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Supporting Reengineering Using Group Support Systems: A Case Study

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All organizations face the problem of how to divide up work or how to design the organization. In this context, business process reengineering has recently received a great deal of attention. This paper describes a series of meetings of a student housing department using multiple group support systems and manual methods to support the reengineering process in a university housing department. The main findings of this case study are that (1) the appropriate mix of group support systems technologies and manual techniques are instrumental in achieving the success of a meeting; (2) a constant review of the overall meeting design contributes to the success of the meeting; (3) negative and positive aspects of a meeting should be balanced to provide feedback and encouragement to the group; and (4) appropriate support of the group understanding development should be provided.

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Introduction

All organizations face the problem of how to divide up work or how to design the organization. In this context, business process reengineering has recently received a great deal of attention.[1] More and more businesses recognize the need to change to meet more competitive environments. Typically, today's organizational structures were designed for a different competitive environment. As Hammer states:

> Many of our job designs, work flows, control mechanisms, and organizational structures came of age in a different competitive environment and before the advent of the computer. They are geared toward efficiency and control. Yet, the watchwords of the new decade are innovation and speed, service and quality . . . Reengineering strives to break away from the old rules about how we organize and conduct business.[2]

The reengineering process begins, like many traditional approaches, with the recognition of existing problems. But instead of simply trying to solve each problem one by one, the reengineering process focuses on the structure of the whole organization and on how this structure might be responsible for the identified problems. It is typically assumed that a changed structure can solve many of the organization's problems. If the organization is designed to meet its present day goals and challenges, no major problem surfaces.

As Drucker[3] states, the involvement of employees is critical to the success of any reengineering process. 'Now, while still far from being

[1] HAMMER, M (1990) 'Reengineering work: don't automate, obliterate' *Harvard Business Review* July–August, 104–112
[2] *Ibid*
[3] DRUCKER, P F (1991) 'The new productivity challenge' *Harvard Business Review* November–December, 69–79

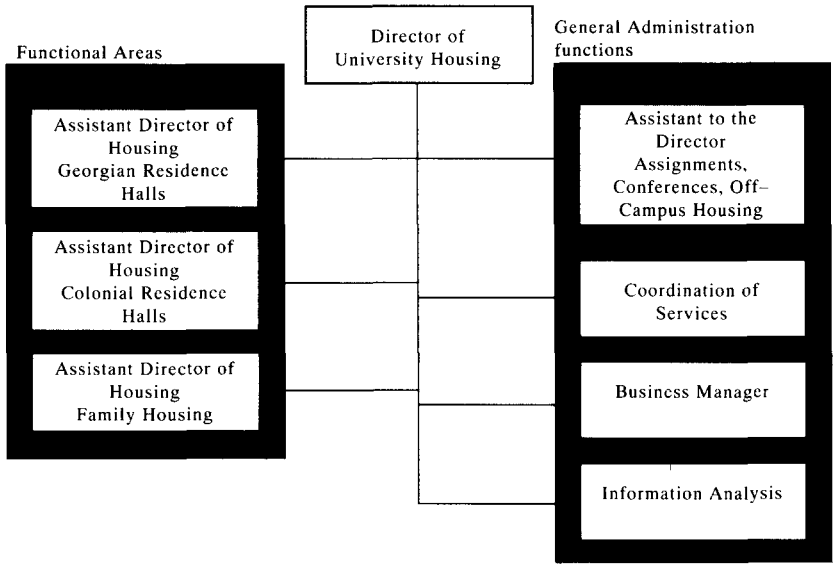

Figure 1 Organizational chart of UH

widely practiced, it is at least generally accepted in theory that the workers' knowledge of their job is the starting point for improving productivity, quality, and performance'.[4] Thus, participation of as many members of the organization as possible is desirable.

This paper outlines how two group support systems (GSS) and some manual techniques were used to examine the present structure and the development of a new organizational design for a large southeastern university's housing department (UH). It commences by introducing the housing department. The paper then describes how GSS technology was used in a series of UH meetings. The paper concludes with a discussion of the findings and implications.

The organization

Founded in 1964, UH is one of the largest university housing departments in the USA. Currently, approximately 6000 single students and 540 student families are living in UH housing. In late 1991, UH decided it was time to reconsider its organizational design. This decision was precipitated by three events. First, a new director had been appointed one and half years before and was gradually reviewing the workings of UH. Second, one senior staff member was about to retire, and there were indications that another person at that level was also contemplating retirement. Third, there was mild, but persistent grumbling from a number of employees about problems with task assignments. As a result of these changes and grumbling, the director decided it was time to examine openly the issue of work division in UH.

UH's professional staff consists of 22 persons. Within UH two distinct interest groups exist. One group is the functional areas that manage the housing facilities and the other group is the general administration function. The functional areas are divided into three subgroups (see *Figure 1*).

The director of UH wanted the entire management team to be

[4] *Ibid*

involved in solving the task assignment problem. An important part of this approach was to gather the opinions and ideas of all members of the management team. Everyone's input was required. The various subgroups of UH have different and sometimes conflicting interests. The goal of the process described in this paper was to overcome these differences and to work together towards a common goal.

In order to get some understanding of the organization, we administered two questionnaires to the participants of the first meeting. The first questionnaire measured group cohesiveness[5] and the second assessed organizational climate.[6] The responses to the cohesion questionnaire suggested the group were slightly above the mid-point for cohesiveness (mean score of 2.3 on a 1–5 scale), indicating that the group was fairly cohesive but that there was enough variation between members of the organization to foster conflict. The Organizational Climate Index assessed that the organization was characterized by a strong tendency for improvement and change.

