Journal of Research in Business Information Systems

Volume 3 Number 3
Spring 2010

Editor
Chynette Nealy

Publication of the Association of Business Information Systems
Web address: http://www.abis-fbd.org

ISSN 1941-8515

Journal Profile

The *Journal of Research in Business Information Systems* (JRBIS) is a national refereed publication published annually by the Association of Business Information Systems. This refereed journal includes articles from fields associated with business information systems focusing on theory, problems associated with information systems and information resources in education, business and industry, government, and the professions.

Manuscripts are selected using a blind review process. The first issue of the Journal will be available Spring 2008. The Journal is scheduled to be listed in ERIC Database and *Cabell's Directory of Publishing Opportunities* in Education, Instructional Technology and Management.

2009 Editorial Reviewers

Dr. Carolyn Ashe, University of Houston Downtown
Dr. Walter Creighton, Northwestern State University
Dr. Betty A. Kleen, Nicholls State University
Vanessa Ritchie, Mississippi Gulf Coast Community College

Circulation/Readership

The readership is comprised of college and university faculty, administrators, staff, practitioners, and students engaged in business information systems or preparing for careers in fields related to information resources. The journal is distributed (CD-ROM) annually to all Association of Business Information Systems members as part of conference registration or membership.

Journal Subscription

Subscription rates are $25 for both non members and for institutions/libraries. For a subscription, please make your check payable to the Association of Business Information Systems (ABIS), and mail it to the editor at the following address: *Please See: ABIS Website for Information*

Call for Manuscripts

You are invited to submit manuscripts for publication consideration in the 2009 issue of the *Journal of Research in Business Information Systems,* a national refereed publication. Manuscripts should address topics of interest to the wide-ranging interdisciplinary and practitioners that read JRBIS. Submissions of manuscripts relating to topics: research findings, theoretical and practical applications, discussions of issues and methods for teaching and assessing instructional technology and reviews of textbooks are encouraged. The journal is scheduled to be listed in ERIC Database and *Cabell's Directory of Publishing Opportunities* in Education, Instructional Technology and Management. Manuscripts will be selected through a blind review process. Manuscripts should not have been published or be under current consideration for publication by another journal.

Manuscripts should be submitted electronically (MS Word format). Submissions should include a title page, a 50-100-word abstract, and 3 to 5 key words or phrases describing the focus of the article. The manuscript body should *range from 10 to 20 double- spaced pages of 10 point font-size*, including tables and references (typically 4000 – 6000 words). Manuscripts and references must be prepared using the style format in the *Publication Manual of the American Psychological Association, Fifth Edition*. The title page is to include the title of the manuscript and a running header. The following information on each author needs to be included on the title page: full name, position/title, place of employment, city, state, zip code, telephone numbers and e-mail address. The first content page of the article should begin with the title, followed by the abstract and introductory text.

To ensure your manuscript is considered for publication in the 2011 Journal, submit manuscript by (July 1, 2010). E-mail manuscripts to: *Please See: ABIS Website for Information*

Journal of Research in Business Information Systems

Table of Contents

Using Experiential Learning to Develop Communication Skills and Increase User Satisfaction with Student Developed Projects

Kimberly L. Merritt, Oklahoma Christian University
K. David Smith, Cameron University

Abstract

This paper presents the experience of a regional university in implementing experiential learning in core MIS courses. In these courses students and clients must interact. The initial interaction is actually when the client describes the project scope to the students. Often, clients only have a vague understanding of what they want from the project, and often they have just a list of outcomes for the project. Students must use interview techniques and other communication methods to uncover more specifics, definitions of entities and attributes from the client's perspective, data flows, processes, etc. Additional opportunities to develop effective communication skills occur with project updates. This interaction with clients also ensures that the client will be satisfied with the final product. It is the experience of this university that the use of experiential learning improves the communication skills of students and increases system success as measured by user satisfaction.

Keywords: experiential learning, communication skills

Introduction

Preparing management information systems students (MIS) for successful careers is a complicated challenge. Students must be adequately prepared with technical skills in programming, database development, systems analysis, and much more. But that is not all. The literature is full of mandates to improve the soft, or non-technical, skills of MIS graduates as well. Students must be able to write, speak, present information and interact with others in addition to the broad range of technical skills required.

Many programs have implemented real-world projects in one or more of the required courses for IS students (Smith & Smarkusky, 2008; Mitri, 2008; Smith & Clinton, 2006) . This experiential learning reaps many benefits for students, universities, and businesses. In these projects, students often interact with actual clients to determine project requirements and complete systems development. In addition to the technical skills honed during this work, students are afforded opportunities to improve team-building skills, written and oral communication skills, along with interpersonal skills that are required for good user relations. These diverse skills are used throughout the project to ensure system success.

An important part of this process must be to increase students' understanding of system success. While technological functionality is vital, user satisfaction with the system is paramount (Chen, Soliman, Mao, & Frolick, 2000). Student projects completed thought experiential learning must ensure the developed system meets the needs of the final user, or client. By increasing the importance of user satisfaction, students are encouraged to focus on the

communication and interaction with the users as much on the technical functionally of the product.

This paper presents the success of one regional university's MIS program in developing student's communication skills by requiring experiential learning in two of the required courses. This experiential learning requires students to work in groups, communicate with end-users, and develop a system to the end-user's satisfaction.

Literature Review

Importance of Communication Skills

Social / interpersonal skills (sometimes called "soft skills") are ranked high by employers as a criterion for job seekers. Social skills include teamsmanship as well as oral and written communication skills. However, they also include the ability to present findings, the ability to listen and draw conclusions, and even understand body language. Lee (2005) indicated that over three quarters of job ads state a requirement for communication and interpersonal skills. Fang, Lee, and Koh (2005) further this thought by stating that "With regard to the most important factors in full time hiring decision, 40% . . . chose the communication skills followed by [other skills]" (61). They further indicate that Team Skills rank only slightly higher than communication skills for an Entry-Level IS Employee.

User Satisfaction

Since the adoption of information systems in business, the topic of system success has been studied. DeLone and McLean (1992) identified six major categories of IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. As systems developed, additional factors of ease of use, end-user perceptions, and available support were added as important factors. However, user satisfaction is considered to be the most useful measurement of system success (Chen, Soliman, Mao, & Frolick, 2000).

Benefits of Experiential Learning

Benefits of experiential learning accrue to the students involved, the university that provides the opportunity, and to the business that benefit from it. Students reap many benefits from the experience, including: improved concept recollection and student outcomes (Polito, Kros, & Watson, 2004); critical thinking and problem-solving skills (Kinsley, 1994); the ability to apply knowledge to related situations (Roberts, 2003); higher levels of student interest and motivation resulting from working on a hands-on project (Elbert and Anderson, 1984; Kinsley, 1993); and improved oral and written communication skills (Harris, 1994). Many authors recommend experiential learning projects as an excellent way to improve student creativity (Cougar, 1995; Gose, 1997; Jacoby, 1996).

The university also benefits from experiential learning. Through constant interaction with the business community, the university strengthens relationships with employers and garners real-world experience for faculty and students (Cooke & Williams, 2004; Fox, 2002; Hervani & Helms, 2004; Stanton, Giles, & Cruz, 1999). Research has shown that additional

benefits include improved classroom practices (Richards & Platt, 1992), instructional productivity (Johnson, Johnson, & Smith, 1991). It allows teachers to challenge their students (Wedel, Behnezhad, & Gray, 2004) and assists the professor in remaining current in his/her field (Cooke & Williams, 2004). Experiential learning enhances the quality of the education a university offers.

