Group Support Systems: A Culture-Task Fit Model

Emad A. Abu-Shanab

MIS Department, Information Technology College, Yarmouk University
Irbid, Jordan, abushanab@yu.edu.jo

Abstract

This study aims to review the literature in the area of group support systems (GSS) and conclude to a model that integrates the task appointed to a group, the culture that fits the individuals in the group, and the facilitation process of the GSS. The purpose of the study is to describe the relationships between a culture-task fit model that groups face in enabled GSS and its effect on the group performance. Literature indicated the importance of the task specifics that face the group and the structure of the group (Homogeneous vs. heterogeneous groups). The study concluded to four propositions that open doors for future research and proposed a method for testing those propositions. This paper included an introduction, followed by a review of the literature in the areas of task, culture, and GSS environment. The third section will try to describe the conceptual model followed by a section that describes the classification system used to define the focus of the study and the propositions of this study are stated. The forth section described the method proposed for testing and validating this work, and finally, the fifth section stated the conclusions and implications of research.

Keywords: Group support systems, information systems, culture, group work, experimental design

1- Introduction:

Group work is becoming more important to organizations as it affects their performance and efficiency. The reason for that is the complex set of tasks that are emerging in our daily jobs that cannot be accomplished by a single person [1]. To increase the acceptance and effectiveness of group work, group support systems (GSS) emerged to facilitate the capabilities of groups, to aid in the process of decision-making, and to facilitate communication among group members [2]. The importance of GSS comes from the gains and losses that GSS offer for individuals and organizations today [3, p.46]

A comprehensive meta-analysis conducted by Dennis and Wixom [4] concluded that the past research in the area of group support systems (GSS), and its effectiveness in supporting group activities is inconsistent. They argue that a solid conclusion related to the effectiveness of GSS in improving group and organization's performance does not exist. This paper tries to explore two main moderators of GSS effectiveness; task and culture. Previous research had covered the areas of task and culture as part of a set of factors that affect the effectiveness of GSS. On the other hand, other research had studied each factor separately. This paper tries to propose a classification matrix that integrates the two factors in one classification system and proposes research ideas to open doors for future research.

The paper consists of five parts: the first is an introduction to the area of GSS. The second is a review of the literature on task and culture and previous research performed in the area. The third is a proposed model that will guide the research, define the variables related to the study, and define the focus of research. The fourth section will describe the classification matrix of the variables and the propositions for future research discussed based on previous research and based on logical tests applied on the model. Finally, conclusions and implications will end this paper.

2- GSS in the literature:

Group support systems (GSS) combine communication, computers, and decision technologies to support problem formulation and solution in group-meetings [2]. "The basic purpose of GSS is to increase the effectiveness of decision groups by facilitating the interactive sharing and use of information among group members and also between the group and the computer" [5]. Holsapple and Whinston [6, p.625] proposed a distinction between GSS and group decision support systems (GDSS) based on the perspective of both. The authors say that GSS is broader than GDSS, as GDSS is directed towards decision support and GSS can be directed towards supporting decisions or other support systems activities like communicating, or creating. The main issue seems to be that GSS is a broader domain than GDSS could be.

Research in the area of GSS concentrated on the factors that affect the effectiveness of the group in performing the job required measuring certain performance outcomes. Those factors include the following: task, type and composition of group, and type of technology [4] [7] [8]. Research added to the previous list contextual factors, in which they included culture [3] [9].

Research on GSS had explored the facilitation effect on the outcomes of the process and on the effectiveness of the group. As we can explore the effect of GSS on group performance, we can also study the

effect of facilitation on GSS effectiveness. Adkins et al. [10] explored the effect of facilitation on quality of decisions, time required to complete decision-making, and group satisfaction, and found that GSS facilitation will improve all those outcomes. On the other hand, GSS provide new opportunities for information exchange that may not be open for non-GSS environments, such opportunities are: information recall, information exchange, and information use [11]. Factors that affect information exchange are: parallelism, group memory, and anonymity [3]. Also, DeSanctis and Gallupe [2] emphasized the role of computer-mediated electronic communication that can replace verbal communication.

