Chapter Two: Literature Review

2.1 Introduction

In this chapter we present a review of various areas of literature that are pertinent to our study of Group Support Systems (GSS) and how they operate. We first examine the background to GSS, how they have developed and how research has been conducted. We look in particular at laboratory experiments and field studies (since most prior GSS research has operated within these methodologies), comparing and contrasting these two methodological approaches and their respective outcomes. Various taxonomies of outcomes have been proposed, including: Mennecke et al.'s (1992) group performance, individual perceptions and group development; Pinsonneault and Kraemer's (1990) task- or group-related outcomes; and Zigurs and Dickson's (1990) distinction between performance and satisfaction outcomes. This latter taxonomy is not only the most simple, but also the most representative of all the schemes proposed, Zigurs and Dickson (ibid.) listing a large number of outcomes, and it is the one we employ here. Following this discussion of outcomes, we continue by examining the different environments where GSS research has been undertaken, as well as paying attention to ergonomic issues and facilitator/chauffeur support for the GSS process.

In the second part of this chapter, we examine the socio-psychological aspects of group processes. Much of this literature will be critical for the development of the research framework and instrument which we describe in Chapter Four. We focus in particular on the way in which status and influence operate in meeting processes and influence meeting outcomes. Finally, we take a brief look at cultural aspects of group interactions, particularly as they apply to Hong Kong where we are undertaking our research.

2.2 Group Support Systems (GSS)

2.2.1 Background

Group Support Systems is a relatively new technology that emerged in the early 1980s. Whereas a Decision Support System focuses on single users, in a GSS the focus is on a group of users, all 'nominally' connected to each other. The exact

topography of the connection varies according to the support system used, ranging from a local area network of terminals, through a number of groups of participants who may or may not all be in the same time zone and place. A key aim of GSS is to improve *group* performance, whether this is meeting productivity, the time taken to reach a decision, the degree of participation that is effected, the degree of satisfaction that is achieved, or many other factors.

Dennis et al. (1988) recount how the first notions of what we now call GSS were conceived in 1965 at the CASE Institute of Technology. By the late 1970s, it was realised that there was a need for a special meeting room where group members could meet. The technology in this room would permit "each user seated at a workstation to interact with the set of requirements and the proposed design of the system" (Dennis et al., 1988, p.621). This early system was known as PLEXSYS-84[1]. The special meeting room soon adopted the generic name "decision room" (see e.g. Gray et al. (1981) and Aronson et al. (1987)). Although early decision rooms were often rather rudimentary in nature (Huber, 1984), by the mid-1980s, research was being conducted into the design and functionality of GSS. DeSanctis and Gallupe's (1987) study is often cited in this respect. They observed that "A GDSS combines communication, computing, and decision support technologies to facilitate formulation and solution of unstructured problems by a group of people" (p.589). They elaborated: "A GDSS aims to improve the process of group decision making by removing common communication barriers, providing techniques for structuring decision analysis, and systematically directing the pattern, timing, or content of discussion" (ibid.).

2.2.2 Laboratory Experiments and Field Studies - An Introduction

As GSS became an increasingly well established research topic, so it moved into the realm of empirical research. A common feature of laboratory research was its predominant use of student subjects. The limitations of using students as participants or surrogates for managers - and this often occurred - had been recognised long before (Lorge et al., 1958), yet very often it was simply too difficult to persuade real managers to participate in GSS sessions. A key difference between the practices of laboratory and field research is that in the former, students are

frequently employed as subjects solving trivial or contrived problems with little vested interest in the outcome, whereas in the latter the businessmen, executives or other professionals who typically participate **are** very concerned about outcomes, in which they **do** have a vested interest. This means that while decision quality (for example) could be measured in student groups by checking how close a solution is to an 'expert recommended solution', this cannot be done in field studies where there is no such thing as a correct answer. Consequently, it may be difficult to generalise results from laboratory experiments to field settings. Howsoever the case, students were used in a wide range of experiments.

By the late 1980s, researchers were becoming increasingly aware of the fact that not only did there need to be a wider application for GSS, but that this application must come through studies validated not with students but 'real people'. Indeed, *recommendations for future research* often included exhortations to conduct field studies, noting the lack of research in this area and echoing the problems of non-generalisability inherent in the use of students as participants. Connolly et al. (1990, p.701), are not untypical in this regard: "questions of external validity must always be raised in experimentation of this sort".

