LBE2	.5878
LBE3	.7611
LBE4	.7634
LBE5	.7752

Table 4.11.2. Factorial Analysis Results of Benefits during the Large-Scale Study

Component Matrix

	Component
	1
LBE1	.902
LBE5	.877
LBE4	.867
LBE3	.850
LBE2	.707

Figure 4.7.1 The Initial Measurement Results of Benefits

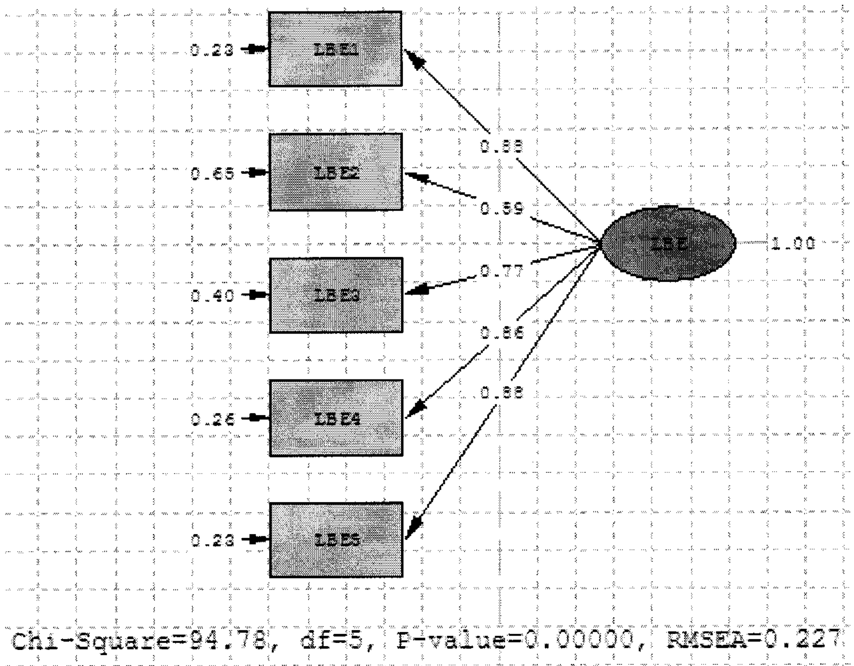


Figure 4.7.2 The Alternative Measurement Results of Benefits

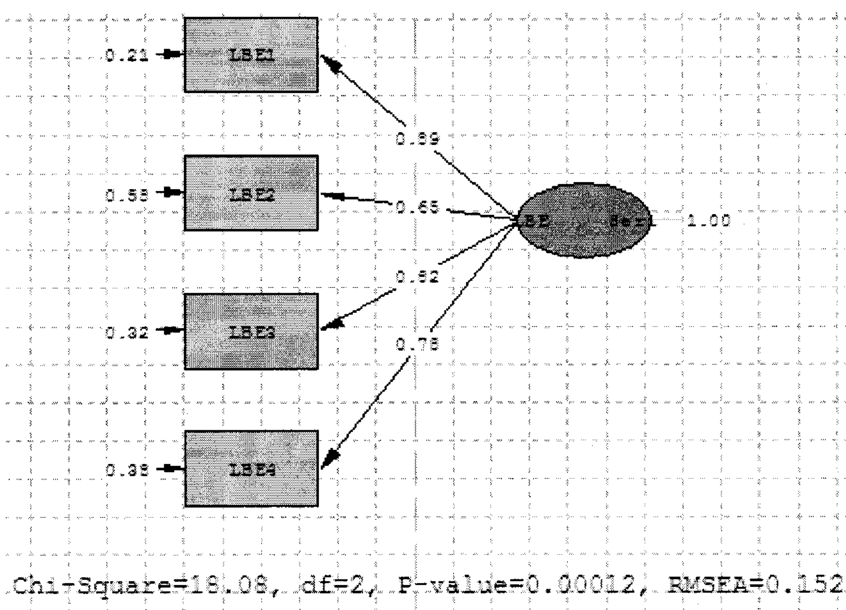


Table 4.11.3. Measurement Scales of Benefits Recommended for Future Studies (4 items)

Label	CITC	Item Description
		alpha = 0.8602
LBE1	.7925	In general, this software enhances my teaching effectiveness.
LBE2	.6030	This software enables me to handle a large class effectively.
LBE3	.7697	This software helps my students to achieve their learning objectives.
LBE4	.6846	This software improves my productivity.

