Chapter 3
Cognitive Mapping Decision Support for the Design of Web-Based Learning Environments

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ABSTRACT
There is much interest in the study of online learning in higher education. Student beliefs towards online learning may influence intentions and ultimately performance. Many studies have flaws in their research design and fall short in providing useful insight for decision making. In this regard, the need for developing practical e-learning implementation framework(s) is crucial. The main objective of this study is to employ the cognitive map technique to causal relationships among belief factors, and investigating various impact chains via simulations. The authors identify optimal e-learning design and implementation, while a partial least squares approach was performed to validate the proposed research model anchored in the Technology Acceptance Model. A survey was carried out and data were collected from 102 respondents. The proposed research model was tested and subsequent cognitive mapping simulations were performed. This study provides designers, instructors and decision makers an approach by which they can identify relevant factors for design, implementation and maintenance.

INTRODUCTION
The first decade of the 21st century has seen a continuously increasing rate in courses offered via the Internet. The Internet is being marketed as the effective vehicle for teaching and learning. And with the global nature of the Internet, teaching and learning technologies can reach the mass audience. There is a vast amount of courses, degrees and certificate programs offered on the Internet by accredited and non-accredited universities and colleges worldwide. This significant pressure from the “education industry” has been felt by the traditional universities since 1996, and
challenged them to redefine and restructure their strategies for their higher education environment. As a result, higher education institutions are setting up their own Internet based “virtual” campuses (Zeynep, 1999).

Internet-supported and fully-Internet courses in higher education institutions are common nowadays. The main objective of web based course environments is to enhance learning experiences and improve learning outcomes. In the past, students’ perceptions on web based learning environments were mixed. While web based environments provided flexibility in time, space and distance and was well received by students in general (Eklund & Eklund, 1996), many students reported feeling a sense of isolation, a lack of motivation, or a lack of support and feedback. These emotions were found to lead students to drop out of web courses.

Researchers in online learning have usually focused on online versus face-to-face, student and teacher attitudes, student and teacher perceptions and reports on online course design studies (Sunal et al., 2003). From all those studies, it was evident that there are mixed attitudes and perceptions about online courses and online tools to assist in the learning process. Results from many studies indicated that students need more direction, coaching and course structure. In general, student’s perceptions concerning the effectiveness of online delivery method were positive and their attitude was that they appreciated the learning tools provided. In the end, all researchers concluded by expressing the great potential of the online learning approach. All the research work had weak theoretical foundation (Sunal et al., 2003), if any at all, and was descriptive and qualitative in nature. Designing, developing and maintaining online learning tools properly according to the changes in users’ learning needs and beliefs should be strictly based on rigorous research frameworks.

Regardless of the extent of failures or successes in running web-based courses (as part of the course or completely online without instructor intervention), the opportunity now exists to look more closely at the effectiveness of a web-based learning environment. However, since the web is a new medium (for developers, instructors and students alike) for course delivery and learning, it is not well known what factors in the online environment contribute more to students’ perceived learning. As the exponential growth of online courses continue to impact students, it is imperative that we gain a better understanding in the design of online learning environments to improve instruction and students’ learning (Jiang & Ting, 2000).

Our research problem addressed in this paper is to provide a theoretically sound methodology for adjusting the design components of an online learning environment, in line with changes in students’ learning needs. The study utilizes a partial least squares (PLS) modeling approach to link the cognitive map simulations design variables.

The response to online learning environments may depend on demographics, nature of course, level of education and context. Not one design fits all. Therefore, it is imperative for designers/managers to adjust the design components of the online learning environments for different courses, target demographics and context. Without systematically being able to investigate and analyze the existence of causality among the design variables, decision makers/managers/designers will not be able to perform appropriate steps of simulation to adjust those design variables. We adopt the cognitive map technique (Lee & Kim, 1997; Zhang et al., 1989) incorporating causality simulations to adjust important factors in online learning environments for an enhanced learning experience. Therefore, the primary research objectives of this study are:

1. To identify important design components of online learning environments which have been suggested to influence outcome variables such as intentions.