A PEDAGOGICAL TOOL FOR THE DEVELOPMENT OF INFORMATION SYSTEMS PROJECT TEAM COLLABORATION SKILLS

Raymond Angelo, Quinnipiac University, raymond.angelo@quinnipiac.edu
Richard McCarthy, Quinnipiac University, richard.mccarthy@quinnipiac.edu

ABSTRACT

Group collaboration skills are critical to team and project success. Despite the high price of project failure information systems programs have struggled to develop replicable, validated, quantitative methods and tools to promote the development of group collaboration and knowledge building, when teaching project management. This research presents a pedagogical tool designed to address this need. The tool is based on scenarios, and utilizes the computer-supported collaborative learning tool of asynchronous discussion boards; a common tool for geographically dispersed project teams. Based on three years of research in five classes, the results of this study demonstrate statistically significant growth of group collaboration skills by student teams through five problem scenarios. The applicability of this tool, including addressing changing approaches when teaching project management, is discussed.

Keywords: Computer-supported collaborative learning, scenarios, information systems project management

INTRODUCTION

Approximately half of the information systems (IS) projects implemented each year are considered failures [5, 18, 35]. These failed projects cost billions of dollars annually [13, 33]. Failures can be due to projects being delivered late, over-budget, abandoned after significant time and resource investment, or failing to achieve desired results. More often than not, the failure of a project is not due to technical issues, but due to social or business-related problems. These issues can include a communication breakdown and lack of participation by project stakeholders; lack of a business case and success criteria for a project; failure to review project status, delays and revisions; or unrealistic schedules [2]. Tiwana and Keil [34] reported that $1 trillion of the $2.5 trillion spent on information systems projects between 1997 and 2001 was spent on underperforming projects, which, for the most part, ultimately failed. By 2009 companies in the United States alone spent in excess of $75 billion annually on failed projects [25]. In 2012 it was estimated that nearly $3 trillion dollars was lost on failed projects worldwide [20].

Information systems project management education can target the need to build collaboration and group knowledge construction skills, and sensitivity to project social issues in students [1, 17, 36]. Building collaboration skills in future information systems project members will lead to greater awareness of issues that can contribute to IT project failure [23]. Through building collaboration skills students can become more successful in recognizing and addressing the critical social risk issues in projects with team members and clients.

This research supports the development of a classroom-based tool that contributes to collaboration and group knowledge building, by dealing with "real world" project issues. Developing a tool that uses business scenarios is consistent with research of Scardamalia and Bereiter [29], who argued that knowledge building pedagogy is based on the premise that authentic creative knowledge work can take place in school classrooms; and knowledge in the classroom community should apply to business and industry. Scardamalia [28] contends that when knowledge building fails, it is usually because of a failure to deal with problems that are authentic for students. This makes exercises inapplicable to connecting to the "larger world" and the tasks or problems perceived by the students are as mere exercises.

De Wever, Van Keer, Schellens, and Valke [8] used the Interaction Analysis Method (IAM) (Gunawardena, Lowe, & Anderson [14] to study the increase in knowledge construction, as measured between the four consecutive discussion groups, as students became more adept at collaboration and knowledge construction. De Wever et al. [8] pointed out the impact of role assignments on the level of knowledge construction. In their work, all groups utilized summarizer and contributor roles in their discussions. Using an analysis scheme to identify message characteristics, results indicated summarizers' contributions focused on theory, content moderating, or summary results. This research showed significantly higher levels of phases of knowledge construction by summarizers in comparison to those of other contributors. The authors concluded that the summarizer seemed to increase students' awareness of group interaction and collaboration, bringing attention to the group process and driving knowledge construction. The summarizer will become a key component in this research.

Stahl [31] noted that computer supported collaborative learning (CSCL) addresses all levels of formal and informal education. Along with this proliferation of technology, working collaboratively within groups has become a focus of educational institutions.