Appendix 3. The Online Survey Used for the Pilot Study

Course Management Systems Survey

Instructions

Dear Faculty Member or Instructional Designer:

The purpose of this study is to explore how instructors and instructional designers use Course Management Systems (e.g. WebCT, Blackboard) in the distance learning environment. The survey seeks to identify specific factors that help instructors use the software more effectively.

This study is being conducted by Mr. Jianfeng Wang of The University of Toledo as part of his dissertation. It is estimated that the survey questions will take you around 20 minutes to complete. Your response will be entered in a coded format and will be strictly confidential. Only group data will be analyzed and reported.

When you complete the survey, please click the "Submit Your Responses" button at the end of the survey. The results will be automatically emailed to Jianfeng Wang.

Thank you for your time and cooperation. I appreciate it very much.

Sincerely,

Jianfeng Wang

Part I. Course Management Systems

1. Please click on the box that best represents which specific software you used in your teaching. Select the one you used most often. In the following sections, the term "this software" refers to your selection of the specific software below.

(Select only one.)

Blackboard
WebCT
eCollege
Other:

Part II. Prior Experience

The following statements enable you to describe your direct participation in using the software in distance learning efforts.
For each statement please fill in an exact number which best describes your situation.

2. I have been using a computer and Internet technology in my teaching for the number of year(s):

(Provide one response only.)

3. I have been using this software in my teaching for the number of year(s):

(Provide one response only.)

4. I have been using this software in my teaching for number of course(s):

(Provide one response only.)

Part III. Course Design

The following statements describe course design goals in distance learning environment.

5. In distance learning, this software helps me encourage contacts between students and faculty.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

6. In distance learning, this software helps me develop collaboration and cooperation among students learning (e.g. team work).

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree

Strongly Agree

7. In distance learning, this software helps me use active learning techniques (e.g. simulation).

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

8. In distance learning, this software helps me give prompt feedback.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

9. In distance learning, this software helps me emphasize time on task.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

10. In distance learning, this software helps me communicate high expectations.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

11. In distance learning, this software helps me respect diverse talents and ways of learning.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part IV. System Re-configurability

The following statements describe the capability of this software in designing learning environment to meet various needs.
*Module (or unit) Design refers to the capability of the software to use a collection of sequentially arranged pages with a table of contents, built-in navigation links, and optional interactive tools.

12. Our online courses use Module (or unit) Design*.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

13. Our online courses use a collection of sequentially arranged pages with a table of contents.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

14. Our online courses use built-in navigation links.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

15. Modules (or units) can be rearranged by users to suit their needs.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

16. Modules (or units) can be incorporated into course design.

(Select only one.)

Strongly Disagree
Disagree

Neutral
Agree
Strongly Agree

17. Our online courses use optional interactive tools.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

On the course homepage, this software enables me to:

18. personalize the look and feel of the homepage.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

19. have some control over the appearance of the homepage.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

20. edit course homepage.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

21. change text style.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

22. modify icon.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

This software provides:

23. a wide range options for the course content.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

24. various ways to manage files.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

25. tabs I can shift from design view to student view so that I can view as a student.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

26. many options for course links.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

27. many choices to deliver course content efficiently (e.g. single page, email, discussion, attachment).

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

This software enables me to:

28. add course content to my course at any stage of the course design process.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

29. add various types of files (e.g. images, Flashes, audio).

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

30. change navigation format.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

31. set sequential viewing for students.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

32. modify the layout of the webpage.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

33. organize pages.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

34. use various tools to contact specific group.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

35. use various tools (e.g. message, discussion board, chat room) to interact with students.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

36. use various tools to help students to interact with each other.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

37. set up multiple forums.

(Select only one.)

Strongly Disagree
Disagree

Neutral
Agree
Strongly Agree

38. set up forums around different topics.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

39. embed forums in appropriate content areas.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

40. let students access associated course resources through different links.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

41. have choices to activate interactive tools for interested students.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part V. Psychological Empowerment

The following statements describe the extent to which the instructors feel confident, competence, discretion, and motivated in using this software.