Meeting facilitation and meeting design

Managers spend between 25 and 80 per cent of their time in meetings.[7] Yet, 50 per cent of the productivity of all meeting hours is wasted due to poor meeting preparation and unclear meeting goals.[8] Clearly, there is a need for an answer to this problems. In the mid 1980s a number of researchers[9] realized that the power of personal computers might be applied to revolutionize group work in the same way that it had dramatically changed the nature of individual work. A GSS is a combination of computer and communications technology with special purpose software designed to improve group performance.

An important side effect of the introduction of GSS technology is a renewal of interest in meeting facilitation and meeting design. Because GSS technology can make a poor facilitator worse and a good one better,[10] there is a need for a better understanding of how to facilitate meetings in general and GSS supported meetings in particular.[11] For the present study, two facilitators were present for all except one phase of the second meeting when the more experienced facilitator was absent for about half the meeting. Both facilitators were familiar with the technology and had managed a number of meetings. The more experienced facilitator had supported hundreds of meetings and taught facilitation skills.

One of the major reasons for low meeting quality is poor or no meeting design. As a result, in this study all meetings were carefully designed. In a typical planning session, the director and a senior member of his staff worked with both facilitators.

Nearly all meetings consist of three phases: meeting preparation, the actual meeting, and a follow up.[12] Prior to a meeting, there is consideration of the meeting's goals and the sequence of activities necessary to achieve these goals. The meeting outcomes and an agenda are the usual product of pre-meeting activity. Then there is the actual meeting during which participants typically meet face-to-face and work through the meeting's agenda. After a meeting, there is frequently follow-up action specified during the meeting. For example, a meeting might produce an action list that requires various tasks to be completed prior to the next meeting. It should be remembered that there is not always a clear demarcation between post-meeting activities for one meeting and

[5]SEASHORE, S (1954) *Group Cohesiveness in the Industrial Work Group* University of Michigan, Ann Arbor, MI; CHIDAMBARAM, L (1989) An empirical investigation of the impact of computer support on group development and decision making performance. Unpublished Doctoral Dissertation, Indiana University

[6]DECOCK, G, BOUWEN, R, DEWITTE, K AND DEVISCH, J (1986) *Organizational Climate Index for Profit Organizations — short version* Center for Organizational and Personnel Psychology, Katholike Universitaet, Leuven, Belgium

[7]MINTZBERG, H(1973) *The Nature of Managerial Work* Harper and Row, New York; MONGE, P R, MCSWEEN, C AND WYER, J (1989) *A Profile of Meetings in Corporate America: results of the 3M meeting effectiveness study* Annenberg School of Communications, University of Southern California, Los Angeles, CA; MOSVICK, R AND NELSON, R (1987) *We've Got to Start Meeting Like This!: a guide to successful business meeting management* Scott, Foresman and Company, Glenview, IL

[8]MOSVICK AND NELSON (1987), *op cit*, Ref 7

[9]For example, HUBER, G (1984) 'The nature and design of the post-industrial organizations' *Management Science* **30** (8) 928–951; DESANCTIS, G AND GALLUPE, R(1987) 'A foundation for the study of group support systems' *Management Science* **33** (5) 589–609

[10]WATSON, R T AND BOSTROM, R P (1991) 'Enhancing group behavior with a keypad based group support system' *Human Resources Development Quarterly* **2** (4) 333–353

[11]BOSTROM, R P, ANSON, R AND CLAWSON, V (1991) 'Group facilitation and group support systems', in JESSUP, L AND VALACICH, J (EDS) *Group Support Systems: new perspectives* Macmillan, New York

[12]OPPENHEIM, L (1987) *Making meetings happen: a report to 3M Corporation* 3M Management Institute, 3M Center A 145-5N-01, Austin, TX

Table 1 *Initial meeting design*

Agenda Activity	Method
(0) Introduction	
(a) Briefing of meeting purpose and meeting etiquette	M
(b) Short training on VisionQuest	VQ
(1) Issues and Problems	
(a) Identification of issues and problems of existing organizational structure	VQ
(b) Evaluation of importance of issues and problems	VQ
(c) Discussion of issues and problems	M
(d) Re-evaluation of importance of issues and problems	VQ
(2) Criteria for a successful design — how do we know we have a good organizational design?	
(a) Identification of criteria	VQ
(b) Evaluation of importance of criteria	VQ
(c) Discussion of criteria	M
(d) Re-evaluation of importance of criteria	VQ
(3) Identification of alternatives	
(a) Identification of alternatives	VQ
(b) Evaluation of alternatives	VQ
(c) Discussion of alternatives	M
(d) Re-evaluation of alternatives	VQ
(4) Decision	
(a) Selection of alternatives to implement	M
(5) Implementation plan	
(a) Identification of implementation activities	VQ
(b) Evaluation of most important implementation activities	VQ
(c) Discussion of implementation activities	M
(d) Re-evaluation of implementation activities	VQ
(6) Allocation of responsibilities for implementation	M

M, manual; VQ, VisionQuest

preparation for the subsequent meeting. In this paper, we find it useful to follow the meeting cycle model in describing activities that occurred.

First meeting

Meeting preparation. Prior to the first meeting, a broad design for a series of meetings was prepared. The initial design was prepared some time before the first meeting, and there was ample opportunity to reflect on its intent and structure. The initial design was a typical agenda for a problem solving or decision making meeting (see *Table 1*). First, the problems are identified and evaluated according to importance. Second, criteria for a successful solution are generated and evaluated. Third, all available alternatives are identified and the best alternative is selected. Finally, an implementation plan is developed. As outlined in *Table 1*, it was planned to use the group support VisionQuest[13] for brainstorming and voting activities and manual techniques to clarify and discuss ideas.