Through this experience, businesses are able to collaborate with the university and evluate potential employees (Fox, 2002; Schuldt, 1991). Student thinking is shaped by the interaction with the business professionals. For the business, working with the students has many of the benefits of hiring an intern (Cooke & Williams, 2004). Additional benefits to business are the valuable expertise of the instructor, the energy of enthusiastic students and the cost savings reaped from not paying consultant fees.

Experiential Learning At Regional University

Program History

Regional University started a Management Information Systems (MIS) specialization in the School of Business in 2000. As part of the MIS curriculum, two of the mandatory classes developed centered on database creation. The first of these courses, Database Management (DBM) had its first class scheduled in the Fall 2001 semester. The DBM class was to be conducted every fall according to the rotation schedule. In the first DBM class, the instructor used a "canned" exercise for the class project and used Oracle Designer as the CASE tool for the class. Students were less than thrilled with both the project and the CASE tool. The project, which dealt with a fictional library, had an easy solution and consequently did not really challenge the students. The CASE tool, a student version, tended to lock up student home computers and even the computers in the School of Business lab had to be rebooted at least once during each class session. Shortly after this experience, the University purchased a full-version CASE tool (System Architect®) for use by students in the development courses.

Early in the 2002 academic year, the DBM instructor was approached by the School of Business Dean of Graduate Studies and asked to create a database to track MBA students and to cut down on amount of paperwork managed by the office. The instructor initiated an experiential learning exercise to complete a fully functional database solution to the stated problem.

This project was a tremendous success, as evaluated by both students and client. Students not only enjoyed the project, but also left the class with letters of recommendation from the Graduate Dean. The student product was very well executed and the client was very happy with the functionality of the resulting database. Based on this, the instructor decided to incorporate experiential learning in all the DBM classes and also instituted it in the Applied Problems in MIS (Capstone) class for all MIS majors.

Benefits were readily apparent in all classes. These included the following:

1. Students that worked on an actual project for actual clients had improved quality of work. This may have been due to the fact that student teams (students in each class were assigned to design teams) were competing to "win" the contract to build the database. Consequently, students spent more time working on the project than they had with the canned exercise. As such they left the class with a deeper knowledge of the subject area.

2. Students were able to practice and increase their oral and written communication skills. One of the criteria for being selected as the class project was that clients had to make time to meet with the database teams. This was required to ensure the students fully understood the definitions and business rules which would allow them to work through the various models used in database design. It further worked to make sure each implemented database had the required functionality. Students also had to present In Process Reviews (IPRs) at specified times. Every student in the team was required to participate. The audience for the IPRs was the instructor and the clients. During these IPRs, students had to completely update the client as to the status of the project, let the client know what would be coming next, and to ask for any clarification that might be required by the team to complete the next phase of the project. If the client was unavailable, students either made appointments to see the client, or used telephone or email to communicate.

3. Students worked in teams. Students actually graded the members of their team on teammanship and a portion of their grade was determined by team members. Additionally, students conducted counseling on students that were not participating, and had the option after counseling of recommending to the instructor that the team member not participating be fired. Throughout the process, students became very proficient at meeting management.

Project Success

Since that first database was created for an actual client there have been numerous projects completed by students. The application of experiential learning has also been made to MIS internships in the program. A listing of these projects, including client information and description of the project is provided in Table 1.

Table 1: Project Listing by Year

Project Name	Class	Semester	Year	Description
MBAU	DBM	Fall	2002	Develop an application to maintain information on students; instructors; courses; grades; comprehensive finals; and course sites of the graduate school of business MBA program.
Contracting Company INC	CAPSTONE	Spring	2003	Create a database tool (COTS preferred: Access (cheap and ubiquitous) to combine a several user interfaces with a report generating output specifically for DoD business developers. The user interfaces will summarize the status of impending opportunities for executives, supervisors, capture managers, proposal managers, and other writers. I would really like it to be available at a secure website for information collaboration.
New Hope Volunteer Fire Department	DBM	Fall	2003	Create a database to track the following for the New Hope Volunteer Fire Department: training events, number of hours required for that training, and those who have completed the training and on what date; dates and locations of fires runs in the district; member and auxiliary member personal information; equipment and service dates for that equipment as well as hand receipt information; an events calendar is an item that would also be of interest to NHVFA, but is an optional item; and have the ability to print out applications for membership.

BSA Camporee	CAPSTONE	Spring	2004	Develop a more user-friendly relational database system for monitoring and maintaining records regarding the BSA Camporee. The new system must maintain all data currently in the current system and allow new information to be added to the database. Additionally, it must meet all the functionality of the current system and provide an easy to use GUI interface. Additionally, it was requested that **IF POSSIBLE** certain information, like registration application forms, from the current system be added to an online environment.
BSA Camporee	Intern	Summer	2004	Complete BSA Camporee DB
Southern Sales	DBM	Fall	2004	***Create a database that has the ability to do the following: track weekly sales and inventory; print out a forecasting sheet (similar to the one provided); compute weeks of inventory based on sales and inventory; print out an exception report on items that have gone below inventory stocking levels; store vendor POC information; track transfers of inventory between three locations; and rovide sales comparisons between products.***

Regional University School of Business Scheduling	DBM	Fall	2004	***Develop a database that has the ability to: print out a Course Schedule sheet for the appropriate semester as well as labels for placing on the master board; print out an exception report on multiple book resources (rooms); print out a teaching load report; print out the Student Rating Envelope instructions; print a semester class schedule and office hour report; print a semester room schedule; and print a calendar to be used for school events.***
LPHS Special Education Resource LAB	CAPSTONE	Spring	2005	***At a minimum, the LAB coordinator would like to be able to accomplish the following activities more effectively: document the ineligibility reports; log parent contacts; ensure the special education student to teacher count does not reach a certain limit for each separate class (must be completed in a by name fashion); monitor modifications of students and ensure general education***

				teachers are notified of all modifications; provide monitor progress (and email it to general education teachers); log participation in the LAB and what modifications were used; monitor calendar reports – using school calendar; ensure IEP and Re-evaluation deadlines are not missed; and possibly input and report 10th of the Month reports
Regional University School of Business Scheduling	Interns	Summer	2005	Complete the Fall 2004 School of Business Scheduling database
LPHS Special Education Resource LAB	Intern	Sumer	2005	Complete the LPHS Special Education Resource LAB database
Regional Hospital Respiratory Dept	Intern		2005	Create a tracking database for the respiratory unit of a local hospital
EHomes LLC	DBM	Fall	2005	Create a database that tracks the following information: information on the rental units; information on tenants; information on rents collected and rents overdue by rental unit; expenses by rental

				unit; supplier/contractor information
Regional University Academic Research Center	CAPSTONE	Spring	2006	Create a database to track how courses from regional university track with other colleges, technical centers, etc. within the state.
Canned Project	*DBM*	*Fall*	*2006*	*Did not find a service-learning project for this semester.*
EHomesLLC	Intern	Summer	2006	Complete the Fall 2005 EHomesLLC database.
WOSC Flight School	DBM	Spring	2007	Specific areas that WOSC Flight database had to track were: the students' names, email addresses, & other contact information, etc; courses; sections offered by semester and year; flight hours and dates; aircraft type; flight Instructors, email addresses, & other information; possible other information; the ability to track the students' courses and flight hours; which flight instructors are flying with which students; flight schedules; and must have security
LPHS Alumni Association	CAPSTONE	Spring	2007	Create a database that allows LPHS AA to track the following: alumni: all pertinent information; years attended or year graduated; extracurricular actives, organizations, clubs, sports along to include significant offices or positions; outside school activities; occupation information; post LHS education information; post LHS education extracurricular activities; and other areas