Field studies were comparatively slower to get going, but it is difficult to gauge precisely how much field work has been done. This stems from the fact that, as Dennis et al. (1989, p.301) observe: "not all field research is formally documented and submitted for publication". This is particularly true where organisations use GSS in their regular work and where no university contact is maintained. IBM, for example, is a major user of GSS, though only a few early studies (e.g. Vogel et al. (1990)) describe IBM's use of GSS. Other methodologies such as survey research, case studies and action research are scarcely documented in the literature at all in spite of calls for more pluralist approaches to IS research (see Bjørn-Andersen (1985), Pervan (1994b)).

Before investigating outcomes in laboratory and field studies, it is essential to discuss the fundamental issues of task type and complexity. "Virtually all group researchers agree that group performance cannot be studied generically without regard to task, and that an individual's performance is without question affected by the type and characteristics of the task" (McGrath,1984). McGrath then illustrates the

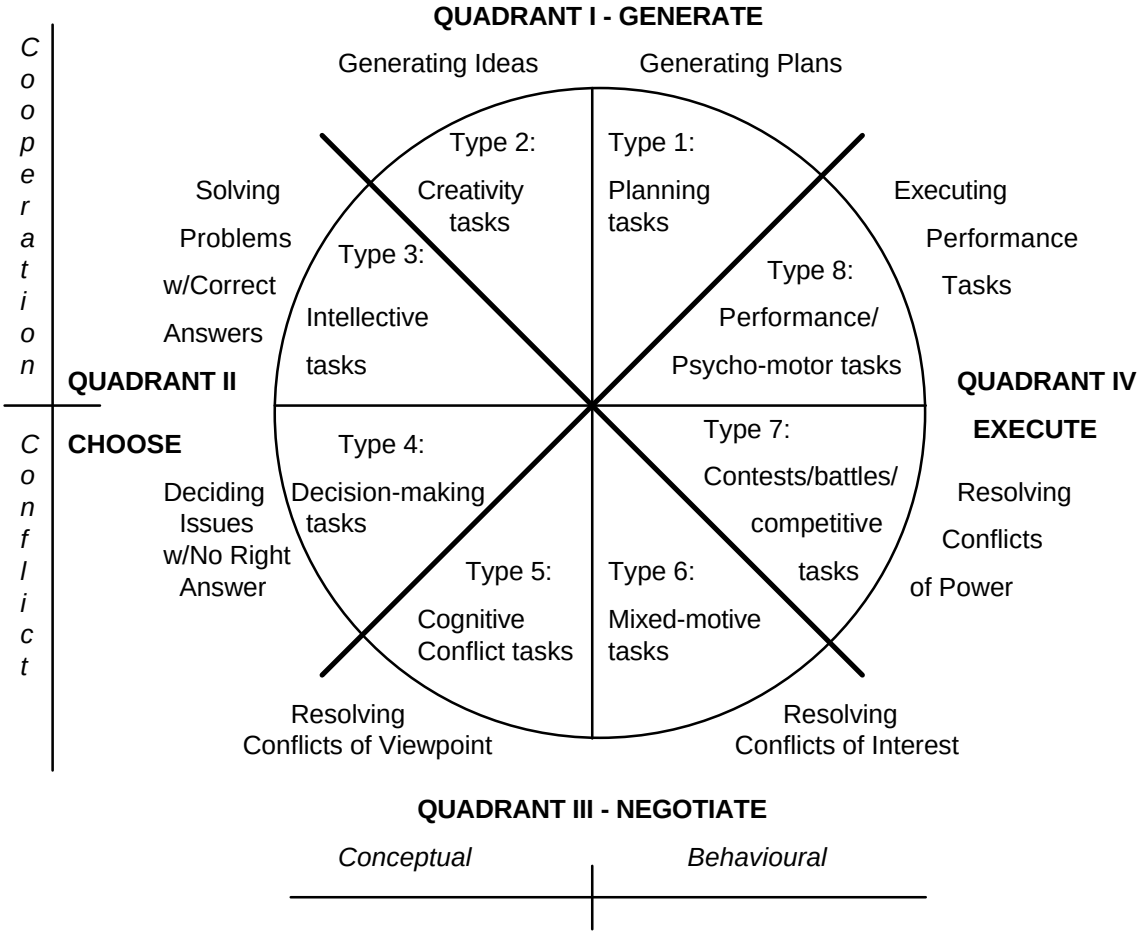
[1] Dennis et al. (1988, p.620) explain that PLEXSYS is derived from the word plexus, meaning "an

complexity of task types in what he terms a 'circumplex', redrawn here in Figure 2.1 below. Most GSS research has employed tasks of Types 1-4, with creativity (idea generating) tasks being particularly popular.