Only the first meeting followed the initial meeting plan. The facilitators decided after the first meeting to modify the agenda because the situation demanded it (see *Table 7* for the final design of the three meetings). All meetings will be explained in more detail in the following sections.

Pre-meeting analysis considered what planning activities had recently occurred in UH. In particular, the facilitators checked for the presence

[13]WAGNER, G (1990) *VisionQuest Users Guide* Collaborative Technologies Corporation, Austin, TX

of an overall strategic plan and mission statement for UH. It would be unwise to tackle a lower level problem such as organizational design if higher level issues, such as strategic planning, had not been addressed. Fortunately, UH had prepared a strategic plan and mission statement three months before the first GSS meeting. This process had embraced nearly all professional staff and apparently provided a firm foundation to proceeding to consideration of organizational design.

Meeting. The first meeting took place on 1 November 1991. There were 14 participants. The family housing area of UH was not represented because of conflicting higher priority activities. Members of the family housing area were represented in the following two meetings. The meeting proceeded to follow the meeting design outlined in *Table 1*.

A fun problem was chosen to demonstrate the features of the system and to train the users. Many participants were pleasantly surprised how easy it was to use the GSS technology. After this short training session participants anonymously generated key concerns about task assignment in a round robin fashion (step 1a in *Table 1*). Participants entered one concern simultaneously and then these were reviewed by the group at the end of each round with the assistance of the facilitator. The review focused on clarification of issue wording, removal of duplicate or redundant issues, and consolidation of issues that dealt with a similar theme. The facilitators took care in maintaining anonymity by carefully wording clarification questions. For example, questions such as 'Is this statement clear to everyone?' were used rather than 'Would someone explain what they mean by this statement?'.

A round robin approach was used because the parallel communication feature of a GSS frequently results in a long list of statements when participants are just let loose in a free-for-all generate. For instance, in one study, a GSS supported 13 person group generated 192 statements in about 45 minutes, compared with a similar size traditional group who generated 50 statements in the same time.[14] In a large group, round robin issue generation limits redundancy.

After several rounds, 40 different task assignment issues were identified. The group was then asked to rate these issues on a 1–7 scale (1: not important, and 7: very important) (step 1b in *Table 1*). A partial listing of the ratings output is shown in *Table 2*, where the top 10 items are shown.

After a short discussion about the results, the meeting concluded because it was just after the agreed ending time and it was a Friday afternoon. Prior to the conclusion of the meeting, participants completed a brief questionnaire to provide the researchers with feedback on the meeting process and outcome.[15] This questionnaire assesses the participants' feelings about the process, their sense of accomplishment and the openness of the communication.

The results of the Group Reaction Questionnaire indicated that the group members generally perceived the process as systematic (mean score of 2.84 on 1–7 scale; 1: very systematic, and 7: not systematic). Also, the sense of accomplishment was relatively high after this first meeting (mean score of 5.14 on 1–7 scale; 1: no sense of accomplishment, and 7: high sense of accomplishment). The group perceived communication during this meeting is relatively open (mean score of 4.52 on a 1–7 scale; 1: no open communication, and 7: very open communication).

[14] WATSON, R, DOWLING, M AND MCGEE, J (1992) 'The effect of a gss on the case method of teaching' *Working Paper*, Department of Management, University of Georgia, Athens, GA

[15] DESANCTIS, G AND POOLE, M S (1991) *Group Reaction Questionnaire* University of Minnesota, Minneapolis, MN

Table 2 *Partial outcome of first meeting*

No	Item	Rating
1	Many staff are not trained to manage portions of their jobs they were hired for and training was not provided by department	5.64
2	Lack of communication	5.57
3	Us/them characterizes many relationships between offices or functional units	5.46
4	Follow-through on many issues is poor and we spent a lot of time passing the buck and blaming others for work not completed, ie facilities management	5.43
5	Varied support for current mix of centralization/ decentralization	5.31
6	Rationale for actions is not always communicated to other members	5.29
7	Certain positions do not have clear responsibilities	5.07
8	Provide better computer connectivity to all housing offices	5.07
9	Lack of understanding in the time commitment some positions require	5.00
10	Inconsistent policies implementation and enforcement	5.00
...	...	...

Follow-up. The major post-meeting activities were to review the meeting process with the director and score the post-meeting questionnaire. The director indicated he was generally happy with the process, thought the afternoon useful, and would gather informal feedback from his staff on Monday.

There is a high degree of openness and candidness of comments in a GSS meeting. This can take its toll on the person in charge of the organization particularly if that person takes comments personally and becomes defensive. The director of UH noted that it took him a couple of days to 'get over the meeting', because he felt that some of the comments were unfair and he did not, and should not, have an opportunity to respond. If the director had become defensive and challenged some comments then the very nature of the information exchange would have altered and participants might have been reluctant to be so frank. One characteristic of a well-developed group is the group's ability to deal with conflict. The group support system enabled the group to exhibit conflict in a positive, non threatening way. GSS have been found to improve a group's ability to manage conflict.[16]

Second meeting

Meeting preparation. After a few day's reflection and discussion with personnel who attended the first meeting, the director decided to continue the process. As a number of key players had missed the first meeting, the director circulated the list of issues to these people and asked them to add new issues. After new issues had been added, appropriate personnel who had missed the first meeting were asked to rate all the issues. In effect, the director manually replicated the GSS procedure. Partial results of this process are displayed in *Table 3.*

Because humans have limited information processing capacity and can only deal with about 7±2 concepts at a time,[17] it is generally important to reduce a litany of concepts down to a manageable list of

[16]CHIDAMBARAM, L, BOSTROM, R AND WYNNE, B (1991) 'A longitudinal study of the impact of group decision support systems on group development' *Journal of Management Information Systems* **7** (3) 7–25

