



# Web sites for every department course

Gali Naveh, Dorit Tubin and Nava Pliskin

*Ben Gurion University of the Negev, Beer-Sheva, Israel*

## Abstract

**Purpose** – To study the implementation of a learning content management system (LCMS) at one department of a university in light of Rogers' diffusion of innovation (DOI) theory and in comparison to known critical success factors (CSFs) in implementation of information systems.

**Design/methodology/approach** – A case study approach was used to examine the implementation process.

**Findings** – Under authority decision to adopt the system throughout the department, the diffusion was quick and without resistance, not in line with authority adoption decision in Rogers' DOI theory. Some of the CSFs found are consistent with implementation CSFs mentioned in the literature.

**Research limitations/implications** – To complement the qualitative research, quantitative research is needed regarding administrative measures taken in implementation processes at other academic departments and the success in terms of system adoption.

**Originality/value** – Successful LCMS implementation in an academic environment is rather rare and studying the successful authority decision in this case is of value to researchers and to practitioners. To adopt the system might imply that administrative measures could expedite implementation in other academic institutions.

**Keywords** Innovation, Worldwide web, Internet, Information systems, Critical success factors, E-learning

**Paper type** Case study

## Introduction

Many universities worldwide have developed various web-based environments (Collis and Moonen, 2001; Macchiusi and Trinidad, 2001; Harasim, 2000; Mason, 2000; Noble, 2001; Bennett and Bennett, 2003). According to The Campus Computing Project (2004), the use of web-based information systems (IS) in instruction was considered by most academic institutions as one of the most important issues during the past few years.

Yet, according to The Campus Computing Project (2004), the adoption of IS innovations in academia has been only partially successful. In the US, e-mail and course web sites were used in less than 10 percent of academic courses in 1994 and in 1995, respectively. Surprisingly, in 2004, while the use of e-mail in academic courses rose to about 75 percent the use of course web sites increased as well but has remained below 40 percent.

Lynch (2002) ascribes this state of affairs to lack of interest among professors in adopting innovations that could contribute to academic teaching. Berge (1998) also found that faculty resistance to change was main inhibitor to online teaching. Maguire (2005) presents a literature review of drivers and inhibitors of online teaching, with lack of technical support cited most frequently by faculty and administrators as an institutional barrier.

In view of the slow diffusion of web sites at academic campuses, despite their perceived importance, it is essential to find out why the use of web sites as an



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instructional tool has diffused at a relatively slow rate in universities around the globe. To shed some light on this question, a case-study approach was used in this paper for analyzing the implementation process of a web-based learning content management system (LCMS) at The Department of Industrial Engineering and Management (IE&M) at Ben-Gurion University (BGU) in Israel and for studying its impact on the interaction between instructor and students and among students themselves.

The next section is devoted to describing the background against which research for this paper was conducted. The case study itself is outlined after the third section, which explains the case-study methodology and the sources of data for the case study. Finally, the main results are presented and discussed in the concluding sections.

### **Background**

Heavy investments in IS, with relatively low success rates (Legris *et al.*, 2003), have led to intensive research for more the 25 years on critical success factors (CSF) in IS implementation (DeLone and McLean, 1992). Four major CSFs have been repeatedly mentioned as positively correlated with user attitude and commitment to the implemented IS:

- (1) Involved top management supportive throughout the IS implementation process (Boynton and Zmud, 1987).
- (2) Highly motivated support team, with extensive ability for problem solving, in charge of leading the implementation process and helping users adopting the implemented IS (Boynton and Zmud, 1987; Beatty, 1992).
- (3) Technical support by lead-user colleagues to help other users adopting the implemented IS (Bowman *et al.*, 1993).
- (4) Effective program for user training (Bikson *et al.*, 1987).