Townsend, Hendrickson and DeMarie [12] considered GSS an important factor in the case of distributed groups as they enhance performance, emphasizing the role that GSS provide to compensate for the missing impact of social cues that enable face-to-face interactions. They emphasized the role of standardization of tools as it will enable employees to move between tasks and facilitate the abilities of employees to master a larger and wider number of systems that they may encounter. Finally, Turoff et al. [7] explored the issue of distributed group systems, and the authors concluded to the fact that GSS design requirement for the distributed groups, would be different than those for decision rooms.

GSS provide a suitable tool to overcome individual and group biases, two dimensions of judgmental biases is explored and they are representativeness biases and availability biases [9]. GSS can provide groups with an excellent means of communication and information exchange, and provide support for decision-making process. The major factors that affect the effectiveness and performance of groups in GSS settings are the following: task, group type and size, contextual factors (including culture), and technology type. The following sections described two of those factors that this paper focuses on and they are task and culture.

Group Task:

The commonly used classification of tasks set by McGrath [13] was used in more than one study and it includes the following four task activities: generate ideas or plans, choose a correct or preferred answer, resolve conflict, and execute previously developed plans. GSS can help in facilitating and performing many aspects of those activities. Research covered many areas in task-technology domain, and the following section will cover part of the research done in this area. Other research used task complexity; the amount of effort required to complete the task, and solution multiplicity; the degree to which there is more than one correct solution, as the bases for classifying tasks performed by groups [9]. Benbasat and Lim concluded that GSS serves groups better in a simple task (generate *or* choose) rather than a complex task (generate *and* choose).

The discussion on group task includes many aspects that concentrated on task and other aspects of group systems. Zigurs and Buckland [14] developed a theory that fits group task to the technology that the group uses. The theory relates task complexity to relevant attributes of GSS technology. The authors based their theory on the following five categories of tasks: simple tasks, problem tasks, decision tasks, judgment tasks, and fuzzy tasks. They concluded that tasks account for more than half the variation in group interaction. On the same path, a rich discussion offered by Mallach [15] in his book *"Decision Support and Data warehouse Systems",* concluded that media richness level should fit with the complexity of the task and thus determining the correct richness of communication is an important issue for the design process of GDSS (Can be applied to GSS also).

Tasks can be subdivided into simpler parts and more focused as they have a hierarchal nature like a tree, and based on this nature, Dennis et al. [16] explored the structuring of tasks that enables researchers and managers to concentrate on specific parts of it and to easily utilize the capabilities that GSS can provide. On the other hand, El-Shinnawy and Vinze [8] used a different classification of tasks, which we will use in this study. The classification is based on the process that group reach consensus through, and this might be judgmental or intellective. Judgmental tasks involve judgmental behavioral, ethical or esthetic judgments. Intellective tasks involve a correct answer and the group needs to uncover such answer and continue with their process. El-Shinnawy and Vinze concluded to the fact that GSS was more effective in the case of intellective tasks, as it brought the opinions of the group members without distortion and facilitated the communication much better than in the case of the judgmental tasks. The main conclusion from this study, related to task and communication, is that groups need to be careful when choosing the type of medium used to complete the task. Another important finding is the interaction of task with medium (GSS vs. Non-GSS), as the study showed that in cases where social and normative influence are allowed to guide groups through the decision process, a face-t-face setting is more effective than a GSS setting. On the contrary, when consensus building and democratic outcome is desired, a GSS setting is more effective and would be a better medium. Finally, the same classification was used by Turoff et al. [7] as the authors used uncertainty and equivocality aspects of the task. Uncertainty means the lack of information (like intellective), and equivocality means the ambiguity of the task (like judgmental). The authors used this classification in studying distributed group systems and concluded that:

"distributed group support systems can be very suitable for problems involving ambiguity" (page 412).