[17]MILLER, G A (1956) 'The magical number seven, plus or minus two: some limits on our capacity for processing information' *The Psychological Review* **63** (2) 81–97

Table 3 *Partial outcome of second meeting*

No	Items	Rating
1	There is a real need for RLCs[1] to develop better facilities skill	5.94
2	Lack of facilities training for many who have facilities responsibilities	5.88
3	Lack of communication	5.71
4	Us/them characterizes many relationships between offices or functional units	5.71
5	Many staff are not trained to manage portions of the jobs they were hired for and training was not provided by department	5.59
6	Procedures and policy do not have consistency throughout department	5.35
7	Rationale for action is not always communicated to other members	5.35
8	RLC salaries not in line with comparable positions in the Southeast, Custodial salaries too low	5.35
9	Varied support for current mix of centralization/ decentralization	5.29
10	Some of our 'procedures and practices' are not oriented to good customer service	5.18
...	...	...

[1]RLC, resident life coordinator

less than 10 items. The facilitators reduced the original list of 70 items to a consolidated light of eight items (see *Table 4*). Their approach was to collect similar items under a broader, higher level description. *Table 4* shows the eight categories and lists selected lower level items for two categories. Where appropriate possible solutions to the eight identified problems were listed by the researchers.

One category that was identified by the researchers was 'Training'. Several of the 70 original items seemed to critique that people were not trained for assigned tasks. For example 'Many of the staff were not trained to manage portions of the job they were hired for and training was not provided in the department' (see *Table 3*, item 5). Other items however pointed towards the fact that a mixture of generalists and specialists existed at UH and that some individuals should have more general knowledge, eg 'There is a real need for RLCs to develop better facilities skills' (see *Table 3*, item 1). Both of these items were combined under the category 'Training'.

Table 4 *Categories and some descriptions*

Training
People are not trained for assigned tasks
Mixture of specialists and generalists
Personal issues
Custodial salaries far too low
Task assignment (jobs, work groups, lines of authority)
Communication
Decision implementation
Relationship between people, sections, etc
Clarity of mission, goals, and priorities
Management procedures and practices

Prior to the second meeting, the facilitators discussed the consolidation process and the outcome with the director and one other UH staff member. They agreed with the process and the outcome. They also discussed the design of the second meeting (see *Table 7*), whose goal was to map the relationships between the consolidated items. The facilitators believed that it was important for the group to understand how key concerns were interrelated so that the group focused on solving the real problem and not the symptoms of another problem.

Meeting. The second meeting was held on 12 December 1991. The meeting commenced with the facilitator describing the consolidation process and showing the mapping of each item to a consolidated description. The intention was to show the faithfulness of the mapping and detect new consolidated descriptions. No new consolidated items were detected, but the group considered a small number of items had been mismapped by the facilitators. The group agreed that the consolidated list was complete. At the end of this phase the group ranked the consolidated items according to their importance. 'Task assignment' was voted by the group as being the most important category.

In the second phase, PRISM was used to uncover the relationship between consolidated items. One of PRISM's tools is a Macintosh implementation of Interpretive Structural Modeling.[18] The technique was developed by Warfield[19] and is defined as a 'method of identifying and summarizing relationships among specific items that define an issue or problem'.[20]

The process begins with the definition of a set of 'elements' and a 'subordinate relation' that allows a paired comparison between items. The items and the question to link pairs of items are entered into the system by the facilitator. In this study, the subordinate relationship was, 'Does A aggravate B?' where A and B were different issues. For example, one of the questions posed to the group was, 'Does Task assignment aggravate Communication?'. Once the set-up was completed, PRISM presented the items a pair at a time, and this information was projected on a public screen easily seen by all group members. For each question, the group was asked to decide whether the question's answer was yes or no. An undecided vote is counted as 'not true'. Because PRISM is a chauffeured GSS, the facilitator determines the group answer by listening to the discussion and observing the head nods or show of hands. Of course, this approach can mean that dominant and high status individuals have more influence than they would in an anonymous situation. However, most of the questions were not controversial, and so we believe that the process was reasonably equitable.

The outcome of PRISM is a directed graph showing the relationship between items (see *Figure 2*). The arrows between boxes describe a relationship. Issues that are grouped within one box were identified to be interrelated and to have the same relationship to other categories. For example the graph shows that 'Personnel issues' and 'Task assignment' issues have to be solved before 'Communication', 'Decision implementation' and 'Relationship between people, section, etc' can be resolved.

There was a discernible change in group atmosphere when the PRISM output was displayed. The group were surprised to realize that its perceived problem, task assignment, was really an effect of two preceding issues. The root cause was 'Clarity of mission, goals, and

[18] SAUNDERS, C S (1990) *Structural Modeling—an introduction* Tandem Communication, Ottawa

[19] WARFIELD, J N (1976) *Societal Systems: planning, policy, and complexity* Wiley, New York

[20] MOORE, C M (1987) *Group Techniques for Idea Building: applied social research methods series Vol 9* sage, Newsbury Park, CA

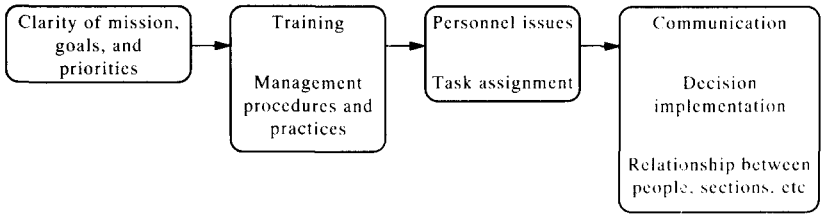

Figure 2 PRISM output

priorities', and the perceived major issue of task assignment could not be tackled until this problem was resolved.