It is important to note that business groups in field settings will undertake quite different tasks to students in laboratory settings. Two key differences evidently lie in the fact that student, experimental sessions typically involve single-session tasks (see Zigurs et al. (1989) for a longitudinal student study), while the complexity of these tasks is normally considerably less than that experienced by business groups (Dennis et al., 1989). Such tasks are characterised by Mason and Mitroff (1981) as hydra-like in their entangling complexity. They may not have an end, and the task may not be completed. Dennis et al. (1989, p.303) observe that "*these tasks are particularly appropriate for GDSS support*" (original emphasis). Indeed, Bui and Sivasankaran (1990) argue that complex tasks lend themselves to GSS. They found that as task complexity increases, so the effectiveness of GSS-supported groups becomes more apparent when compared to groups that do not have GSS support.

interwoven combination of parts or elements in a structure or system". 'sys' is a contraction of system.

Figure 2.1: Task Circumplex (McGrath, 1984)



This is corroborated by Vogel et al. (1987) who observe that tasks that are too simple will undermine the effective use of GSS.

It was perhaps with such task appropriateness in mind that a number of researchers examined tasks along the informational-normative continuum (Huang et al., 1993; Tan et al., 1993a, 1993b), proposed by Davis et al. (1976), also used by Kaplan and Miller (1987), specifically intellective and preference tasks (types 3 and 4 in McGrath's circumplex). The intellective task lies towards one end of the continuum, while the preference task lies towards the other. While, intellective tasks have, or are considered to have, "demonstrably correct answers", preference tasks involve "behavioural, ethical, or aesthetic judgements for which there are no demonstrably correct answers" (Huang et al., 1993). "In terms of solution multiplicity, the former yields [a] single solution and the latter ... yields multiple solutions" (Benbasat and Lim, 1993). Both task types involve activities of a higher degree of complexity than simple idea generation, since intellective tasks may involve multiple criteria (Bui, 1987; Zigurs et al., 1988) and preference tasks will yield more than one

solution as the solutions should reflect individual participant preferences (Watson et al., 1988).

Apart from task complexity, it is also useful to mention task analysability (Perrow, 1967; Rice, 1992). "Analyzable tasks are those for which predetermined responses to potential problems, and well known procedures, are available and useful, because outcomes are well understood" (Rice, 1992, p.478). Daft and Weick (1984, p.287) observe that in unanalyzable task environments, processing is "more personal, less linear, more ad hoc and improvisational". Individuals need "to think about, create or find satisfactory solutions to problems outside of the domain of facts, rules, or procedures" if they are to solve these unanalysable tasks (Rice, 1992, p.479), hence using intuition, creativity and judgement (Simon, 1977) as well as interpersonal sharing of information. The availability of additional information through other media (e.g. GSS) is clearly relevant in this context.

2.2.3 Outcomes in Laboratory Studies

Following Zigurs and Dickson's (1990) taxonomy, the performance outcomes that we consider here are: decision quality, idea generation, depth of analysis, participation and influence, and conflict; while the satisfaction outcomes (principally process and outcome satisfaction) are considered together. However, before we describe these in detail, we make two important observations. Firstly, there is a prevailing inconsistency of results in laboratory experimental research, Jessup et al., (1990a, p.313) commenting "unfortunately, empirical investigations thus far provide confusing results". Various explanations have been suggested for these inconsistencies, for example: the lack of theory driven methodological research (Rao and Jarvenpaa, 1991); the prevalent use of students as subjects, the preference for using small sized groups, and the fact that these groups are formed for the sole purpose of the task studied (Pinsonneault and Kraemer, 1990); and even experimental design itself (Galliers and Land, 1987). A second observation is made by Pervan (1994a) who notes that there has been insufficient replication of experimental conditions to make anything more than the most tentative of generalisations about GSS performance.

2.2.3.1 Decision Quality

Traditionally, decision quality in laboratory experiments has been measured in two ways. The first approach is to construct a task that has a known correct answer.

