Using Collaborative Technologies for Graduate Information Systems Program Planning

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Abstract

The purpose of this study is (1) to propose a systematic collaborative planning model to guide graduate program planning and (2) to share results and lessons learned from the planning model. This study addresses the following research questions:

1. To what extent do internal and external stakeholders perceive the proposed graduate IS curriculum to be viable at MSU?
2. What conclusions and recommendations can be drawn regarding the viability of the collaborative technologies planning model for graduate program planning?

The research presents and applies a three-phase program planning model that effectively incorporates collaborative technology. The model was developed based on recognized theories.

The researchers concluded collaborative technology can be used effectively in graduate information systems program planning. Integration of collaborative technologies into the planning process streamlined and enhanced program development. The process also helped validate competencies deemed important by stakeholders. The researchers provide recommendations for further research and recommendations for successful application of the model into similar environments.

Using Collaborative Technologies in Graduate Information Systems Program Planning

Introduction

Two years ago, through funding from a national grant, the department of Information Systems at Morehead State University (MSU) implemented a wireless Collaborative Technologies laboratory. Initially, the laboratory supported funded project activities which were primarily outreach initiatives. To maximize the effectiveness of the technology, the department explored ways to effectively incorporate collaborative technologies into strategic and program planning and assessment within the university.

This research presents a three-phase planning model designed to inform Graduate Program Development. The model uses feedback via collaborative technology from key stakeholders to inform development and continuous improvement of a graduate information systems program.

Purpose of Study

The purpose of this study is (1) to propose a systematic collaborative planning model to guide graduate program planning and (2) to share results and lessons learned from the planning model.

Review of Literature

Background of Collaborative Technology Systems

A collaborative technology system, also called a Group Decision Support System (GDSS) or a Group Support System (GSS), is a computer-based system often implemented on a local area network. The collaborative system contains software to support meetings and other group work (Dennis et al., 1988). DeSanctis & Gallupe (1987) defined a GDSS as a system that combines communication, computer and decision technologies to support decision making and related activities. Nunamaker et. al., 1997, p. 2) define GSS as “interactive computer-based environments which support concerted and coordinated team effort towards completion of joint tasks.”

Although collaborative technologies have been used for years in the business world (Kraemer & King, 1988), the technologies have only recently been used to support decision making in educational environments (Aiken & Govindarajulu, 1995). According to Aiken and Govindarajulu (1995), educational systems nationwide are using collaborative technologies to foster a shared vision among various stakeholders. According to Aiken (1992) and Klemm & Snell (1994), collaborative technologies are being used to improve education and communication. In education, they are being used to support seminar learning strategies (Aiken, 1992), to validate curriculum development (Aiken et al., 1994; Watson et al., 1990), and, more recently, to support school-based decision making (Aiken & Govindarajulu, 1995).

Effectiveness Studies

Several studies over the last decade have reported that collaborative systems can improve the effectiveness of meetings, support information access, and radically change group dynamics by improving communication, (Nunamaker et. al., in Coleman, 1995; Nunamaker et. al. 1997). Some advantages of collaborative technologies include increased participation, automatic recording of comments and votes, imposition of more structure, and the ability to accomplish more in less time than traditional, non-automated meetings. The net result of these advantages includes high group satisfaction with the meeting process and enabling larger groups to meet, thereby enhancing the knowledge brought to bear on the decisions made (Aiken & Govindarajulu, 1995). In addition, Burdett (2000) concluded GSS has the potential to overcome barriers to women's equal participation in mixed gender meetings, thereby increasing effectiveness and satisfaction of women in the meeting process.

The current researchers extracted six constructs from GSS research, illustrated in Table 1. In developing Table 1, the authors relied heavily, but not exclusively, upon the results from over 150 research studies conducted over the past 12 years at the University of Arizona. (Nunamaker et. al., in Coleman, 1995; Nunamaker et. al, 1997).