The previous section described mainly two types of tasks that are of great interest for this study: intellective tasks, and judgmental tasks. The overwhelming size of studies concluded that GSS is more effective in facilitation and improving group performance in the area of intellective tasks. The relationship between culture and task would be of great interest to our work as certain type of tasks will be affected by the type of group that performs each task. In this study we will use the term idea-generation task to represent intellective task, and we will use decision-making task for the judgmental type, and from that we will try to link the culture background of the group (diverse vs. homogeneous) to the type of task performed.

Culture and GSS:

The issue of culture is an important one in GSS dynamics as it affects the information exchange and communication between the group members, and even it affects the process of decision making. The following section will describe Hofstede framework that was used in more than one study as to classify national cultures.

Hofstede [17] [18] explored the influence that national cultures can have on organizational value systems and what that means in the integration within the organization. The study described four dimensions:

1- Power distance: the extent to which the members of a society accept that power in institutions and organizations is distributed unequally.

2- Uncertainty avoidance: the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity, which leads them to support beliefs promising certainty and to maintain institutions protecting conformity.

3- Individualism: a preference for a loosely knit social framework in society in which individuals are supposed to take care of themselves and their immediate families only (the opposite is collectivism; tightly knit social framework).

4- Masculinity: a preference for achievement, heroism, assertiveness, and material success; as opposed to femininity, which stands for a preference for relationships, modesty, caring for the weak, and quality of life.

Other cultural studies explored the organizational cultures and their interrelationships with individuals and based on a different classification system [19], such research is not our focus in this study.

Based on Hofstede classification we can describe a member of a group to be in a certain cultural category based on his score in the four dimensions discussed previously. The main purpose of this study at this stage is to classify group members to be in two categories by using two countries, and thus the researcher can build two types of groups: diverse and homogeneous.

Based on the previous introduction, many researchers had studied the cultural effect on GSS settings. Research in the area of GSS and culture explored the interaction between culture and task in GSS settings [20] [21] [22] [23]. As an example Tung and Quaddus [20] summarized the research in this area in a table that included 30 studies among which 13 were laboratory studies, 7 conceptual overviews, 2 field studies, and the rest were in different disciplines. From such survey we can see the popularity of experimental studies (or lab settings) in the GSS area. The authors included in the review information about the authors, research type, GSS technology, independent and dependent variables, use of culture, and the findings of the research.

The study performed by Tung and Quaddus explored the differences in cultural settings and using Hofstede dimensions to explain the variations in the experimental results in the list of research described. The value of their study did not stop at this point, but they suggested the implications for the impact of culture on GSS research for the next decade from a point of view of GSS facilitators, GSS software designers, and GSS researchers. By using a 2X2 factorial design, the study explored the effect of culture on two factors: computer support and task. The cultural context was a two group settings in Singapore and Australia. Finally, the authors concluded that culture plays an important role in determining the effectiveness of decision conferencing.

Karahanna, Ahuja, Strite & Galvin [24] explored individual differences and its effect on GSS settings. Through a field study, the authors used 46 employees as subjects in a large state university and formed groups of 6-12 members to brainstorm on an issue of concern. The variables measured were: personal innovativeness, written communication apprehension, oral communication apprehension, computer anxiety, and group cohesion. The results showed that individual differences had an effect on the perception of relative advantage of the system and thus on beliefs and behaviors in GSS settings.

Other similar studies like the study performed by Tan, Wei, Watson, Clapper and McLean [22] showed that in an individualistic culture, the majority influence (the dependent variable) was stronger in unsupported GSS settings than in face-to-face and dispersed settings. The study used a laboratory experiment with subjects from two countries: Singapore and the USA, and the authors tested the relationships between culture and task, and communication medium. On the other hand, Tan, Wei,

Watson and Walczuch [23] reported that groups in Singapore showed higher sustained influence than the USA groups. Also, the study showed that computer mediated communication reduces status effects during communication in both Singapore and USA groups. This time the researchers used status influence and sustained influence as dependent variables and in the same settings as in the study performed by Tan, Wei, Watson, Clapper and McLean [22].