				per client's request.
LPHS HOPE	DBM	Fall	2007	Create an application that tracks students in HOPE. The system must have reports that do the following: calculate each student's time in HOPE; calculate the number of students served daily, weekly, monthly, throughout the school year; provide, on a student by student basis, when each student was in HOPE; track Homework assignments received by HOPE personnel and when they were returned; track parent calls; an email capability to notify individual or groups of teachers of progress of the student / or to notify that assignments were sent, etc.; an assignment submission slip request; a bathroom log; and others reports as required based on interviews, etc.
GNHA DIST 98	DBM	Spring	2008	Create an application that can be used to track the following information: riding clubs; riders; horses and coggins tests; playday event results; points earned by contestants; dues; and who is eligible for finals. Mandatory Reports include: 1st - listing the placement by age groups at District Events, 2nd - listing the number of district play days riders have ridden in (for Finals), 3rd - district placings (for awards at the end of the season and to see who qualifies for finals).
STATE EMERGENCY MANAGEMENT	CAPSTONE	Spring	2008	Create an online database that tracks for all towns and counties in the state: emergency managers; assets; emergencies; training for emergency

AGENCY				managers; grant programs counties and cities/towns participate in
LPHS HOPE	Interns	Summer	2008	Complete the Fall 2005 LPHS HOPE DBM
LPHS SPECIAL ED TESTING DB	DBM	Fall	2008	Create a database to track EOI testing for LPHS special education students. On going.

Table 1: Project Listing by Year

Discussion

The success of the project often appeared to be determined by the amount of contact between the client and the students. Table 2 shows the amount of client contact, main method of contact and the overall success of the project. A Likert scale of 0 – 3 was used to show client contact level. For Contact Level the following weights apply: 0 – Clients were unable to meet with the students and communication was conducted only through email and telephone. 1 – Clients only met with the student once prior to final presentation and communication was almost entirely through email and telephone. 2 – Clients met with the students twice prior to the final presentation. Email and telephones were also used to communicate. 3 – Clients met with the students three or more times prior to the final presentation. Success of the project was determined by focusing on user satisfaction along with the amount of functionality in the database. A Likert scale of 1 – 4 was used with the following weights: 1- low functionality, client unable to use; 2 – low functionality, client still able to use portions of the database; 3 – most functionality present, usable; and 4 – fully functional, usable.

Table 2: Communication Between Client and Students

Project Name	**Client Contact Level**	**Project Success**	**Client Currently Using Database**	**Comments**
MBAU	3	4	No	Overseas portion of MBA program was terminated. Database was shared with other associated MBA

				distance offices and may be in use there.
Contracting Company INC	3	1	No	Instructor chose a project that was too complicated for the class. Client did say that the product was complete enough for him to fix it.
New Hope Volunteer Fire Department	2	3	Yes	
BSA Camporee (to include Internship)	2	3	?	May have used it for one camporee. It was placed on their server
Southern Sales	1	2	?	Client did say that it was usable and that he'd play with it
Regional University School of Business Scheduling (Plus Internship)	3	4	Yes	Was shared with several departments at the Regional University, but unsure whether they used it or not
LPHS Special Education Resource LAB	3	4	Yes	Has been shared with several schools in the district
Regional Hospital Respiratory Dept.	3	4	Yes	Has been estimated to save the Hospital over $10K each year

EHomes LLC (to include internship)	3	4	No	Client has assured the instructor that they intend to use it, but to date they are still relying on spreadsheets
Regional University Academic Research Center	2	2	No	Students met with the client at his office on at least one occasion.
Canned Project	n/a	n/a	n/a	n/a
WOSC Flight School	1	2	No	Flight director quit and moved to another job
LPHS Alumni Association	3	4	No	Alumni association wants to put the database on line. They are using this database as a template to do so
LPHS HOPE (to include internship)	2 (Chair only)	3	No	New teacher may implement next year.
GNHA DIST 98	1	3	No	
STATE EMERGENCY MANAGEMENT AGENCY	3	3	Partially	Decided to go with a packaged product with more functionality. Database has been turned over in Access form for use by individual regional manager and other managers until the new system is up

LPHS SPECIAL ED TESTING DB				Ongoing

Table 2: Communication Between Client and Students

Chart one shows a scatter plot of the data from Table 2. The Correlation Coefficient of the scatter plot is .443. This indicates that there is a positive correlation between client contact and success as measured by user satisfaction.

Chart 1: Scatter Plot of the data from Table 2

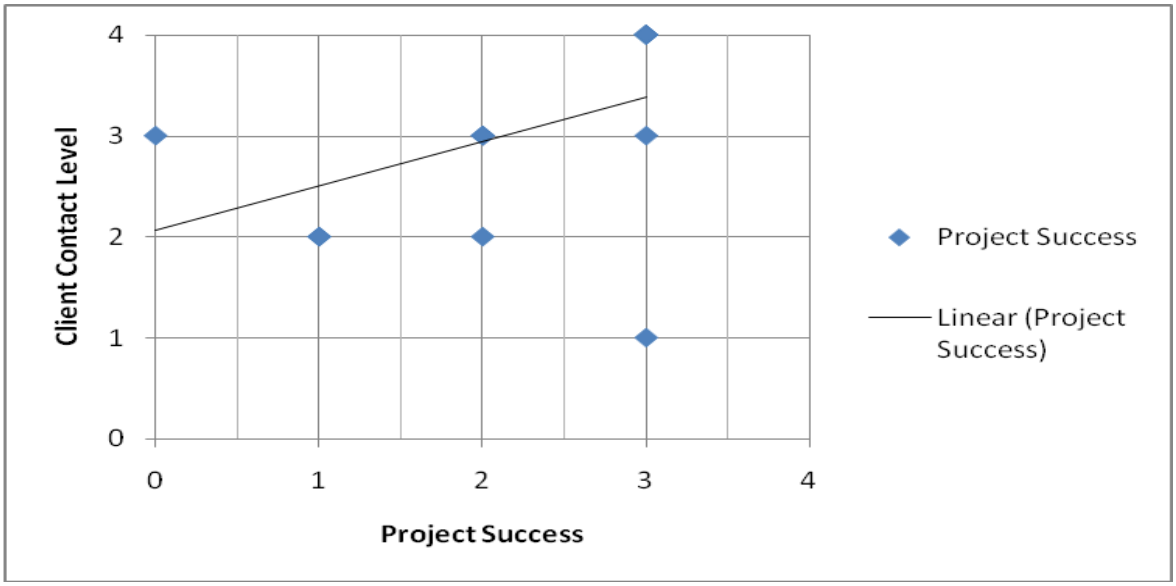


Chart 1: Scatter Plot of the data from Table 2

Conclusion

Using experiential learning in the fashion described in this paper forces students to develop many skill sets other than just the technical skills that the class covers. In order to ensure client and student satisfaction, as well as ensure the database has the proper functionality, students must work together in a cohesive team, and they must develop good social / interpersonal skills, and effective oral and written communication skills. Without these, the project will not have the functionality required by the client, and students will not have all the skills required by employers. It is the experience of this university that the use of experiential learning in core MIS courses improves the communication skills of students and increases system success as measured by user satisfaction.

References

Chen, L., Soliman, K., Mao, E. & Frolick, M. (2000, April). Measuring user satisfaction with data warehouses: An exploratory study. *Information & Management, 37*(3), 103-110.

Cooke, L. and Williams, S. (2004). Two approaches to using client projects in the college classroom. *Business Communications Quarterly*, 67(2), 139-152.

Cougar, J. D. (1995). Implied creativity no longer appropriate for IS curriculum. *Journal of IS Education,* 7(1), 12-13.