Table 1
Lessons Learned from GSS Research

GSS can--
Construct 1: Problem solving/decision making
? structure and focus problem solving efforts
? produce unique ideas of higher quality
? increase the amount of ideas generated during divergent process
Construct 2: Group processes
? establish and maintain alignment between personal and group goals
? help role clarification
? minimize gender inequities
? achieve equal participation due to anonymity and parallel input
? increase energy and group focus due to active participation
? encourage more objective idea evaluation due to anonymity as continuous rather than discrete variable
Construct 3: Leadership/Commitment
? increase the likelihood of "buy in" to the final results
? make a poorly planned meeting worse if leadership is ineffective
? be effectively used with diverse leadership styles, situations and organizational cultures
? help resolve counterproductive conflicts between leadership styles
Construct 4: Bottom line issues
? reduce labor costs by 50% and project time by up to 90%
? improve the quality of ideas through anonymous constructive criticism

- ? lead to improved quality of results
- ? lead to higher participant satisfaction

Construct 5: Situational issues

- ? successfully support multi-language meetings
- ? display different levels of satisfaction implementation in multicultural settings
- ? display behavioral differences across cultures in convergent activities, with high power distance cultures being more resistant
- ? be used effectively in the classroom
- ? be used effectively in Business Process Re-Engineering projects

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To enhance the success of GSS--

Construct 6: Organizational Issues

- ? individuals must have incentives to contribute to the group effort
- ? organizational incentives should be aligned with GSS
- ? maintain GSS competence in the organization
- ? consider successful use of GSS at geographical dispersed sites is still being studied

Theoretical Grounding of Proposed Model

The program planning model used to guide this study is grounded in such recognized theories as social presence theory (Short, Williams & Christie, 1976), social information processing theory (Fulk, Schmitz & Steinfield, 1990), and adaptive structuration theory (DeSanctis & Poole, 1993; Poole & DeSanctis, 1990). Based on these theories, the process recognizes the following variables can effect group decisions: group tasks, presence of a strong leader, bad inter-member relationships, and group norms.

To further ground this study, the research team used a theory-based heuristic model, called the Groupware Grid, useful for assessing the contribution of groupware technology to team productivity (Nunamaker et. al., 1997). Figure 1 illustrates the Groupware Grid.

Along the horizontal axis of the Groupware Grid are the three cognitive processes (communication, deliberation and information access) that, according to the Team Theory of Group Productivity (Briggs, 1994) interfere with each other during group processes, thereby limiting group productivity. Within the communication construct, people attend to choosing words, behaviors, images and artifacts to convey through a medium to other team members. Within deliberation, team members use classic problem-solving activities to form intentions toward achievement of goals. Within the information access construct, members focus upon finding, storing, processing and retrieving information needed to support deliberations. The key function of information, according to the Team Theory of Group Productivity, is to increase the chances of expected outcomes by choosing one course of action over another.

Furthermore, Team Theory posits that the cognitive effort needed to achieve communication, deliberation and information access is motivated by the degree to which interests of individuals are in congruence with the group goal. Given this assumption, the horizontal axis of the Groupware Grid attends to the potential for the technology to affect the cognitive costs of joint effort. In other words, according to the Groupware Grid, groupware may become less productive if the attention demands for communication, deliberation or information access become too high. Conversely, groupware may improve productivity if it reduces the attention costs of these three processes.

The horizontal axis of the Groupware Grid describes three levels of group work. Level one is the individual work level, which means individual efforts that require no coordination. Level two is the coordinated work level, in which the work requires careful coordination between otherwise independent individual efforts. Finally, the concerted, or group dynamics, work level requires continuous concerted effort. Groupware technology is currently available to support all three levels.