Finally, a study performed by Mejias et al. [21] used culture as an independent variable to study the variations in consensus level, satisfaction level in decisions, and participation equity in a laboratory experiment settings. The results showed a higher level of consensus by the Mexican groups than the USA groups, and even the level of satisfaction and the participation equity were perceived higher in the Mexican groups than those of the USA. A link between task fragmentation and cultural differences was suggested by Dennis et al. [16] as breaking the task into subparts will serve in overcoming the cultural differences with respect to the overall treatment of the task by each group member.

The dependent variables:

Research in the area of GSS explored a wide range of dependent variables, but the most commonly used measures are related to performance and effectiveness of the GSS process. To measure such dependent variable, researchers used two sets of measures: performance related measures and satisfaction related measures. The first consists of the following: (1) decision quality, (2) number of ideas generated, and (3) time used to make a decision. The second set of measures consists of: (1) Satisfaction with the outcomes, (2) satisfaction with the process, and (3) confidence with the outcomes [25].

3-Research model and classification system

The conceptual model described in Figure 1, shows five factors that were explored by many researchers in the area of GSS. This paper will try to concentrate on the two factors that were discussed in the introduction and literature review: task, and culture. The dependent variable will be measured by two measures that consist each of three items (check Figure 2).
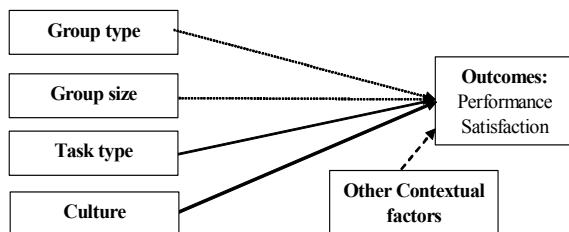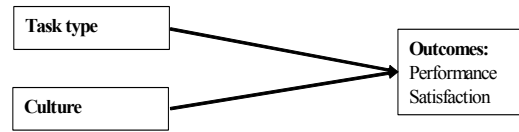

Figure 1: Conceptual model

Figure 2: Reduced conceptual model

Culture: This study will try to deal with the cultural dimensions as a black box and try not to build the propositions based on the four described cultural dimensions proposed by Hofstede. The reason for discussing those dimensions was to build a conceptual base for the cultural differences, as those dimensions will be used to classify the individuals with respect to their cultural preferences and then try to formulate two types of groups: culturally diverse groups (heterogeneous groups), and culturally homogeneous groups. The study will try to explore the difference in the effectiveness of GSS settings between the two groups.

Group task: In the area of Task, this study will only use two types of task: 1) idea-generation tasks, and 2) decision-making tasks. The first is related to idea generation, intellective, or information exchange, which means a lower task complexity and a more defined task as proposed by previous research [7] [8]. The second type is related to the ambiguity of the task and complexity level and as proposed by previous research mentioned.

Performance and satisfaction outcomes: As described earlier, the dependent variable will be performance outcomes and it will consist of two types: performance related measures and satisfaction related measures. For idea generation tasks, we will use the following performance outcomes: number of ideas generated, quality of idea generated, participation and satisfaction with the process. On the other hand, in cases of decision making tasks, we will use the following measures: quality of decision made, satisfaction of outcomes, satisfaction with the process, and the participation level.

The classification system and the research propositions:

The following classification system will be used to guide the research and to generate the research propositions (Figure 3):

Based on the above described classification system, the following propositions are suggested for future research:

- **Proposition # 1:** In a GSS supported environment, homogeneous groups performance will improve more in decision-making tasks than in idea generation tasks.

Figure 3: The classification system- culture task fit model

		Culture	
		Homogeneous groups	hetrogeneous groups
Task	Idea generation	Performance outcomes (C1)	Performance outcomes (C2)
	Decision Making	Performance outcomes (C3)	Performance outcomes (C4)

- **Proposition # 2:** In a GSS supported environment, heterogeneous groups performance will improve more in idea generation tasks than in decision-making tasks.
- **Proposition # 3:** In a GSS supported environment, homogeneous groups performance will improve more than heterogeneous groups when dealing with decision-making tasks.
- **Proposition # 4:** In a GSS supported environment, heterogeneous groups performance will improve more than homogeneous groups when dealing with idea generation tasks.