42. Using this software for online teaching is enjoyable.

(Select only one.)
Strongly Disagree
Disagree

Neutral
Agree
Strongly Agree

43. I see this software as being able to save me time.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

44. I believe I am capable of using this software for my work.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

45. I have considerable choices in how I use this software for online course.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

46. Using this software for online teaching is pleasurable.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

47. I have significant autonomy in determining how I use this software for online course.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

48. I see this software as being able to increase my productivity.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

49. I am confident about my ability to use this software to complete my work.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

50. I have mastered the skills necessary for using this software in my work.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

51. Using this software for online teaching fosters enjoyment.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

52. I have a say in how I use this software for online course.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

53. I see this software as being able to allow me to accomplish more work than would otherwise be possible.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part VI. Support

The following statements describe the extent to which the instructors can rely on other resources to get information to effectively use the software to improve the course.

54. The software vendor has provided most of the help and resources necessary to get us used to the software.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

55. The vendor's Web site forum helps when I have questions.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

56. When I need help in application with my application of this software, I may find answers in the helpdesk provided by the software vendor.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

57. When I need help, I may turn to the vendor's toll free telephone number.

(Select only one.)

Strongly Disagree

Disagree
Neutral
Agree
Strongly Agree

58. When I encounter problems, I may find solutions on the vendor's Web site.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

59. When I encounter problems, I may get help from the vendor via email.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

60. My organization is really keen to see that we are happy with using this software.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

61. I am always supported and encouraged by my organization to use this software in my job.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

62. The training provided by my organization helped me get familiar with this software.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

63. My organizational technicians helped me solve the problem in the application.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

When I have difficulty in using this software, I can:

64. exchange information with others who know how to better use the software for the process.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

65. talk to other people who are more knowledgeable.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

66. discuss with others who know how to make better use of the software for this application.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

VII. Usage Patterns

The following statements describe the patterns of using the software.

I use this software to help:

67. students communicate with each other.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

68. students communicate with the instructor.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

69. students collaborate with each other.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

70. me communicate with my students.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

71. me coordinate student groups.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

72. track number of students' hits on a page.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

73. assign grades.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

74. check my grading.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

75. view student roster.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

76. deny or access a specific webpage.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

77. track students' participation.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent

To Great Extent
To Very Great Extent

78. students track their grades.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

79. students track the status of their assignments.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

80. students track progress.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

81. create online course content.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

82. make my course materials available to students.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

83. deliver online course content.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

84. share the course content with other faculties.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

85. reuse the course content.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

86. backup and restore course content.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

87. assess my students' understanding of the course material.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

88. assess my students' mastering of the course material.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

89. students to take self test.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

90. students evaluate other group members' performance.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

Part VIII. Benefits

The following statements describe the influences this software exerts on individual work and/or organizational performance.

91. In general, this software enhances my teaching effectiveness.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

92. This software enables me to handle a large class effectively.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

93. This software helps my students achieve their learning objectives.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

94. This software improves my teaching quality.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

95. The software improves my productivity.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part VIIII. Demographics

This Section is for statistical purposes. Please be assured that your answers will be kept strictly confidential.

96. Please indicate your role in distance learning:

(Select only one.)

Instructor
Instructional Designer
Other:

97. Your purpose in using the system for:

(Select only one.)

Distance learning course
Web-assisted course
Other:

98. Your title:

(Select only one.)

Professor
Associate Professor
Assistant Professor
Lecturer/Instructor

99. The highest degree you have received:

(Select only one.)

Bachelor
Master
Doctorate

100. Please indicate the College(s) in which online course(s) you taught:

(Provide one response only.)

101. Please indicate the number of year(s) you have been using the computer:

(Provide one response only.)

If you don't like to answer any question below, just randomly type any letter in each box.

102. Your Full Name:

(Provide one response only.)

103. Your Email Address:

(Provide one response only.)

Thank you for your participation. Please do not forget to click on the submission button below!!!

Appendix 4. The Online Survey Used for the Large-Scale Study

Course Management Systems Survey

Instructions

Dear Faculty Member, Instructor or Instructional Designer:

The study in which you are about to participate explores how faculty members, instructors and instructional designers use Course Management Systems (e.g. WebCT, Blackboard, Angel, etc) in the distance learning environment. The survey seeks to identify specific factors that help instructors use the software more effectively.