DeLone W., & McLean, E. (1992). Information systems success: The quest for the dependent variable. Information Systems Research, 3(1), 60-95.

Elbert, Dennis J. and Anderson, D.G. (1984). Student reaction to local vs. published cases: Is there a difference? *Journal of Marketing Education,* 6(2), 18-21.

Fang, X., Lee, S., and Koh, S. (2005). Transition of Knowledge/Skills Requirement for Entry-Level Professionals: An Exploratory Study Based on Recruiters' Perception. *Journal of Computer Information Systems*, 46(1), 58–70.

Fox, T.L. (2002). A case analysis of real-world systems development experiences of CIS students. *Journal of Information Systems Education,* 13(4), 343-350.

Gose,B. (1997, November). Many colleges move to link courses with volunteerism: Some critics of service learning question the quality of the service and rigor of the learning. *The Chronicle of Higher Education*, November, A45.

Harris, Allen L. (1994). Developing the systems project course. *Journal of IS Education,* 6(4).

Hervani, A. and Helms, M.M. (2004). Increasing creativity in economics: The service learning project. J*ournal of Education for Business*, 267-274.

Jacoby, B. (1996). *Service Learning In Higher Education: Concepts and Practices*, San Francisco: Jossey-Bass.

Johnson, D.W., Johnson, R.T., and Smith, K.A. (1991). Cooperative learning: Increasing college faculty instructional productivity," *ASHE-ERIC Higher Education Report No. 4.* Washington, D.C.: School of Education and Human Development, George Washington University.

Kinsley, C.W. (1993). Community service learning as a pedagogy. *Equity and Excellence in Education,* 26(2), 53-63.

Kinsley, C.W. (1994). What is community service learning? *Vital Speeches of the Day.* 61(2), 40-43.

Lee, C. K. (2005). Analysis of Skill Requirements for Systems Analysts in Fortune 500 Organizations. *Journal of Computer Information Systems*, 45(4), 84-92.

Mitri, M. (2008, Spring). A software development capstone course and project for CIS majors. *Journal of Computer Information Systems.*

Polito, T., Kros, J. and Watson, K. (2004, May/June). Improving operations management concept recollection via the Zarco experiential learning activity," *Journal of Education for Business*, 283-286

Richards, J. and Platt, H. (1992). *Longman Dictionary of Language Teaching and Applied Linguistics.* Essex, England: Longman Group UK.

Roberts, G.T. (2003). An interpretation of Dewey's experiential learning theory," Opinion Paper published by New York University through the Institute for Education and Social Policy, 1-9.

Schuldt, B.A. (1991). Real-world versus simulated projects in database instruction. *Journal of Education for Business*, 67(1), pp. 35-39.

Smith, H., Smarkusky, D., and Corrigall, E. (2008). Defining projects to integrate evolving team fundamentals and project management skills. *Journal of Information Systems Education, 19*(1), 99-109.

Smith, K. and Clinton, M.S. (2006). Experiential Learning: A Case Study of a Mutually-Beneficial Database Development Project, *Issues in Information Systems*, 7(1), 24-28.

Stanton, T., Giles, D., and Cruz, N. (1999). *Service learning: A Moment's Pioneers Reflect On Its Origins Practice, and Future.* San Francisco: Jossey-Bass.

Wedel, T.L., Behnezhad, A.R., and Gray, G.L. (2004). A data modeling case: Writers guild of America, east.," *Journal of Information Systems Education*, 15(1), 13-17.

Disaster Recovery Plan for Educational Continuity

Adnan Omar, Southern University at New Orleans
Devi Meenakshi Mantha, Southern University at New Orleans

Abstract

Disaster recovery plans (DRP) are becoming a key part of an organization's overall planning process, because they ensure continuous availability of an organization's critical infrastructure at all times. A major component of these plans involves protecting business-critical data through backups and data replication. However, many organizations today have either inadequate DRPs in place or none at all. Those companies with DRP's in place fared much better than those without such contingency plans. Thus, it is vital for every organization to have a DRP drafted, tested and implemented.

This project focuses primarily on universities in the New Orleans area which suffered major losses of data due to Hurricane Katrina. The end results are compared with the Houston Community College in Houston, TX, which proactively developed a sophisticated DRP post Katrina, and used it to recover rapidly from the ravages of Hurricane Ike in 2008. Therefore, it is evident that DRPs are crucial for the protection of all universities.

Keywords: Data loss, Natural Disaster, Disaster Recovery Plan, Backup, Educational Model

Introduction

Regardless of geographical location, a workplace may be susceptible to events that may cause physical damage. Floods and fires are often the most catastrophic events, but problems like hackers, viruses, and human errors also take an enormous toll. In light of recent events like Hurricane Katrina, many organizations, including universities and colleges, have begun to, or have been forced to, think about how vulnerable they can be to natural disasters. Although such institutional vulnerabilities usually impact individual well-being, some mechanisms currently in place can help protect people and businesses, and most people are comfortable with these mechanisms. Unfortunately, not all organizations consider the impact of unexpected events on the workplace and the appropriate response to emergent situations that have damaged or destroyed the workplace. A well-thought-out mechanism like a DRP can help to protect the organization's workplace and its crucial data during such times.

The objective of this project is to discuss the causes of data loss in general, effective backup strategies, recovery systems developed and their cost effects. The project intends to focus in particular on the universities in the New Orleans area which suffered major losses of data due to Hurricane Katrina.

Statement of the Problem

Disasters such as system crashes, fires, hurricanes and earthquakes, often destroy an organization's electronic files and records, crippling its ability to recover rapidly. An appropriate DRP, Data Backup and Storage are necessary to retrieve the data in case of a disaster. However, not all organizations have a preplanned DRP and a data backup and recovery system which would help at the time of data loss. Hence, all organizations should have a well prepared DRP as well as a cost-effective and reliable data backup system established to ensure the smooth functioning of an organization.

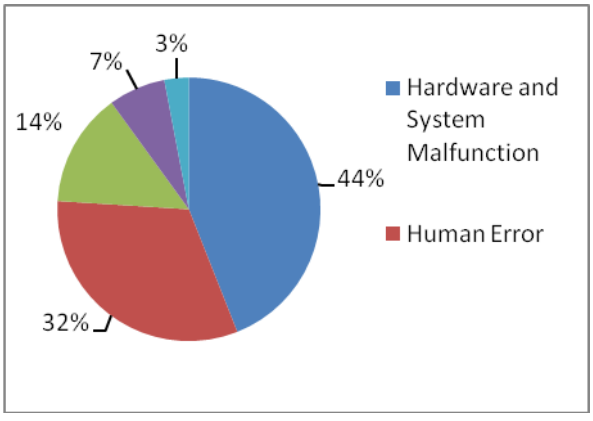
Statement of the Objective

At the heart of every organization are volumes of irreplaceable data that are updated daily. This information must be protected, secured through backups and retrieved immediately in the early phase of a disaster. All organizations must realize that future disasters are inevitable and preparation is essential to ensure that critical data is secured and easily retrievable. Implementing measures to minimize the potentially devastating effects of future data disasters is desirable.

Review of Literature

Data is vital for any organization and no organization is immune from disasters such as disk crashes, power failures, human errors, and natural disasters that lead to loss of data. The data loss can be defined as "unforeseen loss of data or information" (Hoyles, 2007). This can have serious consequences on the day to day organizational functioning. It can be devastating, and can occur due to various reasons. Studies show that 44% of data loss is due to hardware or system malfunction; 32% is due to human errors; 14% is due to software or program malfunction; 7% is due to virus infection, malware, spyware; and 3% is due to natural disaster as shown in Figure 1 (Solid Data Corporation, 2001).