In the development of CSCL research Francescato, Porcelli, Mebane, Cuddetta, Klobas, and Renzi [12] indicated that in the 1980s and early 1990s attention was centered on the individual-centric computer assisted learning, based on constructivist principles. This type of learning did not consider social interaction or group knowledge building in computer-based learning environments. However, in a recent text on collaborative knowledge building, Stahl [32] indicated that a weakness in CSCL studies is that they continue to focus on the individual and not the group. Herrington [16] discussed collaboration needs to be at the basis of the construction of knowledge, and activities should provide the time for student reflection on context and meaning.

Weinberger, Stegman and Fischer [37] described how collaborative learning in small groups should focus on how learners influence one another, and how thinking and knowledge converge.

This study builds a tool to provide student project teams the opportunity to collaborate and develop group knowledge building skills to address information systems project management issues. It is based on a series of scenarios that reflect serious issues in a failing IS project.

The Interaction Analysis Model

Table 1 shows the IAM, which was used in this study for examining social construction of knowledge in discussion groups. In particular, the tool was used to determine to what extent the discussion postings for each scenario reflected the phases of knowledge construction. Higher phases in the scale represent higher order knowledge construction (weight). Students were placed in teams and used discussion boards to address five problem scenarios.

Table 1: Interaction Analysis Model (IAM)

Phase	Weight
Phase 1: Sharing/Comparing of Information	1
A. Statement of observation or opinion B. Statement of agreement from one or more other participants C. Corroborating examples provided by one or more participants D. Asking and answering questions to clarify details of statements E. Definition, description, or identification of a problem	
Phase 2: The Discovery and Exploration of Dissonance or Inconsistency among ideas, concepts or statements	2
A. Identifying and stating areas of disagreement B. Asking and answering questions to clarify the source and extent of disagreement C. Restating the participant's position and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view	
Phase 3: Negotiation of Meaning/Co-Construction of Knowledge	3
A. Negotiation or clarification of the meaning of terms B. Negotiation of the relative weight to be assigned to types of argument C. Identification of areas of agreement or overlap among conflicting concepts D. Proposal and negotiation of new statements embodying compromise, co-construction E. Proposal of integrating or accommodating metaphors and analogies	
Phase 4: Testing and Modification of Proposed Synthesis or Co-Construction	4
A. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture B. Testing against existing cognitive schema C. Testing against personal experience D. Testing against formal data collected E. Testing against contradictory testimony in the literature	
Phase 5: Agreement Statements/Applications of Newly-Constructed Meaning	5
A. Summarization Agreements B. Applications of new knowledge C. Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction	

Validity of the IAM Scale

The use of IAM has been replicated or cited in over 400 studies. In terms of validation, Schellens and Valcke [30]; De Wever et al. [9]; and Marra, Moore and Klimczak [24] developed studies using IAM and demonstrated .70, .83, and .93 inter-rater reliability, respectively, on the coding of messages.

The overarching research question was: To what extent do the students demonstrate group knowledge construction while working on scenarios as a team in an online discussion forum, as measured by the IAM?

METHODOLOGY

Sample Population

Fourteen discussion groups of 75 students participated in this study. The study was conducted over 3 years, with students from two universities. Students in these groups worked as a team using the discussion board to collaborate and address the problem scenarios.

Participants included a sample of computer information system majors at two major universities in Connecticut. Of the total of 75 students, 32 were undergraduates and 43 were graduate students. Students were recruited as part of the courses of study for various courses in which they were enrolled, and received extra credit for voluntarily participating in this research. There were 64 males and 11 females in this study.

Procedures

To begin this study a meeting was held with the primary investigator and the 75 students in the five classes to present the assignment. The simulation began with the presentation to the class of a request for proposal (RFP) that the XYZ Corporation has presented to various vendors, and that the ABC consulting company has competed for and won. In addition a project plan was presented, and project teams needed to work with and maintain this plan. The plan and RFP were deliberately "ill-defined" to create issues for discussion and to enable students to develop and modify the plan as issues arose.