We estimated that the survey questions will take you around 15 minutes to complete. For most answers, please check the boxes most applicable to you or fill in the blanks. Your response will be entered in a coded format and will be strictly confidential. Only group data will be analyzed and reported.

When you complete the survey, please click the "Submit Your Responses" button at the end of the survey. The results will be automatically emailed to Jianfeng Wang.

Thank you for your time and cooperation. I appreciate it very much.

Sincerely,

Jianfeng Wang

Part I. Course Management Systems

1. Please click on the radio button that best represents which specific software you used in your teaching. Select the only one you used most often or you are using currently. In the following sections, the term "this software" refers to your selection of the specific software below.

(Select only one.)

Blackboard
WebCT
Angel
eCollege
Other-only one:

Part II. Prior Experience

The following statements enable you to describe your direct participation in using the software in distance learning efforts.

2. I feel that I am an experienced user of the Internet.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

3. I feel that I am an experienced user of this software.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

4. I have been using this software in my teaching for many years.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

5. I have been using this software in my teaching for many courses.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part III. Course Design

The following statements describe course design objectives in distance learning environment.

In distance learning, this software helps:

6. me encourage contacts between students and faculty.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

7. me develop collaboration and cooperation among students.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

8. me use active learning techniques (e.g. simulation).

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

9. me provide feedback to students frequently and quickly.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

10. students complete task in a timely manner.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

11. me communicate high expectations.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

12. respect diverse talents and ways of learning.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part IV. System Reconfigurability

The following statements describe the capability of this software in designing learning environment to meet various needs.

Interface Reconfigurability

This software enables me to:

13. personalize the look and feel of the course homepage.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

14. have some control over the appearance of the course homepage.

(Select only one.)

Strongly Disagree

Disagree
Neutral
Agree
Strongly Agree

15. edit course homepage.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

16. modify icon on the course homepage.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

17. change text font, size, and other style on the course homepage.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Interaction Reconfigurability
This software enables me to

18. use various tools (e.g. message, discussion board, chat room) to contact specific group.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

19. use various tools (e.g. message, discussion board, chat room) to interact with students.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

20. use various tools to help students interact with each other.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

21. set up forums around different topics.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

22. have choices to activate interactive tools for interested students.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Content Reconfigurability

23. This software provides a wide range options for the course content.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

24. This software provides various ways to manage files.

(Select only one.)
Strongly Disagree
Disagree
Neutral

Agree
Strongly Agree

25. This software provides many choices to deliver course content efficiently (e.g. Webpage, link to file, email, discussion board, attachment).

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

26. This software enables me to add course content to my course at any stage of the course design process.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

27. This software enables me to add various types of files (e.g. PDF, PowerPoint, images, Flashes, audio).

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Structure Reconfigurability
This software enables me to

28. change navigation format.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

29. modify the layout of the webpage.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

30. organize pages.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

31. let students access associated course resource through different entries.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Modularity Design

*Module (or unit) Design refers to the capability of the software to use a collection of sequentially arranged pages with a table of contents, built-in navigation links, and optional interactive tools.

This software enables me to:

32. use Module (or Unit) Design (that is a self-contained package like quizzes, assignments, etc.).

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

33. use built-in navigation links.

(Select only one.)

Strongly Disagree

Disagree
Neutral
Agree
Strongly Agree

34. incorporate Modules (or Units) into course design.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

35. use optional interactive tools.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part V. Support

The following statements describe the extent to which the instructors can rely on other resources to get information and effectively use the software to improve the course.

36. When I need help, I may turn to the vendor's toll free telephone number.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

37. When I encounter problems, I may find solutions on the vendor's Web site.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

38. When I encounter problems, I may get help from the vendor via email.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

39. When I have questions, I may find answers from the vendor's Web site forum.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

40. The software vendor has provided most of the help and resources necessary to get us used to the software.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

41. I am supported and encouraged by my organization to use this software in my job.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

42. The training provided by my organization helped me get familiar with this software.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

43. My organizational technicians helped me solve the problem in the application.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

44. My organization is really keen to see that we are happy with using this software.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

When I have difficulty in using this software, I can:

45. exchange information with others who know how to better use the software for the process.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

46. talk to other people who are more knowledgeable.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

47. discuss with others who know how to make better use of the software for this application.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree

Strongly Agree

Part VI. Psychological Empowerment

The following statements describe the extent to which the instructors feel confident, competence, discretion, and motivated in using this software.