Figure 1: Causes of Data Loss



A commonly overlooked cause of data loss is a natural disaster. Although the probability of catastrophic natural disaster is small, the only way to recover from data loss due to a natural disaster is to store backup data in a separate location. Natural disasters may occur in the form of fire, flood, and lightning strikes followed by power surges.

A survey conducted by the Gartner Group, Contingency Planning and Strategic Research Group, and Price Waterhouse Coopers illustrates that 25% of all PC users suffer from a data loss each year. Despite this, 96% of all business workstations do not backup their data. Approximately 70% of small firms experience a major data loss and go out of business every year and an annual cost of $12 billion is spent on data loss along with $55 billion computer virus damage to U.S. business (Remote Data Backups, 2004). These results make a strong case for the need for a sound Data Backup and effective DRP for any organization, as both these elements sustain the life of an organization at the time of a disaster.

An essential element is a DRP which incorporates a sound Business Continuity Plan (BCP). The BCP consists of the precautions taken so that the effects of a disaster will be minimized, and the organization will be able to either maintain or quickly resume mission-critical functions (InfoSec, 2008). DRPs vary according to the needs, customers and applications of each organization. A disaster recovery plan covers the hardware and software required to run critical applications, the data that an organization must maintain, and the steps necessary to maintain workforce continuity from remote locations (Cisco Systems, 2008).

Every organization must tailor its DRP to meet its requirements. It must be analyzed for its organizational processes and continuity needs, with a significant focus on disaster prevention. It is not uncommon for an organization to spend 25% of its IT budget on disaster recovery (Microsoft, 2008). A DRP must address three areas:

Prevention (pre-disaster): This area covers the pre-planning required — using mirrored servers for mission critical systems, maintaining hot sites, training disaster recovery personnel — to minimize the overall impact of a disaster on systems and resources. It is critical because it maximizes the ability of an organization to recover from a disaster (Chin, 2005).

Continuity (during a disaster): This is the process of maintaining core, mission-critical systems and resource "skeletons" (the bare minimum assets required to keep an organization in operational status) and/or initiating secondary hot sites during a disaster. Continuity measures prevent the whole organization from folding by preserving essential systems and resources (Chin, 2005).

Recovery (post-disaster): These are the steps required for the restoration of all systems and resources to full, normal operational status. Organizations can minimize recovery time by subscribing to quick-ship programs (Chin, 2005).

Figure 2 shows how an organization must plan its DRP/ BCP. Some important steps to follow in this process are: identifying the critical data within the organization; analyzing revenue and cost implications of a disaster recovery plan; framing a disaster recovery plan for all possible types of data loss; backing up data on a regular basis to a secondary source; replicating and/or storing a copy of critical data at an offsite location; testing the data protection and recovery

procedures on a regular basis; and reviewing and updating the organization's continuity plan annually.

Figure 2: Business Continuity Planning Lifecycle

In 2006, a Computer World survey of small businesses with 1-499 employees indicated that as many as 50% of these businesses had no DRPs, with as many as 8% having no plan to set one up (ComputerWorld, 2006). An organization's survival and recovery from a disaster, however, is dependent on a well structured DRP. If this is true for a business with around 500 employees, it is far more true for a university which may have at least as many employees and four to five times as many students, and must store important data such as student registration records, fee bills, attendance, payroll, courses, projects, inventory resources, etc.

Moreover, having a DRP itself is not sufficient; periodically testing the DRP is also mandatory. Although many organizations have a preset DRP, only a few of them check their DRPs regularly. In a poll conducted in 2004, 71% of the organizations admitted that they have not tested their DRPs in the previous year (Klien & Joseph, 2007).

While a natural disaster is the least likely cause of data loss, the magnitude of devastation is the highest and hence is of concern in areas that are prone to hurricanes and storms (Oskar, 2006). Hence, the colleges, universities and other organizations in these areas require a well designed DRP and a periodical data backup. Many colleges and universities in and around New Orleans which were the victims of Hurricane Katrina suffered a severe data loss and, lacking a firm DRP, could not resume normal function immediately.

Hurricane Katrina in 2005 forced the Gulf Coast to realize how unprepared it was for a massive disaster. The area's infrastructure was devastated, disrupting telephone communications

and other elements essential to a modern economy. Thus, the storm highlighted a critical problem, especially in the colleges and universities, which lost vast amounts of critical data.

Southern University at New Orleans (SUNO) is one such example. Hurricane Katrina rendered the university's administration dysfunctional for a long time. "As levies ruptured, winds raged, and flood levels rose, college and university CIOs and administrators discovered how quickly a campus can lose all access to telephone and cell phone communication, computers, and data. E-mail and websites were down. Students and faculty were scattered across the nation with no way of contacting one another. Communication among the administration, faculty, students, and their families can be lost in a heartbeat, just when the need for a source of reliable information is greatest. Administrative computing resources can come to an abrupt halt, meaning no expediting of services, no payrolls, bills paid, or accounts received." (Blaisdell, 2006). In addition to devastating the campus physically, Katrina destroyed SUNO's information technology infrastructure. Most of the computer based data, student files, records, research, etc. vanished in the flood. No part of the country is immune from a similar situation.

Xavier University, though it did not lose any data, has prepared itself to face any future disaster by adopting some changes in its DRP. The plan is simple: a mirrored site is set up in another region of the country and can be used to access the system in case of a disaster. In response to the impact that an earthquake had on them, the University of Southern California and University of California-Berkley adopted a similar plan (Blaisdell, 2006).

Info-Tech's DRP in the Education Sector 2005 Benchmarking Report shows that a surprising 47% of universities and colleges currently have no DRP in place. According to the report, these institutions, however, acknowledge the importance of having such a plan. Sixty-eight percent of them say that they are currently in the process of planning, and 32% of schools with no current plan concede it may be up to three years before they have one in place. This may be because security and end user support are higher IT priorities than disaster recovery. On the other hand, according to Info-Tech, among the 53% of schools currently with a plan in force, a whopping 86% are improving that plan (Schaffhauser, 2005).

Result and Discussion

Table 1 shows survey responses of the ITC directors of each university. Surveys were on the level of preparation of each university's pre and post Katrina.

Table 1: Survey responses of the ITC directors of each university

Question	Pre-Katrina				Post-Katrina			
	XAVIER	UNO	HCC	SUNO	XAVIER	UNO	HCC	SUNO
Is Hurricane preparedness plan satisfactory?	No	No	No	No	Yes	Yes	Yes	Yes
Did the plan achieve its aims?	No	No	Yes	No	Yes	Yes	Yes	No
Was the plan well tested and validated?	No	No	No	No	Yes	Yes	Yes	Yes
Was the content clear?	No	No	No	No	Yes	Yes	Yes	No
Are emergency contact numbers maintained?	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Is there reliable offsite storage?	No	No	Yes	No	Yes	Yes	Yes	No
Was the type of data storage employed economical?	Yes	Yes	No	Yes	Yes	Yes	Yes	No
What % of courses offered online?	10%	20%	N/A	3%	10%	20%	N/A	25%
What % of course material available on Black Board or any other internet tool?	Optional	100 %	N/A	1%	Optional	100%	N/A	50%
Was there a reliable backup?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was there a data centre co-location?	No	No	No	No	Yes, Colorado	Yes, Baton Rouge	Yes	No

Cost Estimates for Backup and DRP

Table 2 shows the cost estimates for data backup of three universities. The reasons for the variations in costs are due to the backbone of infrastructure and the software being used by each university and their maintenance costs.