Certain tasks lend themselves to this kind of approach, particularly the intellective tasks (McGrath, 1984). It is then possible to measure how many of the GSS-supported groups, as opposed to unsupported groups, achieve this correct answer, or how close they get to it. Pervan (1994a), in a meta-analysis of GSS effectiveness measures, reveals that in eleven of thirty lab studies measuring decision quality, the "correct answer" approach was employed. The second approach, documented by Pervan in ten out of thirty studies, employs expert judges who are independently required to assess quality. Quality attributes include criticality, uniqueness and creativeness displayed in both the process taken to reach a decision and the final decision itself. Where results are concerned, Pervan (ibid.) indicates that in only five out of sixteen studies did GSS-supported groups outperform unsupported groups (in the other fourteen studies, no comparison was made). In ten studies there was no difference, while in one, the unsupported groups outperformed the GSS-supported groups. Similar variations in decision quality are found by other researchers (see e.g. Dennis et al. (1991)).

2.2.3.2 Depth of Analysis

Depth of analysis is an area that is closely related to decision quality. Indeed, more thoroughly analysed problems may well lead to higher quality solutions. Anonymity is one of the most frequently studied options available in the GSS toolbox and is important to our discussion of depth of analysis. Jessup et al. (1990a, p.318) found that anonymous groups were "more critical and probing and more likely to embellish an idea". Connolly et al. (1990) in a related study found that anonymous groups generated more high quality ideas when subjected to negative evaluative tone. They attributed this increase in quality to participants' unwillingness to let negatively critical ideas pass by unchallenged, i.e. if a negative comment was made, then more "development, embellishment or defence of the idea was needed" (Connolly et al., 1990, p.699). Ocker et al. (1996) found that distributed anonymous groups generated more creative and unique ideas in a software requirements development task. The expression of individual opinions was encouraged by the distributed and anonymous nature of the communication medium, resulting in a much wider range of ideas than was the case in face-to-face groups. This permitted much deeper and broader analysis.

2.2.3.3 Idea Generation

As a performance measure, the number of ideas generated by group members, and the proportion of those ideas that are critical or unique, has been frequently used in GSS empirical research. The reason for this approach may be that, as a strictly quantifiable unit, it is relatively easy to count how many ideas have been generated. Many researchers have found that electronic brainstorming groups generate more ideas than unsupported brainstorming groups, e.g. Gallupe et al. (1990, 1991, 1992). Other studies have examined different forms of GSS support or different environments. Jessup et al. (1990a) and Jessup and Tansik (1991) find, for example, that anonymous groups generate more ideas than non-anonymous groups.

2.2.3.4 Conflict and its Resolution

GSS-supported groups show an improved ability to handle and manage conflict than do unsupported groups (Pervan, 1994a). Chidambaram et al. (1991), in a longitudinal study, found that GSS-supported groups improved their ability to handle conflict over time, whereas the unsupported groups became relatively less adept at handling conflict. They suggested that the GSS supported group needed time to adapt to the technology. Indeed one participant observed that "the system prevents interaction until you learn to adapt" (ibid., p.20). However, when it had succeeded in making that adaptation, it was clearly able to manage conflict better. Zigurs et al. (1991) found that over a series of eight meetings, group members' attitudes towards the GSS technology became increasingly positive. Unfortunately, such longitudinal research is rarely encountered in reports of laboratory studies.

2.2.3.5 Participation and Influence

Computer-mediated communication encourages people to participate in discussions due to the removal of social barriers that might prevent some individuals from participating (George et al., 1990), as well as enabling all group members to type at the same time (Hiltz et al., 1986; DeSanctis and Gallupe, 1987; Nunamaker et al., 1987). However, while some studies do support the notion that GSS-supported groups will participate more equally (Lewis, 1982; Applegate et al., 1986; George et al., 1987, 1990; Zigurs et al., 1988), in others, no differences were found between GSS-supported and unsupported groups (Beauclair, 1987; Gallupe et al., 1988; Jarvenpaa et al., 1988; Watson et al., 1988). Nonetheless, there is some evidence to

indicate that GSS-supported groups experience a more even distribution of influence (Zigurs et al., 1988) and a reduction of dominance (Lewis, 1982).