Students were presented with scenarios on a weekly basis. Discussion group members submitted individual postings and a proposal for resolution by the end of each week. All students in this study had access to e-learning tools, available through Blackboard Vista®, such as discussion forums, electronic mail, and announcements. The discussion groups consisted of fourteen teams of five or six students. Discussion groups were used to address issues that were presented to the teams, and were moderated by rotating students acting as project manager (project managers rotated for each scenario) for each issue was presented to the team. All group communications were "virtual" through the discussion boards. Issues were presented to the teams by way of fictional memorandums and electronic mail, to and from the client; the Chief Information Officer, to the consulting project leader. The principal investigator acted as the fictional CIO as questions arose. Issues were discussed in the forums by students and the instructor, in the role of the fictional CIO only. The instructor clarified issues and answered questions with only two postings, but did not guide the knowledge building. This process replicated the "working world" where team meetings occur more infrequently than "virtual" project meetings. In the spirit of active learning, and to drive group knowledge building, teams were required to drive each issue to resolution and put project constructs in place to address the issues in a programmatic way.

A rotating project manager within each discussion group was designated for each problem and had the responsibility of summarizing and articulating the group's solution; therefore, the project manager was the "summarizer," as described in the research of De Wever et al. [7]. The project manager was a member of the team. The project manager rotated with each scenario, so with a few exceptions, where groups were greater than five members, each member of each team was the project manager for one scenario. In each of the project issues presented in the scenarios, the teams were asked to reach agreement as to the necessary course of action to address the particular problem.

Establishment of inter-rater reliability for the assessment of the IAM Scale
There were two raters who evaluated the postings in this study. In order to establish the inter-rater reliability of the two raters of the students' contributions to the asynchronous discussion boards, postings from discussion groups' samples of 30 postings from class discussions that preceded this research were used. This also provided experts ample "practice" with the scale, as well as the discussion scenario topics. The goal was to have the raters assess the discussion groups until they reached 70% inter-rater reliability based on Cohen's kappa coefficient. According Landis and Koch [21], 70% inter-rater reliability would demonstrate substantial agreement. The raters in this research achieved 85% inter-rater reliability.

Social Risks Subscale Items and Validation
Problems addressed by the discussion groups were presented in five real-world scenarios that represented issues in a troubled information systems project. The scenarios were based on electronic mail communications between the Chief Information Officer of a client and the students, who represented a consulting group working on the project. Students were placed in "balanced" discussion groups based on their scores on the Social Risk Subscale, which was developed for this study. This was done to form groups that had a similar initial group-level sensitivity to "social and business" risks to project failure prior to the discussions.

These scenarios were devised for this study to align with project failure issues presented by Kappelman, McKeeman, and Zhang [19]. The authors surveyed 55 IT project managers to find the top warning signs of project failure. The primary people-related risk was lack of senior management support. Key process-related risks included communication breakdown among stakeholders and having no business case for the project. Keeping in mind that more often than not, the failure of a project is not due to technical issues, but due to social and business-related problems, this scale was designed to direct the building of scenarios that reflected these social business issues. In order to validate the fact that issues that are in the Social Risks Subscale actually represent the social risks that are present in information systems projects, a panel of five experts were asked independently to evaluated the content validity of this scale. These experts are information systems professionals with an average of 17 years in project planning and execution. Using the process described by Rubio, Berg-Weger, Tebb, Lee, and Rauch [27], a "Yes/No" rating form was presented to the experts that represented potential social and business issues identified from the Kappelman and his team. After review of the experts, seven issues were finalized as the Social Issues Subscale. The seven item Social Issues Subscale (see Table 2) was presented to students embedded in an eighteen item scale, masked with 11 non-social or technical issues, which were also part of Kappelman's risk issue, but were technical in nature.