The group's surprise at the outcome was due to two reasons. First, the group indicated at the beginning of the session that they believed task assignment to be the most important issue. Of course, with hindsight it is clear that an unclear mission statement will cause task assignment problems, but the group needed to learn this itself rather than be told the answer. Second, UH had spent some time working on its mission statement and participants thought that this was no longer an important issue because it had been previously addressed.

Once the group had recovered from its surprise, several members presented explanations for what the findings meant. About half-an-hour was spent considering the directed graph and presenting interpretations. Attention mainly focused on why the mission statement was unclear. A number of participants admitted to not really knowing or remembering what the statement implied and how they should interpret it in their regular work. The discussion was cut for a lunch recess.

After the lunch break of about an hour, the group reconvened and used VisionQuest to rank the consolidated issues. The purpose was to let the group share its revised opinion of the issue importance and overcome any effect of dominance from the face-to-face discussion during the PRISM session. As can be seen in *Table 5*, 'Clarity of mission, goals and priorities' replaced 'Task assignment' at the top of the list. A low score means that many people ranked the item at the top of the list. This output confirmed that as a result of using PRISM, the group had changed its opinion about the nature of its problem.

The next planned stage of the process was to have the group list possible outcomes for resolving each of the issues. The intention was that the group should not focus on solutions, but rather describe the results of an appropriate solution. The facilitators wanted the group to

Table 5 *Ranking of issue categories*

Issues and outcomes	Average rank
Clarity of mission, goals and priorities	1.7
Training	3.6
Management procedures and practices	4.4
Task assignment	4.5
Communication	4.7
Relationships	4.9
Personnel issues	6.1
Decision implementation	6.1

Table 6 *Sample issue category and outcomes*

Clarity of mission, goals, and priorities
1. Development departmental philosophy
2. When each person is able to describe how accomplishing their duties fulfils the mission and also understands how others do the same
3. All people in the department can relate to the mission story
4. Action plan for each person or unit based on mission
5. Method of measuring effectiveness towards mission
6. When all areas of the department work together

concentrate on identifying goals before it thought about solutions. In this regard, they were following Dewey's[21] notion of structured problem solving in which solution criteria are identified before alternative solutions are judged. It is important to know how to judge a good solution before considering alterantives. The facilitators had planned a structured idea generation using VisionQuest. The plan was that participants would enter outcomes for each of the eight consolidated issues. However, a system failure resulted in this procedure being abandoned, and the facilitators had to quickly revert to manual group techniques.

The group was subdivided into four representative subgroups. Each group was given two issues and asked to work collectively to identify a ranked list of desirable outcomes for each issue. After the groups had worked for about 45 minutes, the rank lists were then collected and entered into a computer using a standard word processor. As this computer was linked to the public screen, it was possible to project each issue and the suggested outcomes on the public screen. The facilitators then walked through each issue and its outcomes. The purpose was to share the information with the group and clarify, edit, and elaborate where necessary. Partial results for one issue are displayed in *Table 6*. At the end of this phase the meeting concluded as it was close to the scheduled finishing time, and it was apparent that the group's attention was diminishing fairly rapidly.

Follow-up. There were no significant post-meeting activities. The facilitators reviewed the process and discussed their recollections of the meeting and any insights they had gained. There were two major conclusions. First, interpretative structural modelling was valuable because it led to a different understanding of the problem. Second, manual group techniques are a necessary and effective backup system when technology fails.

Third meeting

Meeting preparation. Pre-meeting thinking for the final meeting was driven by three concerns. What is the next stage in the process? How to move from a negative aura to a positive atmosphere? How to hand back control to the group?

The first two meetings had a negative atmosphere. They focused on what was wrong and how it could be fixed. It was apparent to the facilitators that UH was a successful organization. It was their observation that the organization was well managed, it had high calibre staff, concerned and committed employees, and enjoyed a national reputa-

[21]DEWEY, J (1910) *How We Think* D C Heath, Boston, MA

Table 7 *Final meeting design*

	Description	Method
Meeting No 1	Briefing of meeting purpose and meeting etiquette, training on VisionQuest	M
	Identification of issues and problems of existing organizational structure	VQ
	Evaluation of importance of issues and problems	VQ
	Discussion of issues and problems	M
Meeting No 2	Description of consolidation process	M
	Discussion of consolidated categories	M
	Detection of relationships between categories	PRISM
	Lunch break	
	Rank categories by importance	VQ
	Identify possible outcomes for each category	M (sm groups) Word processor
	Discussion and clarification of outcomes	M
Meeting No 3	Identify strength of UH	VQ
	Select top five key strength	VQ
	Identify sources of strength	VQ
	Select top five key sources of strength	VQ
	Identify key departmental goals	M (sm groups)
	Identify guiding principles, beliefs, and assumptions	M (sm groups)
	Discussion of result and search for volunteers to complete process	M

M, manual; VQ, VisionQuest

tion for the quality and progressiveness of the service it provided students. However, meetings had focused on what was wrong and this tended to give a jaundiced view of UH. Another concern for the facilitators was the process of handing back control to the group. They had to remove themselves from the group, and let it get on with solving its problems.

After some deliberation and consultation with UH, a third meeting was designed (see *Table 7*). The overall goal of the third meeting was to hand back control to UH and leave the group with a very upbeat and positive view of itself. The facilitators wanted the group to recognize its strength and the source of these strengths so that it could build upon them when solving its problems.

Meeting. The third meeting was held on 21 January 1992. As planned, the meeting commenced using the brainstorming tool of VisionQuest in a round robin manner to identify the strengths of UH. As before, at the end of each round the facilitators checked that the group understood the meaning of each statement. At the completion of the generation, participants were asked to each select the top five key strengths. Partial results of the rating are shown in *Table 8*. The score represents the number of votes for each item.