2.2.3.6 Satisfaction Outcomes

Satisfaction is a highly complex variable, Zigurs and Dickson (1990) identifying 36 components of satisfaction. However, for the most part, satisfaction is generally reduced in the literature to process or outcome related satisfaction, with few studies attempting to investigate the construct in more depth. George et al. (1990, p.402) state unequivocally: "Two types of satisfaction have been studied in GDSS experiments: satisfaction with the process and satisfaction with the outcomes". Despite this lack of depth, there has been no shortage of studies that attempt to measure process and outcome satisfaction. Nonetheless, there is a distinct lack of consistency in the results.

Jessup and Tansik (1991) and Cass et al. (1991) found that with GSS-support, face-to-face groups experience higher levels of satisfaction than dispersed groups. This can be attributed to the fact that in a face-to-face setting, the medium of communication is richer than in a dispersed situation, where visual and verbal interaction are impossible (Smith and Vanacek, 1989) unless video- and audio-conferencing tools are available.

For manual groups, a general observation has been made that as group size increases, so group member satisfaction decreases (Mullen et al., 1989). This decrease may be attributed to the loss of individual recognition in the 'crowd' (Zimbardo, 1969; Diener, 1980) and to the subjective discomfort associated with being surrounded by many people (Stokols, 1972; Knowles, 1980). A number of studies have found that when GSS support is present, group size increases lead to satisfaction level increases (Dennis et al. 1990b; Gallupe et al., 1992), but these results are not entirely consistent, as Valacich (1989) found larger groups to be no more satisfied than smaller groups.

2.2.4 Outcomes in Field Studies

The performance outcomes we consider here include: decision quality, time and cost, and participation and re-participation; the satisfaction outcomes once again include process and outcome satisfaction, but we additionally consider factors that influence satisfaction. The very different nature of the task environment in field

studies (when compared to laboratory experiments) means that it is not always easy to make direct comparisons between the two. Some variables, as we shall describe, are not always appropriate for the two genres of research, decision quality being a case in point. Indeed, some researchers themselves have at times exhibited a certain unease with field research as a discipline, Post (1993, p.24), for instance, remarking: "this study was not experimental and did not rely on controls and comparison groups". This is an important concern, yet field research is clearly not organised along the same lines as laboratory research.

2.2.4.1 Decision Quality

It is arguable that there is no, or should not be a *correct* answer in a field setting, and so decision quality is not a directly measurable variable. Ideally groups will be free to ponder the evidence laid before them, discuss it and arrive at a solution. The nature of the problem in field studies does not always lend itself to the sometimes simplistic and contrived problems found in laboratory research. However, it may be possible for expert judges to rate the quality of strategic plans made with the support of GSS. Pervan's meta-analysis of the GSS literature (1994a, p.568) indicates that GSS-supported groups achieved significantly better solutions than unsupported groups.

However, as with experimental studies, it is insufficient to look at simple results in isolation. Rather, we need to examine the mediating and independent variables that have impacts on the outcomes. Dennis et al. (1991) list a number of such independent and mediating variables, including: organisational culture (public, private, military), provision of incentives, nature of problem, group history, group hierarchical structure, group experience with GSS, group size, group logical size, task type, task complexity, meeting length, etc. In any one study, most of these 'variables' may in fact stay constant, i.e. all participants might be managers with no *ad-hoc* groups and an incentive provided to all groups. Nonetheless, there is still a considerable amount of variation involved and this makes us wary of generalising the increased effectiveness which Pervan (1994a) reports to all studies. It should be realised that it is seldom the case in field studies that one 'group' will undertake tasks manually while another does so with GSS support. Rather, the participants must record their perceptions of their would-be performance level, had they had only manual support. This introduces a further degree of error into calculations of quality.

2.2.4.2 Time and Cost

In field settings, the maxim 'time = money' is relevant to a far greater extent than in the laboratory, where, participant (student) time is part of their normal study day and researcher/facilitator time is part of what they are paid to do. Therefore, it is appropriate to look at time and cost together in the field: benefits or outcomes are often measured in terms of these two variables. An almost unequivocal finding from field studies is that GSS-supported groups are more efficient than unsupported groups (e.g. Adelman, 1984; Nunamaker et al., 1988; Dennis et al., 1990c). We should remember, though, that time savings do not necessarily mean shorter meetings. Rather, meetings tend to be longer but the number of meetings is substantially fewer. More specific measures of time/cost outcomes are given by Post (1993), a consultant, who describes savings of US$432,260, 11,678 man-hours and 1773 total days of flow time for a series of meetings at Boeing with the GSS product 'TeamFocus'. Additional outcome measures for consultants could include return and re-participate business by clients. This is discussed further below.