Table 2: Items in Social Issues Subscale and Percentage of Agreement by Experts

Social Risks	Percentage of Agreement by Experts
Communication breakdown among project stakeholders	100%
Key stakeholders do not review and sign off deliverables on a timely basis	100%
Key project stakeholders do not participate in major review meetings	
Lack of top management support of commitment to project	100%
No business case for the project	80%
Project manager cannot effectively lead the team and communicate with clients	100 %
Schedule deadline not reconciled to the project schedule	80%

The five information system professional raters assessed the presence of the social risks in each of the five scenarios. Assessments for each rater are shown in Table 3. The last column indicates that 80% of the raters agreed that a social risk was identified in the particular scenario. It should be noted that each social risk was represented in two or more scenarios, and all of the scenarios reflected at least two of the social risks.

Table 3: Expert Validation of the Presence of Social Risks in Project Scenarios
Scenarios

Social Risks	**Rater 1**	**Rater 2**	**Rater 3**	**Rater 4**	**Rater 5**	80% Consensus
Communication breakdown among project stakeholders	1,2,3,4,5	1,2,34,5	2,3,4,5	1,2,3,4,5	1,2,3,4	1,2,3,4,5
Key project stakeholders do not participate in major review meetings	1,2,3,4,5	1,4	1	1,2,3,4,5	124,5	1,4
Key stakeholders do not review and sign off deliverables on a timely basis	1,2,3,4,5	2,4,5	2	2,3,5	2,4,5	2,5
Lack of top management support of commitment to project	2,3,4,5	2,3,4,5	2,3,4,5	2,3,4,5	2,3,4,5	2,3,4,5
No business case for the project	2,5	2,5	2,5	2,5	2,5	2,5
Project manager cannot effectively lead the team and communicate with clients	1,2,4	3,5	1,2,3	1,2,3,45	1,2,4	2,4
Schedule deadline not reconciled to the project schedule	1,3	1,2,35	1,5	1,5	1,2,3,5	1,2, 5

Students were presented with a list of 18 issues of issues that can contribute to project failure, and the seven social issues were embedded in the scale. Students were asked to rate the critical nature of these potential issues, based on a Likert Scale, 1-10. As discusses, students were placed in discussion groups based on their perceived criticality of the social issues. This was done to balance each group's predisposition to sensitivity to these issues.

To evaluate the research question, a content analysis of messages for levels of knowledge construction posted by participants in asynchronous discussions groups was conducted. The assessment was based on the IAM instrument developed by Gunawardena, Lowe, and Anderson [14] and was used to measure knowledge construction. Group scores measured higher order knowledge construction on the knowledge construction score (IAM), between the five problem scenarios, as applied to the discussions postings.
H_1: There will be no statistically significant difference in the growth of higher order knowledge construction, as reflected by group scores on the knowledge construction score (IAM), between the five problem scenarios, as the participants' progress through them. The independent variable was the assessment scenario. The dependent variable was the level of knowledge construction reflected in the five scenarios, as measured by the IAM.

As indicated, the independent variable for this hypothesis was the project scenarios, with five levels, corresponding to each scenario presented. The five dependent variable measures are the average scores for the aggregate postings, or IAM Phase weight, for the combined discussion groups for each of the scenarios. The scores for each of the postings were determined by the IAM phase weights assigned each individual posting by two raters. One average aggregate score for the discussion groups on the IAM represented each experimental condition for each of the five successive scenario conditions. The scenarios are presented in Appendix A.

RESULTS

There were a total of 1131 discussion postings across all of the fourteen discussion groups. Since each scenario was evaluated by two raters, the average score for each posting was used in this analysis. An ANOVA revealed that there was a statistically significant difference between the IAM for the five scenarios for the total sample (F [4, 1126] = 13.367, p = .001). Table 4 shows the IAM score for the combined eight discussion groups by scenario.

Table 4: Discussion Postings: IAM Scale

Scenario	Mean	N	Standard Deviation
1	1.8310	284	1.20861
2	1.8945	218	1.21639
3	2.1583	240	1.22215
4	2.3690	187	1.25304
5	2.5074	202	1.09098
Total	2.1225	1131	1.22647

Table 5 shows the ANOVA for the discussion postings for all the discussion groups.