Table 2: Cost estimates for data backup and storage per annum for four universities

Parameter	Xavier	UNO	HCC	SUNO
Backup Tapes	N/A*	$61,000	$15,000	$6,000
Offsite Data Storage	N/A*	$4,330	$5,000	$2300
Hardware maintenance	N/A*	$20,000	$6,000	$100,000
Software maintenance	N/A*	$21,600	$500,000	$200,000
Software Purchase for safeguarding the data	N/A*	$60,000	$50,000	$20,000
Number of employees and students the data storage can serve	N/A*	17,063	300,000	3,105
Total	N/A*	$166,930	$576,000	$328,300

*N/A = not available

Outcomes/Findings

When Hurricane Gustav made landfall along the Louisiana coast as a strong Category 2 hurricane on September 1, 2008, about 1.9 million people evacuated with 200,000 being residents of New Orleans alone making it the largest evacuation in the history of Louisiana. All the universities closed their campuses for the entire week.

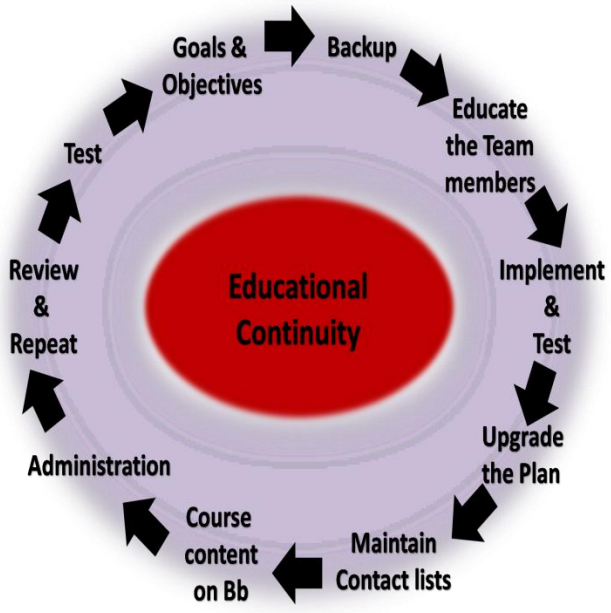
During and after Hurricane Gustav, websites of Xavier University of New Orleans and University of New Orleans continued to function. Although SUNO experienced no data loss during Hurricane Gustav its local website, black board and the email services were down and students faced difficulty contacting faculty and staff for any valuable information. SUNO does not have a failover plan that includes Domain Name Services (DNS). The lack of a failover plan for DNS caused failure resolution for www.suno.edu. Therefore, students and faculty could not log on to the website. Students and faculty had to use www.sunoonline.com instead. This caused problems because everyone was not aware of www.sunoonline.com. This proves that SUNO is not yet adequately prepared for disasters and that it needs a comprehensive DRP to face such situations in future. Fortunately, SUNO was not affected directly by Hurricanes Gustav and Ike. Had this happened, SUNO would have been in a situation similar to that which occurred after Hurricane Katrina. Although its DRP has been drafted, SUNO lags in its implementation. It is recommended that SUNO act aggressively to put its DRP in place before it faces any such disasters in future.

With wind gusts approaching 100 mph, the 600-mile-wide category 2 Hurricane Ike hit Houston on the night of September 12, 2008. Though HCC was not much affected, predictably, the storm caused widespread power outage in the area, including at HCC. The power outage at HCC disrupted the college's primary data centre. However, HCC's system was equipped to cope with such a situation; the college immediately shifted the IP address of the primary data centre to the secondary data centre, and the operations thus continued with minimum disruption. Experience from other universities offer many practical lessons for institutions that are subject to such catastrophic events.

Proposed Model for Successful Educational Continuity

The model consists of ten steps; the first step in disaster planning is, of course, to acknowledge the possibility of a disaster. New Orleans will always be vulnerable to hurricanes (Blaisdell, 2006), so it is vital that all the colleges and universities prepare a contingency plan of their own to ensure that their business operations will not come to a halt. This encompasses a comprehensive, strategic approach to maintaining business operations while protecting one's organization from a host of risks including hardware failure, viruses, theft, fire, and other natural disasters. The most common mistake is not planning for a potential disaster. The reasons for lack of preparation include fear that it will cost too much or the belief that one's business is too small to be affected.

Figure 3: Model for successful educational continuity



Thus, the following steps are essential for successful continuity strategies:

Step 1: Identify and analyze goals and objectives based on the needs of the organization to create an efficient plan, since disaster planning is not a one-size-fits-all concept. The primary objective of the plan should be to enable an organization to survive a disaster and to re-establish normal operations as early as possible.

Step 2: Issues like prioritizing the type of data to be stored, the type of backup needed and the time period of data storage must be considered. Choosing a secure storage location offsite must be addressed very carefully.

Step 3: Educating the team members of the DRP and the employees with the organization's DRP is vital to mitigate the risks during the event occurrence. Every university prone to such

disasters must deliver a power point presentation about their DRP including tips to be followed during the event, instead of just posting the plan on the website.

Step 4: Implement the DRP and validate the results obtained according to the needs of the organization and test the plan regularly under various conditions for its enhancement.

Step 5: Upgrade the plan periodically to reflect organizational changes and technological advancements. Technology plays a vital role in any business where data is crucial. A proper platform must be created for businesses to keep up to date with the latest technology so as to remain compatible for safeguarding their data.

Step 6: Build solid contact lists and update them regularly to establish a clear means of communication during a disaster.

Step 7: For colleges and universities, the DRP must necessitate updating all course content, syllabi, and student-faculty contact information on Blackboard each semester whether they are taught online or not. This helps the faculty and students to continue their work while going through a disaster. Otherwise, an inexpensive piece of backup media such as a writable CD could mean the difference between business disaster and business survival. Depending on the amount of critical information one needs to protect, there is a wide array of affordable media available such as flash drive, floppy disk etc.

Step 8: The administration must ensure that faculties are uploading their course content on the Blackboard every semester, and the material must be checked by the black board administrator to make sure that the complete course requirement (syllabi, course material, schedule, faculty contact information, etc.) are uploaded.

Step 9: Review, analyze, update, and repeat the entire process of step 1 through step 8 periodically, depending on the sensitivity of the data and the requirements of the organization.

Step 10: Test, test, and test. No plan is complete until it is tested. Testing helps adapt changes in the business and its technology infrastructure. In fact, testing is the only way to identify weaknesses in the plan and consequently address such weaknesses. Until the plan is tested, it cannot be considered usable.

Conclusion & Recommendations

Events such as Hurricane Katrina, Gustav, and Ike show that SUNO is not adequately prepared for the future. Though SUNO has spent thousands of dollars to maintain the latest software to run its mainframe activities, its failure to achieve its goals was evident during Gustav's landfall in south eastern Louisiana. While UNO, Xavier and HCC maintained functioning websites during the recent Hurricanes Gustav and Ike by rolling over their IP addresses to their remote web servers, SUNO failed to achieve this critical goal.

This failure occurred despite the fact that SUNO spends far more per capita than any other institutions being studied. The total annual cost of data backup and storage for UNO, HCC, and SUNO are $166,930, $576,000 and $328,300, respectively. In summary, SUNO's management must reconsider its DRP and data backup procedures for successful educational continuity. It must implement what had been drafted on paper. Developing and implementing a well-organized DRP will directly affect the recovery capabilities of the university.

The extensive analysis of the DRP's of the four institutions has led to the conclusion that the 10-step model proposed here would best serve the long term needs of any institution of higher education regardless of its location.