48. I have considerable choices in how I use this software for online course.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

49. I have significant autonomy in determining how I use this software for online course.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

50. I have a say in how I use this software for online course.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

51. I am confident about my ability to use this software to complete my work.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

52. I believe I am capable of using this software for my work.

(Select only one.)

Strongly Disagree

Disagree
Neutral
Agree
Strongly Agree

53. I have mastered the skills necessary for using this software in my work.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

54. Using this software for online teaching is enjoyable.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

55. Using this software for online teaching is pleasurable.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

56. Using this software for online teaching fosters enjoyment.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

57. I see this software as being able to save me time.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

58. I see this software as being able to increase my productivity.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

59. I see this software as being able to allow me to accomplish more work than would otherwise be possible.

(Select only one.)
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

VII. Usage Patterns

The following statements describe the patterns of using the software.

Communication & Collaboration

I use this software to help:

60. me communicate with my students.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

61. me coordinate student groups.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

62. students communicate with me.

(Select only one.)
To No Extent
To Little Extent

To Moderate Extent
To Great Extent
To Very Great Extent

63. students communicate with each other.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

64. students collaborate with each other.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

Class Management
I use this software to:

65. track the number of students' hits on a page.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

66. permit my students to get access to a specific webpage.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

67. track students' participation.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent

To Great Extent
To Very Great Extent

68. help students track the status of their assignments.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

69. help students track progress.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

Content Management
I use this software to

70. make my course materials available to students.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

71. deliver online course content.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

72. backup and restore course content.

(Select only one.)
To No Extent
To Little Extent
To Moderate Extent
To Great Extent

To Very Great Extent

73. reuse the course content.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

74. create online course content.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

Assessment
I use this software to

75. assess my students' understanding of the course material.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

76. assess my students' mastery of the course material.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

77. help students take self-tests.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

78. help students evaluate the performance of other group members.

(Select only one.)

To No Extent
To Little Extent
To Moderate Extent
To Great Extent
To Very Great Extent

Part VIII. Benefits

The following statements describe the influences this software exerts on individual work.

79. In general, this software enhances my teaching effectiveness.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

80. This software enables me to handle a large class effectively.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

81. The software improves my productivity.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

82. This software helps my students achieve their learning objectives.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

83. This software improves my students' learning.

(Select only one.)

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Part VIIII. Demographics

This section is for statistical purposes. Please be assured that your answers will be kept strictly confidential.

84. Please indicate your role in distance learning: (Note: Instructional Designer refers to a staff who works in distance or eLearning department to assist instructors in online course design)

(Select only one.)

Faculty or Instructor
Instructional Designer
Both faculty and instructional designer
Other:

85. Please identify your status as:

(Select only one.)

Full-time
Part-time
Other:

86. Please indicate your purpose in using the system for: (Web-assisted course is taught in the traditional face to face classroom setting and utilizes the Web to enhance delivery of the course content)

(Select only one.)

Distance learning course
Web-assisted course
Both distance learning and Web-assisted courses
Other:

87. Please indicate your title:

(Select only one.)

Professor
Associate Professor
Assistant Professor
Lecturer/Instructor
Other:

88. Please indicate the highest degree you have received:

(Select only one.)

Doctorate
Master
Bachelor

89. Please indicate the institution you belong to:

(Select only one.)

Bowling Green State University
Columbus State Community College
Lorain County Community College
Union Institute and University
University of Cincinnati
University of Dayton
University of Toledo
Ohio State University
The University of Akron
Youngstown State University
Other:

90. Please indicate the subject matter of course(s) you taught:

(Select only one.)

Arts and Humanities
Business Administration
Education
Engineering
Health and Human Services
Law
Nursing
Pharmacy
Physical Sciences
Social Sciences
Other:

91. Please indicate your gender:

(Select only one.)

Female
Male

92. Please indicate your age group:

(Select only one.)

Under 21
21 - 30
31 - 40
41 - 50

51 - 60
Over 60

Thank you for your participation. Please do not forget to click on the submission button below!!!