Table 5: Analysis of Variance

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	77.067	4	19.267	13.369	.000**
Within Groups	1622.723	1126	1.441		
Total	1699.790	1130			

*p < .05, ** p < .01

As shown in Table 6, the Tukey HSD test was applied to compare the means of each scenario to identify where differences between the pairs of means were statistically significant. The level of collaboration, or learning to collaborate [3], had developed significantly through this study. This is evidenced by the fact that by the third scenario, the IAM score had reached a statistically significant difference level of collaboration, when compared to the first two scenarios. This persisted for scenario 4 and 5. Also, there was a consistent statistically significant growth in the IAM Score from scenario one though five.

There do not appear to be any characteristics of the scenarios themselves that would account for the sequential increase in collaboration. In their research using problem scenarios, De Wever et al. [8] reported if tasks are very complex or very straightforward, students will demonstrate significantly lower levels of knowledge construction, when compared to tasks of moderate complexity. In terms of increased social complexity of scenarios, as reflected by the number of social issues presented, scenario two represented the most social issues (six), followed by Scenario Five (five issues), Scenario Four (four issues), Scenario One (Three issues), and Scenario Three (Two issues). Using the measure of number of social issues present in a scenario as a measure of complexity, there would not have been sequential growth in IAM scores; this study did not indicate that complexity was an issue. With regard to the subject matter in each of the scenarios, there does not appear any scenario that was more complex that others, with the exception of Scenario One, which dealt with financial issues. Specifically, Scenario One dealt with project planning issues, Scenario Three dealt with training, and the remaining Scenarios dealt with various issues that the CIO had with his management. The five scenarios did represent a sequence of events over time in one

fictitious company, so students did develop a familiarity with the clients represented in these scenarios. Students were able to refer back to information in previous scenarios, to build a point or view or support or dispute an argument. There was no mechanism in place to determine if the phenomenon of a continuum of scenarios had any effect on progression of collaboration/knowledge building.
Table 6 shows the detail comparisons of the average IAM scores for the combined 14 groups for the five scenarios.

Table 6: Multiple Comparisons of IAM Scores by Scenario for Total Sample

(I) Scenario	(J) Scenario	Mean Difference (I-J)	Std. Error	Significance.
1	2	-.06351	.10810	.977
	3	-.32735*	.10526	.016
	4	-.53800*	.11305	.000
	5	-.67644*	.11049	.000
2	1	.06351	.10810	.977
	3	-.26384	.11232	.130
	4	-.47449*	.11966	.001
	5	-.61293*	.11724	.000
3	1	.32735*	.10526	.6149
	2	.26384	.11232	.5707
	4	-.21065	.11710	.1093
	5	-.34909*	.11463	-.0359
4	1	.53800*	.11305	.8469
	2	.47449*	.11966	.8014
	3	.21065	.11710	.5306
	5	-.13844	.12182	.1944
5	1	.67644*	.11049	.9783
	2	.61293*	.11724	.9333
	3	.34909*	.11463	.6623
	4	.13844	.12182	.4713

*. The mean difference is significant at the 0.05 level.

CONCLUSIONS

The results of this study indicate that we can effect and track the rate of collaboration within a group. This pedagogical research demonstrates a much needed, classroom-based, quantitative tool for assessing group collaboration building. This study begins to addresses the challenges of facilitating collaborative construction of learning, and measuring it. Lin and Lan [22] argue that no research has proposed an approach to evaluate learner's knowledge contributions in web-based collaborative learning environment through a comprehensive assessment activity.

The primary delivery mechanism discussed and deployed was a computer supported collaborative learning construct: asynchronous discussion groups, which are useful in education [7, 8, 10, 30] and utilized in business [6, 15, 17]. This work presents a viable online, as well as hybrid, platform for this type of learning with the utilization of a platform and mechanism common to information systems project management education and business: asynchronous discussion groups.