4- Research method:

To test for the previous propositions the following steps need to be performed:

1- The domain and focus of the research are discussed previously and the research hypotheses will be derived from the propositions mentioned.

2- The research method to test the propositions would be an experimental settings and the researcher will form groups according to the following treatments listed in the following matrix with the total number of groups = 40 groups. The setting of the study will be between two countries, and the groups will be formed accordingly and to represent the treatments described. The task will be two types in which one of them will be easy, but needs a high communication facilitation process. The other type of task will be judgmental and needs some analysis and discussion among the group members. Finally, each group will consist of 4 persons, with a total of 200 persons in the study. Following Figure 4, which describes the same setting with the total number of groups in each treatment cell:

3- The variables used by research need to be measured, and it is preferred to use a well-tested and validated instrument than to develop a new one. The following table includes the variables and the instrument intended to be used or developed (Table 2).

Table 2: Measurement instruments and steps for experiment

Variable	Instrument
Task:	The type of task need to be designed to provide the variety of tasks needed for the experiment (intellective vs. judgmental).
Culture:	Replicate the study by Tung and Quaddus (2002), further research is needed in this area.
Group performance: • Number of ideas: • Quality of ideas: • Time spent to reach a decision:	Instrument: • Counting ideas. • Expert ratings: Good, Fair, and Bad. • Measuring time spent until reaching a decision or stop generating ideas.
Satisfaction	Using the instrument used in Dennis (1996) for the three measures. Satisfaction is in the facilitation and communication process: includes information usage, satisfaction of the process, and satisfaction of the quality of results.

4- After performing the experiment a 2X2 factorial analysis is performed to compare the groups results and to test the hypotheses stated.

5- Results, conclusion and implication are discussed at the end of the study.

Figure 4: The distribution of groups between treatments

		Culture	
		Homogeneous groups	hetrogeneous groups
Task	Idea generation	10 groups	10 groups
	Decision Making	10 groups	10 groups

5- Conclusions and research implications:

The purpose of this research was to explore the factors affecting group performance in a GSS supported environment. This study reviewed the literature in the area of GSS and explored the research done related to task and national culture effects. The literature in the area of GSS mainly emphasized the important role of GSS in facilitating the communication process between group members. The differences between GSS and non-GSS were explored by more than one study and its effect on the group performance, as a result, this study will concentrate on the task-culture relationships. In the area of task, the research conducted covered many aspects of the relationship between task and GSS. The study used two type of task: intellective and judgmental tasks, and described the characteristics of both. Finally, the literature discussed national culture as a way to describe groups as: diverse groups and homogeneous groups. The cross classification between the three variables and their relationship to performance guided the process of stating the research propositions. The study concluded to four propositions that open doors for future research and proposed a method for testing for those propositions.

This research emphasizes the importance of GSS and implies the design characteristics of the GSS settings and how they relate to the group task, and the type of group. Also, the result of this research will provide an integrated picture of task-culture fit perspective in a GSS supported environment.

References:

[1] Bamber, E., Hill, M., and Watson R., "Audit Groups and Group Support Systems: A Framework And Propositions For Future Research." *Journal of Information Systems,* (12:2), Fall 1998, pp. 45-73.

[2] DeSanctis, G. and Gallupe, R., "A Foundation For The Study of Group Decision Support Systems." *Management Science,* (33:5), 1987, pp. 589-609.

[3] Nunamaker, J., Dennis, A., Valacich, J., Vogel, D., and George, J., "Electronic Meeting Systems To Support Group Work." *Communication Of The ACM,* (34:7), July 1991, pp. 40-61.

[4] Dennis, A. and Wixom, B. "Investigating the Moderators of the group Support Systems Use With Meta-Analysis." *Journal of Management Information Systems,* (18:3), Winter 2001-2002,pp. 235-257.

[5] Huber, G., "Issues in the Design of Group Decision Support Systems." *MIS Quarterly,* (8:3), September 1984, pp. 195-204.