The second phase of the meeting was similar to the first phase. Participants identified the source of UH's strengths and then selected the top five key sources of strength. Partial results are shown in *Table 9*.

During the next phase of the meeting the group was split into groups of five to six persons. The groups were intentionally mixed so that each subgroup was made up of members from all interest groups within UH. The small groups were then asked to recommend additions, changes, and deletions to the existing mission statement. Specifically, they were asked to generate additions, changes and deletions to the mission

Table 8 *Top strengths of UH*

No	Strength	Score
1	The financial bottom line of the department is very good	12
2	Strong, energetic, supportive leadership	12
3	The student development/residence life programme is progressive	9
4	Quality and talent of staff	8
5	Autonomy to performing jobs	6
6	Ethnic, cultural, interests, and lifestyle diversity of staff	6

Table 9 *Top sources of strengths of UH*

No	Sources of strength	Score
1	The leadership (staff)	8
2	Having little department service	6
3	The students who provide for our good financial status	5
4	National reputation allows us to recruit top quality people	5
5	Customer service orientation (students, families, internal staff, other campus departments, faculty, conference guests)	5

statement. Also they were asked to operationalize the mission statement and the additions in terms of key departmental goals and guiding principles, beliefs, and assumptions. This exercise was designed to give control back to the team and to foster communication across subdivisions. Partial results are displayed in *Tables 10* and *11*.

Table 10 *Key departmental goals — additions*

From mission	No 1 providing comfortable, affordable, and secure on-campus student and family housing No 2 offer opportunities for residents to grow and develop in many respects of their lives No 3 teach the value of human diversity No 4 promote and develop residents' good citizenship skills No 5 promote an environment conducive to learning and enhancing student-faculty interaction in the residential setting No 6 establishing strong partnerships with other campus departments No 7 development of employees both personally and professionally
Addition by topic	
Service	* Provide the best possible customer service
Employee and staff related	* Committed to employee success through training, staff development, and team building and department commitment
Financial	* Forward planning and management to generate sufficient revenue to maintain and improve our programs
Facility management	* Well-planned, effective and efficient facility management
Evaluation and improvement	* Continued evaluation and enhancement of department organizational structure in order to better meet the needs of our constantly changing constituency
Understanding and support	* Enhanced productivity will result from staff in different functional units understanding and appreciating and supporting each other's roles
Changes	* Change to No 1: Provide a variety of comfortable . . . Continual assessment of our customer-services and re-examine to achieve satisfaction. (Goal to remove obstacles)
Deletions	None

Table 11 *Guiding principles, beliefs and assumptions*

From mission	No 1 we will act with integrity and dignity in our service to residents and university community No 2 individual rights are defended No 3 individual differences are respected No 4 employees are our most valuable resource No 5 broad-base employee involvement in facility management and planning
Additions by topic	
Student service	* We offer valuable opportunities for every resident to grow through experiencing new aspects in their lives
Student academic	* Student academic success is paramount
Employees	* Our most valuable resources include: employees, facilities, financial strength, students/customers
Innovation/creativity	* Encourage and reward innovation and creativity designed to enhance customer service
Involvement	* Stake holders should be involved in decisions that effect them such as hiring employees, setting policies, etc
Financial	* We believe we should be financially sound
Technology	* Utilizing state of the art technology to most effectively meet our service and operational objectives
Changes/deletions	None

At the end of the third meeting, volunteers were sought for revising and translating the mission statement into a business philosophy and to map the existing job functions of UH. A number of participants immediately volunteered, and perhaps this is indicative of the feelings that the meetings generated. The group appeared to leave the final meeting in a very positive and healthy frame of mind.

Follow-up. The facilitators met with three people from UH to discuss follow-up action. A task force had been developed to revise the mission statement. The team was made up of representatives from all divisions of UH. The accomplishment of this task went smoothly and no further support from the facilitators was needed. Once the mission statement was revised it will be reviewed a second time by the professional staff and accepted in its final form.

The second task, a mapping of the existing job functions, was undertaken by one individual. For this task the help of the facilitators was required because the individual was unfamiliar with the process of function/relationship mapping. One facilitator met with the individual to explain the technique.

Once both tasks are accomplished, the old job function mapping of UH will be examined in the light of the revised mission and philosophy statement. Small groups will make suggestions for improvements in groupings of functions within and between positions. Finally, the suggestions will be reviewed and accepted or rejected by departmental leadership.

Assessment of participant reaction

To follow-up on the impact of the series of meetings a structured open-ended interview was administered. The Cohesion Questionnaire[22] and the Group Reaction Questionnaire[23] were re-administered to assess

[22] *Op cit*, Ref 5
[23] *Op cit*, Ref 15

if there was any change in the group cohesiveness and to compare the group's opinion about the process after the first meeting with their opinion after the last meeting.

The mean score of the Cohesion Questionnaire administered after all three meetings was not different from the result of the one administered before the first meeting. A possible reason to explain why this score did not change is that the meeting might have actually made the group more aware of some problems within the group. Thus, the participants' overall opinion about the functioning of the group has not changed. Also, no change in perception of the group's reaction to the meetings could be determined.

Nine follow-up interviews with randomly selected participants from all organizational units were performed to elicit more information about group member's expectations and concerns before the meetings, assessment of perceived benefits and problems with the process, perceived sense of achievement, opinion about the technology used, and identification of surprises and critical incidents during the series of meetings. The purpose of these interviews was to discover the group's opinions about the process and the technology.