2.2.4.3 Participation and Re-participation

Participation has two rather different implications for GSS field research. Firstly we can look at how meeting members participate in their meetings, how much they contribute to the discussion, and what levels of participation equality exist. Secondly we can examine how willing these people are to participate, how frequently they do so and whether or not they are under pressure to do so. While the first of these implications also applies to laboratory research, the second does not as students used in these experiments do not have the choice to participate or not. If they do not participate, then they are not part of the study[2]. Furthermore, laboratory studies seldom involve longitudinal measurement and so notions of reluctance and frequency scarcely apply.

As far as actual meeting contribution and participation are concerned, the evidence from the field is that GSS supported groups generally have higher levels of participation than unsupported field meetings. This is particularly likely to be the case where anonymity of communication is guaranteed. However, this finding is moderated by group history. Benbasat and Lim (1993) observe that established

[2] Indeed, as Jessup and George (1997) admit, even when they do participate, if their contributions are judged to be sufficiently *abnormal*, they may be excluded from the analysis.

groups with their established social orders have less implementable anonymity. This in turn reduces the extent to which participation can be equalised.

The formal hierarchy of a group, which is clearly associated with the group history, also plays an important role in group member participation. Benbasat and Lim (1993, p.453) contend that the 'spirit' of GSS "is to promote democratic meetings and thus is not in line with the concept of hierarchy". Consequently, more formally structured groups may benefit less from GSS in terms of participation, especially if anonymity cannot be implemented effectively. This is not necessarily a negative process, as, at least in the context of an organisation, it is perhaps more appropriate to expect the higher (and so more experienced and competent) echelons of the hierarchy to exert more constructive influence and participation than the lower level participants. It is important to clarify here that both 'group history' and 'formal hierarchy' are not discrete variables. Very often there will be relative degrees of development or structuring and these will necessarily exert an impact on the way in which the group and its members operate.

It is very useful to measure success of a system through its use, and re-use. Hitchcock et al. (1994, p.70) state: "Repeat client business is the bottom line measure of the success of a technology-aided GSS session". This kind of comment is supported by Dennis et al. (1990a) who report that Burr-Brown, the subject of their investigation, expressed interest in holding repeat meetings on an annual basis, and by Post (1993) who found that participants at Boeing rated their willingness to reparticipate in meetings at 4.37 on a 5-point scale. Nunamaker et al. (1989) report that the group support facilities at the University of Arizona were in continuous demand in the period following their development with a waiting time of three weeks. DeSanctis et al. (1992), however, found in their study of IRS teams that not all groups were so willing to reparticipate. While some groups used the GSS system frequently, and on their own initiative, others seemed reluctant to use the system, and often then only at the suggestion of a facilitator. It is likely the case that some groups *adapted* (see DeSanctis and Poole (1994) for their exposition of Adaptative Structuration Theory) to the technology rather better than others. Nevertheless, it is acknowledged that different GSS have different characteristics and hence users may find it more or less easy to adapt to them.

2.2.4.4 Satisfaction Outcomes

Satisfaction is a frequently measured variable in field studies and is often used as a justification for or illustration of benefits arising from GSS use. Nunamaker et al. (1989), for example, report that their users at IBM were strongly satisfied with the computer-aided and group problem-solving processes. Fundamentally, if participants are not satisfied with the use of a system, then it is difficult to justify its use. However, measures of satisfaction are hard to pin down. This situation is not helped by researchers who often fail to indicate precisely what they mean by satisfaction or what participants were supposed to be satisfied with (see e.g. Dennis et al. (1991)). The research literature indicates that both process and outcome satisfaction are higher in GSS-supported groups than unsupported groups (Pervan, 1994a). The data is typically collected from post-session questionnaires, but unstructured interviews are also used.

2.2.4.5 Factors which Influence Satisfaction

As with participation, it is dangerous to assume that satisfaction can be measured independently of other factors. Nunamaker et al. (1991, p.1337) report that groups "working in more integrative or 'win-win' situations tended to report higher effectiveness, efficiency and satisfaction than groups in less positive settings". In some situations, larger groups may experience greater satisfaction if they have GSS support than smaller groups (or than unsupported groups). Ackoff's (1981) belief that it is necessary for the individuals responsible for decision execution to understand the basis for the decision is related to the issue of group size. He observes that the most efficient way of facilitating decision makers' understanding is to include as many of these individuals as possible in the meeting. Some influential participants may insist on membership of meetings for political reasons, though very often their support for a decision can speed up its passage and acceptance. With these extra people involved, the logical size of the group (Dennis et al., 1991) will increase and all participants will benefit from the increased knowledge and experience available (Benbasat and Lim, 1993).