Rogers (1995), in modeling and describing the process of innovation diffusion and adoption, distinguishes between two types of driving and inhibiting factors:

- (1) Characteristics of the innovation – relative advantage, trialability, observability, complexity, and compatibility.
- (2) Personal and personality characteristics of potential adopters – e.g. social status, formal education, ability to deal with abstractions, and fatalism.

Bennett and Bennett (2003) examined the attitude of faculty members in a college towards using IS in instruction and designed a campus-wide training program for faculty members, which took into consideration factors that influence technology adoption according to Rogers (1995). Among faculty members who participated in this training program, Bennett and Bennett found a significant change in beliefs and attitudes and a reduction in resistance. Macchiusi and Trinidad (2001), who examined the process of IS adoption at an Australian university in light of Rogers (1995), describe high commitment to IS by management and faculty. They suggest that the fast adoption there was due, among other reasons, to achievement of a critical mass of system users.

Rogers and Shoemaker (1971), in discussing ways of bringing about diffusion of technology innovation in organizations, argue that an authority decision may lead to quicker results even though implementation may be problematic due to resistance to a

decision that was made by an authority minority. According to Zaltman *et al.* (1973), resistance to innovation can be diminished if an authority decision is made with member participation and is reached after consulting with other members of the organization.

Against this theoretical background, using the case-study methodology as described next, this paper examines the diffusion of a LCMS in an academic department, where the adoption decision was an authority decision without member participation.

### **Methodology**

One of the reasons to use a case-study methodology in this research is the inability to explain the relatively low campus-wide diffusion of course web sites and the complexity of the phenomenon being studied (Dube and Pare, 2003). The use of academic course web sites can be examined from the perspectives of IS implementation, diffusion of innovation, or pedagogical perspective. A multi-perspective examination calls for an in-depth investigation, often achieved by employing the case-study approach (Bailey, 1978).

Case studies can be conducted as participant or non-participant observation (Cohen and Manion, 1994). In this paper, participant observations were used by one of the authors, a graduate student and an instructor at IE&M who took an active part in the diffusion process. Other than participant observations, data for the case study was obtained via interviews, system logs, course web sites and questionnaires. Interviews were conducted with the main actors (e.g. the department chairperson) and with lead users in order to frame the case. Additional interviews were conducted with adopters and non-adopters in order to identify possible adoption drivers and inhibitors. System logs were used in order to study the extent of system use. All existing IE&M course web sites were examined in order to characterize their use as instructional tools. Questionnaires were distributed among users in order to study the characteristics of early and late adopters.

### **Case facts**

BGU has been the academic center of the southern part of Israel for the past 35 years. Currently, the number of BGU students and full-time faculty members exceeds 16,500 and 750 respectively. At IE&M, one of 40 departments at BGU, more than 1,000 graduate and undergraduate students are being taught by about 100 instructors (30 of which are full-time faculty members) and 50 teaching assistants. As at other BGU departments, web sites were created for instructional purposes in some IE&M courses since the mid-1990s. Instructors could also post instructional materials on the BGU Printouts Site that the BGU Computation Center built for students to print.

In late 2001, BGU acquired HighLearn (HL), a complete web-based e-learning solution that has been developed in Israel by Britannica to address a broad range of educational needs ([www.britannica-ks.com/Products/Edu.asp](http://www.britannica-ks.com/Products/Edu.asp)). HL is a user-friendly and easy-to-use LCMS designed to assist institutions in effectively delivering courses and content and in managing all aspects of e-learning. For each course, HL enables posting of administrative messages, course materials, homework assignments, quizzes, and tests. It also facilitates such functions as the creation of course calendar, e-mail address book, forums, surveys, and bulletin boards.

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As any other software package acquired for the benefit of all departments on campus, the BGU Computation Center assumed responsibility for HL installation, maintenance, and training. HL went live at BGU during the Academic Year 2001-2002. In the first semester that the HL platform was up and running, 16 BGU courses were hosted on it, and in the following semester, the number grew to about 80. During 2002-2003, the number of HL-based courses increased to about 450 and reached close to 650 and 940 during the 2003-2004 and 2004-2005 academic years, respectively.