References

Blaisdell, M. (2006). *How Ready is Ready?* Retrieved June 15, 2008, from the World Wide Web: http://campustechnology.com/articles/41204/

Chin,P. (2005). Retrieved June 17, 2008 from the World Wide Web: http://www.intranetjournal.com/articles/200503/ij_03_24_05a.html

Cisco Systems, (2008). *Planning for the Unexpected Disaster. Retrieved August 16, 2008* from the World Wide Web: http://itresources.whatis.com/document;94621/tech-research.htm

Computerworld. (2006). *Protecting Critical Data in Small Organizations: Disaster Recovery, Business Continuity and Other Key Aspects of IT Strategy*. Retrieved July 8, 2008, from the World Wide Web: http://www.computerworlduk.com/whitepapers/index.cfm?whitepaperid=3605

Hoyles, M. (2007). *Data Loss - The Scariest Term in Business Today.* Retrieved August 4, 2008, from the World Wide Web: http://www.articlestree.com/business/data-loss-the-scariest-term-in-business-today-tx486411.html

InfoSec. (2008). *Business Continuity Planning and Disaster Recovery Planning.* Retrieved July 3, 2008, from the World Wide Web: https://infosec.uga.edu/oldsite/bcpdrp/index.php

Kevin H. Klein and Patricia A. Joseph. (2007). *Information Technology Disaster Planning: Lessons Learned from Katrina.* Retrieved June 13, 2008, from the World Wide Web: *http://isedj.org/isecon/2007/3122/ISECON.2007.Klein.pdf*

Microsoft. (2008). Retrieved May 27, 2008, from the World Wide Web: http://64.233.169.104/search?q=cache:MHetuTzCeTIJ:searchsecurity.techtarget.com/sDefinition/0,,sid14_gci752089,00.html+It+is+common+for+an+organization+to+spend+25%25+of+its+IT+budget+on+disaster+recovery&hl=en&ct=clnk&cd=2&gl=us

Oskar, P. (2006). *Natural Disaster Causes 3% of Data Loss.* Retrieved May 23, 2008, from the World Wide Web: http://www.buzzle.com/editorials/9-4-2006-107556.asp

Remote Data Backup. (2004). *Data Loss Facts & Figures.* Retrieved June 15, 2008, from the World Wide Web: http://74.125.45.104/search?q=cache:9_WiBls86eMJ:www.data_/restoration_services.com//What%2520is%2520Data%2520Loss.pdf+%2412+billion+is+spent+on+data+loss+along+with+%2455+billion+computer+virus+damage&hl=en&ct=clnk&cd=1&gl=us&client=firefox-a

Schaffhauser, D. (2005). *Disaster Recovery: The Time Is Now*. Retrieved June 17, 2008, from the World Wide Web: http://campustechnology.com/articles/40565_3/

Solid Data Corporation. (2008). Retrieved May 20, 2008, from the World Wide Web: https://secure.solidit.net.au/soliddata/signup.php?affiliate=222

THE NET GENERATION: CAN THEY REALLY WALK THE TALK?

Margaret S. Kilcoyne, Northwestern State University
Julie McDonald, Northwestern State University
Brenda L. Hanson, Northwestern State University
Sue Champion, Northwestern State University
Margaret Garland, Northwestern State University
Glenn Maples, Northwestern State University

Introduction

Today's students, those currently leaving high schools and entering colleges and universities, are supposed to be the digitally literate generation. The group of students born between 1982 and 1991 has been labeled as "the net generation" (Jones, 2007; Oblinger, D., & Oblinger, J., 2006; Skiba & Barton, 2006).

Many students seem to feel confident with technology because they can use an IPOD and text with a cell phone. That is, these students may have confidence in their digital literacy simply because they have successfully mastered a small portion of the available technology. ("A Digital Decade", 2007; Hargittai, 2005; Oblinger, D. & Oblinger, J., 2006)

Student confidence is an important question for educators. There is ample evidence that confidence can be an asset in both learning and performance. For instance, increased confidence has long been shown to lead to increased learning in mathematics (Morris & Bowling, 1979) and sports performance (Woodman & Hardy, 2003). However, overconfidence leads to biases likely to inhibit learning and leads to poorer performance (Alba & Hutchinson, 2000).

Thus, the question of whether the general confidence of students in their mastery of technology is warranted, or if this confidence is misplaced becomes important. The answer to this question is critical in determining the goals and delivery methods of classes focused on teaching the digital literacy skills required for success in an academic environment.

Our research operationalizes this question of functional digital literacy by examining students' knowledge associated with the Internet/World Wide Web and their confidence in that knowledge. The objectives of the study are: (1) to investigate the relationship between students' knowledge of the World Wide Web and their confidence in that knowledge; and, (2) to examine the extent to which students are overconfident in this knowledge. Data collected from this study will be used to implement revisions to the subject matter taught in a computer literacy course offered at the post-secondary level.

Population

The target population of the study was defined as high school seniors and entering first time college/university freshmen in the United States. The accessible population of the study was operationally defined as high school seniors (scheduled to graduate fall 2008 or spring 2009) in a southern rural high school (1,281) and entering College of Business freshmen (0 earned hours) enrolled in a college orientation class at a small regionally accredited four-year university.

Instrument

The survey instrument was developed by reviewing items from a previously conducted study (Hargittai, 2005) and the development of questions from review of current literature (Shelly & Vermaat, 2008). Students will not be asked any personal or identifiable information. The modified instrument was divided into five sections. The first section of the study asked the respondents whether they were at least 18 years old as of their last birthday. If the respondents answered yes, then they were instructed to proceed with the survey; but if they answered no, they were to stop. For the orientation class only, the respondents were asked to provide the name of their high school and the state in which the high school was located. Student respondents were asked to check all classes that they had taken at their high school. The classes listed were Computer Science, Computer Literacy, and Business Computer Applications. For the orientation class only an additional category called 'Other' was listed.

The second section of the survey asked the respondents four yes/no questions about their internet literacy knowledge. The third section of the survey requested that the respondents provide their perceived understanding of 38 preselected internet-related items with 1-no understanding to 5-full understanding. The fourth section of the survey using multiple choice questions (objective test) asked the respondents to select the appropriate definition for each one of the 38 preselected internet-related items. The fifth section of the survey using a Likert scale (1-not at all skilled to 5-expert) asked the respondents to rate perception of their overall Internet/World Wide Web knowledge.

Procedure

In the fall of 2008 those entering college/university freshmen enrolled in the College of Business freshmen orientation section and all graduating high school seniors from a local high school were surveyed.

Graduating high school seniors: At the beginning of the class, the researcher informed the high school students that their participation in the study was voluntary and confidential. Verbal directions were provided about the study. Next, the researcher instructed the students to complete the survey. The first question of the high school survey asked the students as of your last birthday, are you 18 years old or older? If yes, then proceed with the survey. If no, stop here. The students were given 25 minutes to complete the survey.

Freshmen enrolled in the College of Business freshmen orientation section: At the beginning of the class, the researcher informed the College of Business freshmen orientation class that a survey had been launched on Blackboard (Blackboard is a web-based course management system used as a component of all courses taught at the University). The students were informed that their participation in the study was voluntary and confidential. Verbal directions were provided about the study. Next, the researcher instructed the students to complete the survey.

Data Analysis and Results

The data obtained was analyzed using appropriate descriptive and correlational statistical tests. The following interpretative scale was used:
less than 1.50—no understanding;
1.50 to 2.49—little understanding;
2.50 to 3.50—some understanding;
3.51 to 4.50—good understanding; and greater than 4.50—full understanding.