Furthermore, we must center on the importance of the learners' knowledge contribution in a structured learning activity, to develop skills in knowledge construction, group collaborative process, and cognitive growth [3, 26, 38]. The focus of this research is knowledge construction and collaboration; in particular group knowledge construction. Most research in collaboration has been focused on the learning of individuals. Collaborative learning involves individuals as group members, but also involves phenomena like the negotiation and sharing of meanings—including the construction and maintenance of shared conceptions of tasks—that are accomplished interactively within group processes. Collaborative learning involves individual learning, but is not reducible to it [33]. Project management issues arise when teams do not effectively communicate. We need to take this into account as we develop group exercises that address the team skills that students need to be effective as project team members.

This research addresses three aspects of failure; the failure to educate students to collaborate in groups, and the impact of this failure to groom information systems professionals who can collaborate on and avert information systems project failures. The problem of information systems project failure was also examined. While not disregarding technical issues as a contributor to project failure, the discussion clearly was that the critical business and social issues warrant greater examination. This research used sensitivity to social and business issues in information systems projects as a control method for balanced discussion groups. Future research should examine quantitative approaches to the growth in sensitivity to project issues.

Finally, research from the Pew Institute argues that the future of institutions of higher education will require more efficient collaborative environments. Successful institutions will not just attempt to force technology into existing educational modes, but will develop new ways of enabling collaborative learning. Future application of this tool should address "guided reflection" by the instructors, in the context of peer-to-peer learning [4, 11].

REFERENCES

1. Bernsteiner, R., Ostermann, H., & Staudinger, R. (2008). Facilitating e-Learning with social software: Attitudes and usage from the student's point of view. *International Journal of Web-Based Learning and Teaching Technologies, (3)*, 16-33.
2. Bourne, L. (2010, February) *Beyond Reporting the communication strategy*. Paper presented at the proceedings of PM Global Congress Asia Pacific 2010, Melbourne Australia.
3. Cobos, R., & Pifarre, M. (2008). Collaborative knowledge construction in the web supported by the KnowCat system. *Computers & Education, 50*(3), 962-978.
4. Cortez, C., Nussbaum, M., Woywood, G., & Aravena, R. (2009). Learning to collaborate by collaborating: a face-to-face collaborative activity for measuring and learning basics about teamwork. Journal of Computer Assisted Learning, 25, 126–142.
5. Dalcher, D. and Drevin, L. (2003, September). *Learning from information systems failures by using narrative and ante-narrative methods.* Preceedings of the 2003 annual research conference of the South African institute of computer scientists and information technologists on Enablement through technology, Pretoria, South Africa, 137 – 142.
6. Damian, D., Lanubile, F., & Mallardo, T. (2006, May). *The role of asynchronous discussions in increasing the effectiveness of remote synchronous requirements negotiations*. Paper presented at the Proceedings of the 28th international conference on Software engineering, Orlando, Florida.
7. De Wever, B., Schellens, T., Valcke, M., & Van Keer, H. (2006). Content analysis schemes to analyze transcripts of online asynchronous discussion groups: a review. *Computers & Education, 46,* 6–28.
8. De Wever, B., Van Keer, H., Schellens, T., & Valcke, M. (2007). Applying multilevel modelling to content analysis data: Methodological issues in the study of role assignment in asynchronous discussion groups. *Learning and Instruction, 17*, 436 – 447.
9. De Wever, B., Van Keer, H., Schellens, T., & Valcke, M. (2010). Roles as a structuring tool in online discussion groups: The differential impact of different roles on social knowledge construction. *Computers in Human Behavior, 26*, 516–523.
10. Ellis, T., & Hafner, W. (2008). Building a framework to support project-based collaborative learning experiences in an asynchronous learning network. *Interdisciplinary Journal of E-Learning and Learning Objects, 4*, 167-190.
11. Falkner, K., & Falkner, N. (2012). Supporting and structuring "contributing student pedagogy" in Computer Science curricula Pedagogy and Group Collaboration. *Computer Science Education, 22,* (4), 413–443.
12. Francescato, D., Porcelli, R., Mebane, M., Cuddetta, M., Klobas, J., & Renzi, P. (2005). Evaluation of the efficacy of collaborative learning in face-to-face and computer-supported university contexts. *Computers in Human Behavior, 22*, 163–176.