As soon as the BGU Computation Center made IE&M management aware of the availability of HL at BGU, a planned an orderly implementation process was initiated by IE&M chairperson. Having a vision of ubiquitous use of course web sites, she viewed the new web-based IS platform as an opportunity to improve the quality and uniformity of teaching at IE&M. In consultation with the person in charge of IS programs at IE&M and on the basis of a detailed work plan, a pilot HL implementation was initiated in about ten IS courses (during second Semester of the Academic Year 2001-2002). An IE&M doctoral student was hired to lead and manage the pilot. Following a post-pilot evaluation, according to which HL was judged highly suitable for IE&M needs, IE&M chairperson took an authority decision to universally adopt HL in all IE&M courses.

During the summer break that followed, an HL steering committee was formed to plan measures that would facilitate fast and smooth implementation of HL at IE&M, to start with, and to monitor the progress of the implementation process, later on. The steering committee included the faculty member in charge of the IS programs, one IS doctoral student, and the IS manager of IE&M.

The first recommendation of the HL steering committee was to designate two doctoral students (instead of the one hired for the HL pilot) to form the "HL Support Team". The support team was put in charge of overseeing the HL implementation at IE&M and charged with applying all measures necessary to expedite diffusion. In particular, they were responsible for creating a uniform structure for IE&M course web sites, making sure new course web sites are ready in the beginning of each new semester, helping to solve problems for the IE&M instructional staff and students, communicating with HL professionals at the BGU Computation Center and, in particular, helping tailor special HL training programs for IE&M staff, and putting together an IE&M wish list for Britannica.

Another recommendation of the HL steering committee was to expand the role of IE&M teaching assistants to include creation and maintenance of course web sites on HL, including conversion of existing non-HL course web sites. In addition to HL training programs that were offered to the BGU community as a whole, the assistants were required to participate in one of three rounds of training programs that were especially tailored to meet IE&M needs.

Toward the beginning of the first Semester of the Academic Year 2002-2003, due to severe budget cuts, the IE&M chairperson notified the teaching staff that copying teaching materials in hard copy would no longer be budgeted. Following the opening, by the HL Support Team, of web sites for all 90 IE&M courses offered in that semester, IE&M chairperson circulated a letter to all teaching staff to let them know that HL has become the standard vehicle for electronic communication with students, explaining that since this system is user-friendly, creation and maintenance of course web sites should become easier than before. The letter also made it clear that, at IE&M, the

responsibility for creating and maintaining course web sites has been added to the job description of teaching assistants. From then on instructors and their assistants began to use HL extensively for distribution of instructional materials electronically and for communication with and among students.

### Results

In the pilot semester, 10 percent of courses offered by IE&M had an active website on HL. This number jumped to 80 percent in the first post-pilot semester of the HL implementation at IE&M. In the second post-pilot semester, the diffusion rate increased to 90 percent and in the following semesters, the diffusion rate has increased to 98 percent. In the other 14 departments at the Faculty of Engineering in the university, only 23 percent of the courses have active HL web sites.

The interviews conducted for this case study reveal that the inability to distribute hard copies, the active encouragement as well as the immediate and friendly help provided by the HL support team almost around the clock, created a positive atmosphere whereby most of the teaching staff began to use HL for distributing handouts electronically and for communication with and among students. As indicated in the answers to open-ended questions in the questionnaires and interviews, the HL implementation has affected individual instructors and students as well as the IE&M community as a whole.

The analysis of all IE&M web sites revealed that most (98 percent) have been used for posting pedagogical and administrative information and 10 percent have had at least one active discussion forum, with the latter percentage remaining steady since the first post-pilot semester.