The results of the interview show that overall a positive attitude towards the process prevailed. All interviewees indicated that the meetings were worth the time and most participants felt that progress towards the proposed goals was made. The GSS technology received excellent evaluations from all interviewees. Many people indicated that they enjoyed using the technology. The newness of the technology seems to have stimulated group members interest in the meetings. Group members also indicated that they were impressed with the efficiency and power of the technology.

Conclusion

This paper described how GSS technology was used during the reengineering of a college housing department. Data collected by direct observation, questionnaires and personal interviews indicates that most members of the management team were generally satisfied with the process. Especially the personal interviews showed that most participants believed that the same outcome could not have been achieved in the time, if conventional methods would have been used. Especially the anonymity and simultaneity of the GSS systems were credited for the success of the project.

A number of lessons can be derived from this study. Although the process described in this study is reengineering, the lessons can be useful for many GSS supported meetings. The main components of the meeting strategy that attributed to the success of the meetings are (1) appropriate mix of GSS technologies and manual techniques; (2) a constant review of the overall meeting design; (3) balance of positive and negative aspects; and (4) appropriate support of the group understanding development. These will be briefly discussed.

Appropriate mix of GSS technologies and manual techniques

A recent review of GSS studies[24] found only two experimental GSS studies that used more than one technology. Gopal, Bostrom and Chin[25] used a combination of GroupSystems and OptionFinder and Jarvenpaa,

[24] ZIGURS, I AND BUCKLAND, B (1993) 'Exploring task-technology fit in group support systems research' University of Colerado Faculty Working Paper No 93–02

[25] GOPAL, A, BOSTROM, R AND CHIN, W (1992) 'Modeling the process of gss use: an adaptive structuration perspective' in NUNAMAKER, J JR AND SPRAGUE, R (EDS) *Proceedings of the Twenty-fifth Hawaii International Conference on System Sciences Vol IV* IEEE Computer Society Press, Los Almos, CA, pp 208–219

Rao and Huber[26] combined a personal workstation network and an electronic blackboard. So far no field study has employed a mix of GSS technologies. The present field study shows that multiple GSS can also be used successfully in a real business environment.

GSS can be classified according to a number of schemes. Watson[27] identified three ways to classsify GSS. GSS can be classified according to the type of meeting they can support, according to the type of technology used, and according to the type of output generated. The type of meeting can be same place/same time, same place/different time, different place/same time, and different place/different time. All meetings described in this study were same time/same place and thus this distinction is not useful for this discussion.

GSS can also be classified by the type of technological support provided. The different levels are f (single facilitator workstation), k (a keypad for each group member) and w (a workstation for each group member. Only k- and w-GSS can offer anonymity and simultaneity. In f-GSS the facilitator has to ask the group for input through open discussion, show of hands, or other face to face means. Another classification of GSS is according to the output generated by the product. A GSS can help the group to share opinions, build a shared understanding, and/or build a shared mental model. So far no GSS has been developed that can support all three outputs but several GSS support two of the three.

Two types of GSS technology were used during this study. VisionQuest[28] was used to support brainstorming and rating and PRISM[29] was used to perform interpretative structural modelling. VistionQuest is a w-GSS and supports sharing of opinions and the development of a shared understanding. PRISM is an f-GSS and supports the development of a shared mental model. Thus, PRISM and VisionQuest supplement each other perfectly. As could be seen in this study, VisionQuest can be used to share opinions and to come to a shared understanding of a problem, while PRISM can be used to develop a shared mental model.

Several participants indicated during the interview that the anonymity and simultaneity offered by VisionQuest during the brainstorming and the rating sessions improved the final results. People generally felt more comfortable to criticize the organization without having to personally 'back' the statement. It was believed that the participants were more frank than usual using the GSS technology. Participants also mentioned during the interviews that the GSS technology seemed to foster more equal participation of all participants.

Although no anonymity could be offered during the PRISM sessions, the interpretive structural modelling tool of the PRISM technology helped the group to identify the real source of their problems. The task assignment problem which was believed to be the source of all problems, was identified as being a cause of a different problem. The real source of the organizations problem, the lack of clarity of the mission statement was identified. The fact that most interviewees identified the PRISM analysis as the critical incident of the series of meetings stresses the value of the interpretive structural modelling approach. So far no GSS has been developed that supports the development of a shared mental model with k or w support.

Several GSS vendors have also started to incorporate linking options in their software. For example PRISM can now load VisionQuest caps.

[26]JARVENPAA, S, RAO, V AND HUBER, G (1988) 'Computer support for meetings of medium-sized groups working on unstructured problems: a field experiment' *MIS Quarterly* **12** 645–665

[27]WATSON, R (1992) 'Grouping groupware' *Groupware Report* Preview Issue, 4–5

[28]*Op cit*, Ref 13

[29]*Op cit*, Ref 18

Also, the vendors of VisionQuest and Lotus are currently working to link the two products.

We strongly believe that the GSSs used were instrumental in achieving the success of the process. However, to support meetings the best way possible, GSS technology has to be combined with manual techniques.[30] GSS have several advantages compared with manual techniques. The ability to operate at a distance via networks and the efficient analysis of votes are only two of the capabilities of GSS that cannot be replaced with manual techniques.

There are also situations in which manual techniques are more useful than GSS techniques. It could be because the method used has not been implemented in a GSS, eg clustering of the ideas must still be performed using manual techniques because no GSS tool has been developed to perform this task. Another reason to use manual techniques is that the facilitator feels that it will be better for the group's development at their present stage if they were not separated by the technology and interact directly with each other. Manual techniques can also be useful as a backup when the technology fails because of technical problems. We learned during this field study that it is extremely important to have manual techniques ready as a back-up because the meeting must go on even if technical difficulties arise.