13. Garg, P., (2010). Critical failure factors for enterprise resource planning implementations in Indian retail organizations: An exploratory study. *Journal of Information Technology Impact, 10* (1), 35-44.
14. Gunawardena, C., Lowe, C., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research, 17*, 397–431.
15. Herbsleb, J., Paulish, D., & Bass, M. (2005, May). *Global software development at Siemens: experience from nine projects.* Paper presented at the Proceedings of the 27th international conference on Software engineering. St. Louis, Missouri.
16. Herrington, J. (2006, October). *Authentic e-Learning in Higher Education: Design principles for authentic learning environments and tasks.* Paper presented at the Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education. Honolulu, Hawaii.
17. Hunt, C., Smith, L., & Chen, M. (2010). Incorporating collaborative technologies into university curricula: lessons learned. *Journal of Computers in Higher Education, 22*, 24–37.
18. Jackson, P., & Klobas, J. (2008). Building knowledge in projects: A practical application of social constructivism to information systems development. *International Journal of Project Management, 26*, 329–337.
19. Kappelman, L., McKeeman, R., & Zhang, L. (2006). Early warning signs of it project failure: The dominant dozen. *Information Systems Management, 23* (4), 31- 36.
20. Kingsman, M. (2012). Worldwide cost of IT failure (revisited): 3 trillion. Retrieved 6/23/14 from http://www.zdnet.com/blog/projectfailures/worldwide-cost-of-it-failure-revisited-3-trillion/15424
21. Landis, J. R., Koch, G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33* (1), 159-174
22. Lin, P., & Lan, Y. (2012). An approach to encouraging and evaluating learner's knowledge contribution in web-based collaborative learning. *Journal of Educational Computing Research, 47*(2) 107-135.
23. Luna-Reyes, L., Zhang, J., Gil-Garcı´a, R., & Cresswell, A. (2005). Information systems development as emergent socio-technical change: a practice approach. *European Journal of Information systems, 14,* 93–105.
24. Marra, R. M., Moore, J. L., & Klimczak, A. K. (2004). Content analysis of online discussion forums: a comparative analysis of protocols. *Educational Technology Research Development, 52,* 23–40.
25. Micheals, P. (2007) *Calculating the cost of failed software projects*. Retrieved 10/24/10 from CompterWeekly.com at http://www.computerweekly.com/Articles/2008/05/06/230115/Calculating-the-cost-of-failed-software-projects.htm**.**
26. Pifarre, M., & Cobos, R. (2009). Evaluation of the development of metacognitive knowledge supported by the KnowCat system. *Educational Technology Research and Development, 57*, 787-799.
27. Rubio, D.M., Berg-Weger, M., Tebb, S., Lee, E., Rauch. S. (2003) Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research, 27,* 94-104.
28. Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In Smith, B. & Bereiter, C. (Eds.), Liberal education in a knowledge society, pp. 67-98. Chicago, Open Court Publishing.
29. Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), Cambridge Handbook of the Learning Sciences (pp. 97-118). New York: Cambridge University Press.
30. Schellens, T., & Valcke, M. (2005). Collaborative learning in asynchronous discussion groups: What about the impact on cognitive processing? *Computers in Human Behavior, 21*, 957–975.
31. Stahl, G. (2005, November). *Sustaining online collaborative problem solving with math proposals*. Paper presented at the International Conference on Computers and Education (ICCE 2005), Singapore, 436-443.
32. Stahl, G. (2006). *Computer Support for Building Collaborative Knowledge*. Cambridge. MA: MIT Press.
33. Stanley, R., & Uden, L. (2012). Why p*rojects fail* from the p*erspective* of s*ervice science* In Uden, L., Herrera, F., Pérez, J. B., & Rodríguez, J. M. C. (2012). *7th international conference on knowledge management in organizations: service and cloud computing*. New York: Springer Publishing Company, Incorporated.