System logs showed that use of an online bulletin board, which has been active at IE&M for a number of years prior to the HL implementation and has served as the only means of electronic communication with students before the HL implementation ([www.ie.bgu.ac.il/weboard++/](http://www.ie.bgu.ac.il/weboard++/)), has diminished by 50 percent.

The questionnaire data was used for interpreting the results. No statistically significant correlation was found between system adoption and personal characteristics, such as gender and age. Similarly, no statistically significant correlation was found between system adoption and professional characteristics, such as past experience with course web sites and seniority of instructors and teaching assistants.

More insight was gained from the participant observations and the open-ended questions of the questionnaire and from the interviews that followed. It may very well be that personal and professional characteristics of system users made no difference due to the high computer literacy, the high rate of system adoption, and past experience with internet tools. In fact, for some instructors and teaching assistants the system was nothing new. Rather, they perceived it as the right solution for a current problem at the right time. For example, posting of instructional materials on the BGU printouts site of the computation center was perceived as a nuisance, as was the use of e-mail as another channel of communication.

Whereas prior to the HL implementation, interacting and communicating with students online was a complex tiring process, the HL provided instructors with a solution to a real need, as one respondent said while arguing that with HL it has been easier to disseminate information even for users without deep technical knowledge:

I now have a convenient and organized way to distribute materials to my students.

Other instructors seem to agree, with the second one saying:

I did not need help from my teaching assistant to maintain the web site.

Another instructor said, explaining that they have been able to manage information distribution in a timely manner by themselves, even though their assistants were charged with this responsibility:

I can easily add, update and delete files.

A fourth instructor, emphasizing the advantage that updates can be conducted online for students to immediately access everywhere and at anytime:

I am able to update online the materials which my students can then access.

These advantages come loud and clear in two additional quotations:

HL provides a fast and effective way to communicate with the students.

HL provides new options such as forums and surveys.

Both highlighting the ability to use communication channels other than bulletin boards and e-mail, such as forums and surveys, to facilitate greater interaction with students.

The attitude of teaching assistants toward HL was also positive. Almost half of the respondents among teaching assistants mentioned that HL has helped them in their work by increasing the accessibility to and for students. One of them, pointing to increased efficiency, said:

No need to build a special website for each course and web sites are uniform.

While another, highlighting the uniformity of all courses within one system said:

Communication with students through only one channel is easier.

The third said that the system has made it easier to interact with the students:

I was able to update everybody at once, on any thing.

### **Discussion and conclusion**

Our results are in line with IS implementation theory and practice (Boynton and Zmud, 1987; Beatty, 1992; Bowman *et al.*, 1993). This was confirmed in interviews with the person in charge of the IS programs at IE&M. The HL steering committee, under her leadership, planned and carried out the implementation with IS implementation CSFs in mind, including top-management support, highly motivated colleagues, functioning as a support team, and user training, all of which proved useful in this case.

The results are also in line with the characteristics found by Rogers (1995) to drive innovation adoption. HL has had a relative advantage and has addressed a concrete need, the previous alternative (printouts) became unavailable, the system was available (i.e. trailabe) and interaction among the teaching staff made it easier for potential adopters to witness the innovation and its advantages, HL has been compatible with potential adopters' values and customs (perceived as being innovative and up to date), HL complexity, if any, has been removed through support and training.

The results are in line with the theory about the effect of an authority decision (Rogers and Shoemaker, 1971) as well. This was confirmed in interviews with IE&M chairperson. Even though her decision to adopt the system was aimed mainly at raising instruction quality, stopping hard-copy distribution conveyed authority. It seems that the authority adoption decision have been successful in this case even though it was made without member participation because of the innovation characteristics and the planned IS implementation process, conducted with CSF in mind.

Further research should focus on the implementation processes in other academic departments and their success in correlation to the administrative measures taken to encourage system's adoption.

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**Corresponding author**

Gali Naveh can be contacted at: [galin@bgu.ac.il](mailto:galin@bgu.ac.il)