Data collected from the two groups (high school seniors and college freshmen) was examined for significant differences between the two groups. Generally the groups were comparable, with the college freshmen performing (on average) a few percent better on the objective test. Based on the measures examined, it was decided to combine the two groups for the purpose of this analysis. This decision was confirmed by re- running the analyses described below for the freshmen group and getting the same results as those derived from the combined group. Since the study examined first semester freshman in their first few weeks on campus, their similarity to high school seniors is not unexpected.

Measures for Confidence

Student confidence in their overall knowledge was operationalized in two ways. First, confidence was measured on a 1-5 scale for each of the 38 items related to the WWW (third section of instrument) before the student took the knowledge test. The average for these ratings was computed for each student as an overall level of confidence (AVGCONF). Second, a summary question asked the students their overall confidence (fifth section of instrument) after the objective test (fourth section of instrument) (POSTCONF).

Performance was measured as the total number correct on the 38-item objective test (PERF).

Skill was measured by summing the students' responses on the four items (second section) asking students' perceptions of their abilities to perform specific, WWW-related tasks (SKILLS).

Another measure COURSES was computed as the sum of the number of technology courses students had completed before the study. This measure is not reported below as it was not directly associated with increased performance or confidence. COURSES was significantly related to SKILLS.

The descriptive statistics for the measures are provided in Table 1. These statistics show:

- The confidence indicated after the objective test (POSTCONF) was higher than the average confidence before the test (OBJCONF). A paired t-Test showed this difference to be significant at the .01 level.
- The average number of skills (SKILLS) that the students self-reported that they could perform was 3.4 out of a possible maximum of 4.
- The average performance on the objective test was 16.0 out of a possible maximum score of 38 or 42%.

Correlation tests were conducted to examine the strengths of the associations among the variables. These correlations are summarized in Table 2. These correlations show:

- The overall confidence of students measured before the objective test (AVGCONF) was strongly correlated with all three of the other variables (PERF, POSTCONF, SKILLS)
- Performance on the objective test (PERF) was highly associated with all three of the other variables (AVGCONF, POSTCONF, SKILLS)
- PERF was NOT significantly associated with student confidence after the test (POSTCONF).

It seems reasonable for students who performed well on a test to see an increase in confidence while those that performed poorly to have a decreased confidence. To capture this idea, the difference between each student's average confidence before the test (AVFCONF) and his or her corresponding confidence after the test (POSTCONF) was calculated. The resulting variable (DELTACONF) indicates whether confidence increased or decreased. Similarly, student performance was divided into LO, MID (middle two quartiles) and HI quartiles. The resulting contingency table is shown in Table 3.

Table 3 shows the change in students' levels of confidence, grouped by performance on the objective tests. Twenty-nine students in the highest group of performers (HI) exhibited an increase in confidence while 18 showed decreased confidence. Similarly, 52 students in the middle two quartiles showed increased confidence (30 decreased) and 34 students in the lowest performing quartile indicated increased confidence (13 decreased).

Discussion

Student confidence is a two-edged sword in education. On one hand, good teachers fight to instill a certain level of confidence in their students, knowing that higher confidence generally leads to higher performance. On the other hand, too much confidence paints an unrealistic picture for students leading to reduced effort.

The data collected indicates that, as would be expected, increased confidence is associated with increased performance. This outcome is congruent with similar results in areas as diverse as mathematics and track. Performance is also significantly associated with mastery of skills.

The lack of a direct significant association between the number of technology classes taken by a student and his or her performance was not expected by the researchers. One possible explanation is that the test had a large number of items not taught in the high school technology classes.

The results indicate that the students taking the test greatly over estimated their own mastery of technology. Before the test, students were given a set of questions asking for their confidence in their knowledge in 38 specific areas. The average knowledge rating (AVG CONF) was 2.52. The students then took the test and scored an average of 42% correct. Despite this abysmal performance, the students then rate their average ability (POSTCONF) at 2.99. In fact, 34 of the 47 students who were the lowest performers rated their overall ability as higher.

A limitation of the study is the different confidence measures used before and after the test. The use of two different techniques, one an average of 32 specific measures and the other a single summary question, tends to confound the reasons for this over confidence.

Implications

This research suggests that when teaching computer literacy, instructors should place more emphasis on students learning specific skills tied to computer literacy. This seems to promote the widely held belief of best practices that students engaged in active learning are more likely to learn than those who are simply listening.

This research also suggests that teachers may need to "burst the bubble" of students before they are ready to learn. Stripping away a layer of overconfidence may help average students to realize that they need to place more effort into mastering computer literacy, as they may not know as much as they perceive they do.

References

A digital decade. (2007, March 29). *Education Week.* Retrieved September 25, 2008, from Academic Search Complete database.

Alba, J.W., & Hutchinson, J.W. (2000, December). Knowledge calibration: What consumers know and what they think they know. *Journal of Consumer Research, 27*(2), 123-56.

Hargittai, E., (2005, Fall). Survey measures of web-oriented digital literacy. *Social Science Computer Review*, *23*(3), 371-379.

Jones, D. C. (2007, Spring). Thinking critically about digital literacy: A learning sequence on pens, pages and pixels. *Pedagogy, 7*(2), 2007-221. Retrieved September 17, 2008, from EBSCO Publishing.

Morris, C. J., & Bowling, J. M. (1979). Math confidence and performance as a function of individual differences in math aptitude. Paper presented at the 1979 meeting of American Educational Research Association.

Oblinger, D., & Oblinger, J. (2006, Spring). Is it age or it: First steps toward understanding the net gernation. *CSLA Journal, 29*(2). 8-16. Retrieved September 1, 2008, from Academic Search Complete database.

Shelly, G. B., & Vermaat, M. E., (2008). *Discovering Computers 2009 Complete*. Course Technology: Boston, MA.

Skiba, D., & Barton, A. (2006, May). Adapting your teaching to accommodate the net generation of learners. *Online Journal of Issues in Nursing, 11*(2), 15-15. Retrieved September 18, 2008, from Academic Search Complete database.

Woodman, T., & Hardy, L. (2003). The relative impact of cognitive anxiety and self-confidence upon sports performance: a meta-analysis. *Journal of Sports Sciences*, 21, 443-457.

Table 1 - Descriptive Statistics for Measures

		AVGCONF	SKILLS	PERF	POSTCONF
N		200	221	196	223
Missing/Incomplete		27	6	31	4
Mean		2.5203	3.4118	16.0357	2.99
Std. Deviation		.91490	.99893	4.30548	.949
Skewness		.496	-1.701	.632	.273
Std. Error of Skewness		.172	.164	.174	.163
Minimum		1.00	.00	6.00	1
Maximum		5.00	4.00	31.00	5
Percentiles	25	1.7961	3.0000	13.0000	2.00
	50	2.4342	4.0000	15.0000	3.00
	75	3.1250	4.0000	19.0000	3.00

Table 2 - Measure Correlations

		POSTCONF	AVGCONF	PERF	SKILLS
POSTCONF	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	223			
AVGCONF	Pearson Correlation	.549(**)	1		
	Sig. (2-tailed)	.000			
	N	197	200		
PERF	Pearson Correlation	.134	.304(**)	1	
	Sig. (2-tailed)	.063	.000		
	N	193	178	196	
SKILLS	Pearson Correlation	.305(**)	.410(**)	.284(**)	1
	Sig. (2-tailed)	.000	.000	.000	
	N	217	195	192	221

* Significant at .05 level ** Significant at .01 level

Table 3 - Change in Confidence vs. Performance

		CONF		
		Increase	Decrease	Total
PERF Quartile	LO	34	13	47
	MID	52	30	82
	HI	29	18	47
Total		115	61	176