34. Tiwana, A., & Keil, M. (2004). The one-minute risk assessment tool. Communications of the ACM, 47 (11), 73-77
35. Warkentin, M., Moore, R., Bekkering, E., & Johnston, A. (2009). Development project risks: An integrative framework. The DATA BASE for Advances in Information systems, 40 (2), 8-27.
36. Webster, R. & Sudweeks, F. (2006, November). Enabling effective collaborative learning in networked virtual environments. Current Developments in Technology-Assisted Education, pp. 1437-41. Paper presented at Fourth International Conference of Multimedia and Information and Communication Technologies in Education, Seville, Spain.
37. Weinberger, A., Stegmann, K., & Fischer, F. (2007). Knowledge convergence in collaborative learning: Concepts and assessment. Learning and Instruction, 17, 416-426.
38. Yu, F. Y., Liu, Y. H., & Chan, T. W. (2005). A web-based learning system for question posing and peer assessment. Innovations in Education and Teaching International, 42(4), 337-348.

APPENDIX A

The following are the five scenarios that were presented to the discussion groups.

Scenario 1:

To: ABC Project Manager
From: XYZ CIO
Date: April 1, 2011
Re: Project Delays

I am very concerned about the progress, or lack thereof, regarding our network infrastructure implementation. Back in January we reviewed the project costs and deliverables. Your team was supposed to have begun the project implementation by now, in order to finish the project on time. We have secured all of the hardware, software, and have completed the wiring, but due to the cost overruns we have not started the network implementation. This, of course, has put us behind schedule.

Here is what we had budgeted and what we have spent to date:

Category	Budget	Actual	Comments
Routers and switches	70,000	70,000	
Wiring (labor)	20,000	30,000	Labor for contractor inflated due to union raises, over-runs
Consulting		20,000	Task 2 and 3 Complete, Project management 60 hours to date

There are two major problems.

1. You have already burned 60 hours @ $250/hour = $15,000 for project management, and we are have not begun to install anything. I know some other things came up that we did not plan on, but are 2 months behind, and will run out of project management hours before the project ends.
2. We are two months behind schedule.
3. Why was the over-run for labor for wiring charged back to us? This should have been handled by the project manager.

How will you address this? We cannot miss our target date, and we cannot exceed our budget.

Scenario 2

To: ABC Project Manager
From: XYZ CIO
Date: July 1, 2011
Re: Project Status

We have reached a critical stage in our rollout of the network to support our new
E-commerce application. My office is receiving a lot of questions around the business reasons for our implementation. In a meeting of all of the executives last week, I was hit with many questions and resistance to this rollout. Many of the non-technical (business side of the company) executives in our organization are questioning our implementation, including how we can justify the investment that we are making in this project. I am quite surprised at this development, as all of these individuals agreed that we should consider this project back in August of 2009, when we last discussed this as a group. Now, however, when we are informing them of their needed commitment to the project from their teams, they are asking a lot of questions.
How can we address this? I need to connect the technology to the business.

Scenario 3:

To: ABC Project Manager
From: XYZ CIO
Date: July 15, 2011
Re: Train the Trainers

I do not feel that my staff is going to be ready to train the business clients on the use of the system. What can you do to address this? I believe that our original agreement was that your team would provide training and support in this area.

Scenario 4:

To: ABC Project Manager
From: XYZ CIO
Date: July 31, 2011
Re: Business Issues - Urgent

The VP of Sales and Marketing does not agree that we need to make this move to sell our toys to the public. She feels that she needs an explanation in terms of how this will benefit the organization.
The VP of Manufacturing, who also handles shipping, needs to understand how this implementation will affect his organization.
Let me know what we can do.

Scenario 5:
To: ABC Project Manager
From: XYZ CIO
Date: August 15, 2011
Re: Communications

Thanks for addressing the business issues with my management counterparts. I believe that we have reached a point in time where some of the other executives now believe in this project. However, the CEO and CFO are still struggling with the ROI here. We need to get on this quickly. My challenge is how do we maintain this momentum with them? How do we keep all these executives on the same page with us?
I need ideas. This is critical.