Meeting planning

A study of 50 experienced facilitators indicated that facilitators perceived planning and designing meetings as their most crucial function.[31] This finding is consistent with our impression that the careful design and planning of the meetings contributed to the success of these meetings.

Every meeting was thoroughly planned in a pre-meeting session which typically involved the two facilitators, the director of UH, and a senior staff member of UH. Results from the previous post meeting phase were taken into account when planning the next meeting. Before the first meeting an initial design for the entire process was identified and distributed to all participants to communicate a shared idea of what the series of meetings was trying to accomplish. When it became clear after the first meeting that the initial plan should not be followed, a new meeting plan was developed to more accurately match the situation at hand. The plan was adjusted a second time before the third meeting for similar reasons.

We believe that this constant review of the process can be partially credited for the success of the meeting. We argue that no meeting design should ever be final. The facilitator must remain flexible and adaptable and prepared to redesign the meeting outline to accommodate the group's need.

Balance negative and positive aspects

The first and second meeting focused on what was wrong with UH's organization. This left a negative atmosphere within the group. The facilitators felt that this should be balanced with a more positive atmosphere in the third and last meeting to avoid discouraging the participants. The third meeting focused on the strength of UH and identified goals and principles for the organization. We believe that this balance of positive and negative aspects was necessary to provide the group with positive feedback and encouragement in accomplishing their ultimate goal. Direct observation of the participants during the third

[30] MILLER, J AND MILLER, A (1992) 'Success = Groupware + Traditional techniques' *Groupware Report* November, 1–3

[31] CLAWSON, V AND BOSTROM, R (1993) 'Facilitator forum—the sixteen dimensions of effective facilitation' *Groupware Report* **2** (2) 4–6; CLAWSON, V AND BOSTROM, R (1993) 'Facilitator role study—take two' *Groupware Report* **2** (4) 4–6

meetings indicate that this goal was accomplished. The interviews also indicated that the members of the group felt confident that UH was on its way to reach the ultimate goal, to improve the organization.

Group understanding development

An important insight we gained from the series of meetings was a grasp of how a group's understanding of a problem is developed by appropriate use of GSS technology. We identified a three-stage model of problem comprehension. First, the group shares opinions so it has a general understanding of the domain of its problem. Electronic brainstorming and the facilitators' verbal clarification of issues assists a group to reach this first stage. The outcome is an unordered list of issues. Its value is that it lets the group draw boundaries around the problem. Everything that someone thinks is important gets included. As a result, the scope of the problem might be broadly defined, but at least everyone participates in the process.

In the second stage, the list of issues is classified into less than 10 broader topics and then ordered. The original list is typically too large to be handled as one chunk. For example, in this meeting the group generated 70 issues in the first meeting. Many of these issues overlapped, and because of the list's length it was difficult for the group to process all the information. The list had to be condensed to a more manageable size. Given the recognized limits to human information processing,[32] a list to less than 10 items is generally desirable. Then the reduced list needs to be ordered so that the group understands its joint priorities. This process moves the group from defining the boundaries of the problem to identifying the areas that should get most attention. The second stage helps the group to focus on what is important.

The third stage uncovers the relationship between items in a list. The shortcoming of an ordered list is that it does not explicitly recognize that items are often interrelated. For instance, in this case, an unclear mission statement contributed to problems with task assignment. Thus, if the group had attempted to solve the task assignment problem without first addressing mission statement clarity its success might have been limited because a root cause was left untouched. The third stage produces a causal map showing relationships between items. Consequently, the group discovers the sequencing of actions necessary to solve the problem. Thus, while the group may feel task assignment should be the focus of its attention, learns that other issues must be first resolved in order to solve this problem.

Summarizing, a group moves through three stages of problem comprehension:

1. Defining the scope of the problem.
2. Identifying the area of focus.
3. Identifying the sequencing of problem solving actions.

This transition in problem understanding can be depicted graphically as shown in *Figure 3*. An important lesson that we learned from this project was that successful problem resolution requires a group to cover each of these phases.

This paper demonstrates how mixing multiple GSS technologies and face-to-face techniques can be used during a series of GSS supported meeting. The findings indicate that this approach works. The approach provides greater flexibility to the meeting designer and is probably

[32] *Op cit*, Ref 17

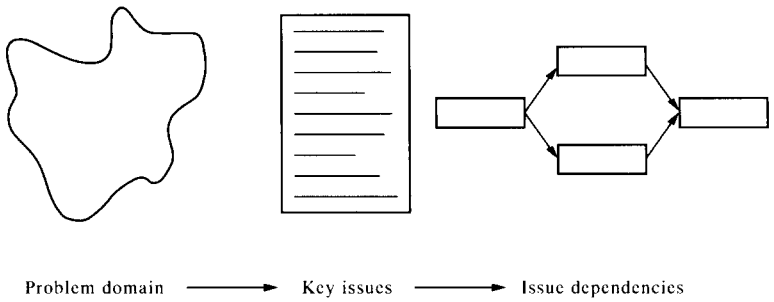

Figure 3 The three phases of group problem understanding

superior to relying on a single technology. We suggest that meeting designers consciously consider alternative group technologies, including manual and electronic facilitation, when designing meetings.

Future research in this area should focus on developing a theory of meeting design which incorporates selecting the best task and technology match. The theory should state for which tasks a combination of technologies or manual techniques are most appropriate. The theory of meeting design should also include the balance of positive and negative aspects in a meeting, and support for group understanding development.

Another possible stream of future research could identify how meeting design and planning skills can be developed in facilitators. Also, the possibility to incorporate support for meeting design and planning into the GSS could be investigated. For example an expert system could be used to suggest strategies for meeting planning and design in a particular situation.