Figure 1
The Groupware Grid

	Communication Support	**Deliberation Support**	**Information Access Support**
Concerted/Group Dynamics Level	Anonymity Parallel Contribution	Structured & Focused Processes	Session Transcripts Automatic Concept Classification
Coordinated Level	Asynchronous Communication	Schedule matching Automated workflow Project Management	Shared Data Stores
Individual Level	Preparing Communication Stimuli	Modeling Simulation	Information Filtering Local Data Stores

Nunamaker et. al. (1995) summarized reasons why teamwork can be challenging. Poor teamwork can be influenced by such factors as waiting to speak, domination, fear of speaking, misunderstanding, inattention, lack of focus, inadequate criteria, premature decisions, missing information, distractions, digressions, wrong people, groupthink, poor grasp of problem, ignored alternatives, lack of consensus, poor planning, hidden agendas, conflict, inadequate resources and poorly defined goals. A properly designed facilitation session strives to eliminate or minimize these factors.

Research Questions

This study addresses the following research questions:

1. To what extent do internal and external stakeholders perceive the proposed graduate IS curriculum to be viable at MSU?

2. What conclusions and recommendations can be drawn regarding the viability of the collaborative technologies planning model for graduate program planning?

Methodology, Results and Discussion

Three-Phase Graduate Program Development Model

A Three-Phase Continuous Improvement Program Planning Model, illustrated in Figure 2, was developed by the researchers to inform effective information systems graduate program planning. The researchers used the Nunamaker et. al., 2001, theory-based heuristic model, called the Groupware Grid, to guide the application of the GSS elements within the model. Specifically, the current study employed the elements of the Groupware Grid illustrated in Figure 3.

Figure 2
Three-Phase Graduate IS Program Development Model using Collaborative Technologies

Program Development Phase I

- ✍ Internal and External Information Access
- ✍ Grounded GSS Competency Facilitation Session with External Stakeholders (Advisory Boards)
- ✍ Revision based on feedback from External Stakeholders

Program Development Phase II

- ✍ GSS Program Facilitation Session with Internal Stakeholders (Faculty/Administration)
- ✍ Internal Buy In
- ✍ Revision based on feedback from Internal Stakeholders

Program Development Phase III

- ✍ GSS Program Facilitation Session with target audience stakeholders (Graduate Students)
- ✍ Revision based on feedback from intended audience
- ✍ Final outcome; program proposal
- ✍ Implementation with Continuous Improvement Process

Figure 3
Elements of Groupware Grid Employed in Current Study

	Communication Support	**Deliberation Support**	**Information Access Support**
Concerted/Group Dynamics Level	Anonymity Parallel Contribution	Structured & Focused Processes	Session Transcripts Automatic Concept Classification

To maximize the effectiveness of the collaborative technology, the researchers employed a skilled GSS facilitator. The researchers assumed the use of a skilled facilitator increased the probability of applying key GSS success factors. Further, as recommended by Nunamaker et. al. (1997; Nunamaker, in Coleman, 1995), clear criteria, grounded in current data, were incorporated into the collaborative sessions with stakeholders.

Phase I Results

Phase I planning for the proposed graduate program began in January, 2001. To ground development of the initial concept paper describing the program, the researchers used a national curriculum model (ACM/AIS, 1999) and national and regional employment trend data (National Science Foundation, Freeman & Aspray, 1999; Kentucky Long-term Policy Research Center, 2000).

Phase I activities were completed in February, 2001, when the researchers conducted the collaborative technologies session with the department's national information systems advisory board. National advisory board members were determined to be credible external stakeholders. Using the vote and topic commentator functions of the collaborative technology, the advisory board members identified and ranked key competencies to consider for incorporation into the proposed program. Results are reported in Table 2. The process described below was achieved in less than 30 minutes as part of an advisory board meeting, confirming the efficiency reported in the GSS research literature. The graduate program proposal was then revised based on Phase I results.