[6] Holsapple, C., and Whinston, A., *"Decision Support Systems: A Knowledge-Based Approach*." Course Technology, 1996.

[7] Turoff, M., Hiltz, S., Bahgat, A., and Rana, A., "Distributed Group Support Systems." *MIS Quarterly,* December 1993, pp. 399-417.

[8] El-Shinnawy, M. and Vinze, A., "Polarization and Persuasive Argumentation: A Study of Decision Making in Group Settings." *MIS Quarterly,* June 1998, pp. 165-198.

[9] Benbasat, I. And Lim, L., "A Framework for Addressing Group Judgment Biases with Group Technology." *Journal of Management Information Systems,* (13:3), Winter 1996-97, pp. 7-24.

[10] Adkins, M., Burgoon, M., and Nunamaker, J., "Using Gr5oup Support Systems for Strategic Planning With The United Air Force." *Decision Support Systems,* (34:2002), pp. 315-337.

[11] Dennis, A., "Information Exchange and Use in Group Decision Making: You Can Lead a Group To Information, but You Can't Make It Think." *MIS Quarterly,* (December 1996), pp. 433-457.

[12] Townsend, A., Hendrickson, A., and DeMarie, S., "Meeting the Virtual Work Imperative", C*ommunication Of The ACM,* (45:1), January 2002, pp. 23-25.

[13] McGrath, J., "*Group: Interaction and performance*." Prentice-Hall, Englewood Cliffs, NJ, 1984.

[14] Zigurs, I., and Buckland, B., "A Theory of Task/Technology Fit and Group Support Systems Effectiveness." *MIS Quarterly, (*September 1998), pp. 313-334.

[15] Mallach, E., "*Decision Support and Data Warehouse Systems."* Irwin McGraw-Hill, 2000 (Chapter 10, p. 393).

[16] Dennis, A., Aronson, J., Heninger, W., and Walker II, E., "Structuring Time and Task in Electronic Brainstorming." *MIS Quarterly,* (23:1), March 1999, pp. 95-108.

[17] Hofstede, G., "Motivation, Leadership, and Organization: Do American Theories Apply Abroad?" *Organizational Dynamics,* Summer 1980, pp. 42-63.

[18] Hofstede, G., "The Interaction Between National and Organizational Value Systems." *Journal of Management Studies,* (22:4), July 1985, pp. 347-357.

[19] O'Reilly, C., Chatman, J., and Caldwell, D., "People and Organizational Culture: A Profile Comparison Approach to Assessing Person-Organization Fit." *Academy of Management Journal,* (34:8), 1991, pp. 487-516.

[20] Tung, L. and Quaddus M., "Cultural Differences Explaining the Differences in Results in GSS: Implications for the Next Decade", *Decision Support Systems,* (33: 2002), pp. 177-199.

[21] Mejias, R., Shepherd, M., Vogel, D., and Lazaneo, L., "Consensus and Perceived Satisfaction Level: A Cross-Cultural Comparison of GSS and Non-GSS Outcomes Within and Between the United States and Mexico," *Journal of management Information Systems,* (13:3), 1996, pp. 137-161.

[22] Tan, B., Wei, K., Watson, R., Clapper, D., and McLean, E., " Computer-Mediated Communication and Majority Influence: Assessing the Impact in an Individualistic and a Collectivistic Culture." *Management Science,* (44:9), 1998a, pp. 1263-1278.

[23] Tan, B., Wei, K., Watson, R., and Walczuch, R., " Reducing Status Effects with Computer-Mediated Communication: Evidence from Two Distinct National Cultures." *Journal of Management Information Systems,* (15:1), 1998b, pp. 119-141.

[24] Karahanna, E., Ahuja, M., Strite, M., & Galvin, J., "Individual differences and relative advantage: the case of GSS" *Decision Support Systems,* (32:4). March 2002, pp. 327-342.

[25] Benbasat, I. And Lim, L., "The Effects of Group, Task, Context, and Technology, Variables On The Usefulness of Group Support Systems, A Meta-Analysis of Experimental Studies." *Small Group Research,* (24:4), November 1993, pp. 430-462.