Table 2
Phase I Results
Collaborative Technology Competency Voting
National IS Advisory Board, February 19, 2001

10-Point Likert Scale, with 10 High Point
N = 9

Competency	**Mean**	**STD**	**N**	**Total**
Planning & Implementing	8.33	1.87	9	75
Innovation, Change & Tech	8.11	0.33	9	73
Strategic Planning/Managing IT	8.11	1.76	9	73
Advanced Project Mgmt.	8.00	1.31	8	64
Business Process Reengineering	7.89	1.62	9	71
Telecom/Networking	7.56	1.51	9	68
Enterprise Resource Management	7.56	1.51	9	68
C++, Java, HTML, CGI Scripts	7.56	1.88	9	68
Certification Options	7.5	2.07	8	60
Cases in Innovation & IT	7.44	2.13	9	67
Web Information Systems	7.38	.74	8	59
Innovation & Diffusion of Technology	7.38	1.41	8	59
Transformation & Changing Paradigms	7.33	2.00	9	66
Technology as an Enabler for Economic Development	7.22	1.99	9	65
Systems Methodologies & Solutions Development	7.11	2.03	9	64
Data Warehousing and Data Mining	7.11	2.09	9	64
E-Organizations	7.00	1.32	9	63
Virtual Learning Environments/Lifelong Learning/Corporate University	7.00	1.58	9	63
Work Group Computing/Collaborative Technologies	6.89	1.27	9	62
Digital & Interactive Media	6.89	1.69	9	62
Technical Problem Resolution/Help Desk	6.78	1.79	9	61

Management				
Programming for E-Business	6.67	1.22	9	60
Selling Technology to Executive Management	6.5	2.78	8	52
Database Development	6.44	1.94	9	58
Research Strategies in IS (including R&D in corporate environments)	6.33	1.41	9	57
Global Issues	6.33	2.12	9	57
Knowledge Management/Organizational Memory	6.22	1.39	9	56
Advanced OS/Micro Architectures	6.22	1.72	9	56

<u>Phases II and III</u>

During February, 2002, the researchers will conduct Phase II of the study. During Phase II, researchers will direct a facilitated GSS session to selected faculty and administration at MSU. During this session, a SWOT (strengths, weaknesses, opportunities, and threats) analysis will generate results to further inform program refinement. The GSS technology brainstorming and categorizer functions will be used for the SWOT analysis. Pending data availability, the researchers will share results of Phase II to conference participants.

After analysis and refinement of Phase II data, Phase III will be conducted. During Phase III, on-site MSU graduate students will engage in a GSS session using the brainstorming and categorizer collaborative technology functions. The session will be a mirror image of Phase II, using SWOT analysis.

Based on the combined analyses of the activities conducted within the three planning phases, the program proposal will be finalized. After implementation, the graduate program will use collaborative technologies annually/bi-annually to inform continuous future improvement. A SWOT analysis of internal and external stakeholders is anticipated.

Conclusions and Recommendations

Based on this study, the researchers concluded that collaborative technology can be effectively used in graduate information systems program planning. Integration of collaborative technologies into the planning process has streamlined and, more importantly, enhanced program development. In phase I, the process helped validate competencies deemed important by external stakeholders.

The following recommendations are provided to similar program interested in applying the model described in this study:

1. Begin with a review of data/curriculum models to inform the initial program proposal.
2. Once a collaborative technology system is implemented, implement a process to support both the technology and skilled facilitators.
3. Buy-in from key internal and external stakeholders is a key success factor; involve strong key stakeholder representatives in your program planning stages.
4. When planning the graduate curriculum, consider and address internal and external constraints and opportunities within your environment, e.g., strategic plans, accreditation standards, technological infrastructure, faculty expertise, and adequate resources. Emerging internal constraints and opportunities prompted the researchers to significantly alter the program during the middle stages of the planning process.
5. Ensure success factors for successful collaborative technology sessions recommended from research are implemented; typically, given the complexity of the technology, this requires employing a trained facilitator.
6. Keep in mind results from collaborative technologies are designed to inform, not dictate, decisions.

Furthermore, the researchers offer the following recommendations for additional research:

1. Report results of Phases II and III after data collection is concluded.
2. Replicate model in other educational program planning environments to determine and compare success and effectiveness factors.
3. Replicate model with internal and external stakeholders located in geographically distributed locations.
4. Empirically analyze GSS Research factors contained within Table I to determine construct validity.
5. Share the format/structure of the graduate program developed as a result of this process; the current title is Master of Science in Innovation & Global Information Technology.

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