As a way to include a large, but partially remote, group (and thereby reap the benefits of a logically large group), Vogel (1995) reports that in Bled, Slovenia, a GSS meeting room is expressly designed so that while a select group of individuals can engage in a face-to-face meeting, a considerably larger number of other

interested parties, experts, etc. can remotely participate in that meeting from an adjoining room. In this way, the core meeting does not appear to be so large as to get out of hand, yet other relevant people can participate in the meeting.

2.2.5 GSS Tools and Characteristics

A variety of GSS programs were built by different universities and organisations in the 1980s. However, each program would typically only offer a small set of tools such as electronic brainstorming and idea evaluation or voting. GroupSystems (developed over the last 12 years at the University of Arizona), is an exception, with a much more comprehensive 'suite of tools'. In this research we use the GroupSystems for Windows (GSWin) program and hence the tools we describe here relate to it. In the following sections we describe the capabilities of the software.

2.2.5.1 Electronic Brainstorming/Idea Generation/Idea Categorisation

Electronic Brainstorming is one of the most widely available GSS tools. It is also the tool that has been used most frequently in research (e.g. Jessup et al. (1990a) and Dennis et al. (1993)). A somewhat more structured tool is the Idea Generation/Categorisation tool (called Categoriser in GSWin). This permits the free generation of ideas but then permits group members both to comment on the ideas and to categorise them according to theme. This enables each idea to be discussed in considerable detail while still maintaining a useful structure.

2.2.5.2 Group Outliner

The Group Outliner tool has two key functions. It can operate as a tool that permits a group to create a hierarchical diagram of a set of processes or activities. This is useful when a group needs to examine the sub-processes, sub-sub-processes, and so on, that contribute to an overall process. Each process can be described in detail through the item commenting function. Moreover, this tool can also be used for group authoring, where each process may represent a chapter or section and each sub-process is a paragraph or sub-section. In this way a group can create a document collectively. All changes or additions made by other members of the group are available to all group members. When a member is writing in a particular process or sub-process, no one else can edit or add to that process - thus ensuring content integrity.

2.2.5.3 Evaluation and Survey Tools

There are a number of different ways in which evaluation of ideas can be carried out electronically. GSWin provides a number of template options including agree/disagree, multiple choice, yes/no, rank order and ten point allocation scales. In addition, customised templates can be developed to reflect the specific needs of the group. After voting, group members can see a result sheet which indicates how they voted in comparison to the other group members, as well as showing how much consensus the group has achieved on the evaluated items. While ballot items must be rated on the same scale for the Vote or Evaluation tool, the Survey tool permits multiple scales within a single instrument. This is very useful for the design of electronic questionnaires.

2.2.5.4 Anonymity

An additional feature often associated with GSS is anonymity. Essentially, the provision of anonymity means that meeting members can generate ideas or discuss items without being identified. Anonymity is not a compulsory feature of the software - participants can be invited to sign in - nor is it necessarily desirable, as it removes participants' ability to claim credit for ideas (Lyytinen et al., 1993). When group interaction is anonymous, however, group members should be subject to much less influence (see 2.3.3.1) or pressure from their seniors or peers (Jessup et al., 1990b; Jessup and Tansik, 1991).

2.2.6 Environments

GSS operate in a number of different environments. These are often referred to taxonomically by their time and space dimensions. Thus, a group of people may interact at the same time (synchronously) or at different times (asynchronously), in the same place (face-to-face) or in different places (dispersed). In the dispersed setting, the group members may be seated individually - for example in their offices - or in several larger face-to-face groups - this is called multiple group sites (Dennis et al., 1988). Traditionally, research has been conducted into meetings held synchronously - there is very little work documenting asynchronous work using a GSS, though of course virtually all electronic mail communication occurs asynchronously. Equally, most meetings studied have involved face-to-face groups, though Tan et al. (1993a, 1993b), amongst others, have conducted laboratory

experiments in dispersed settings. Mashayekhi et al. (1993) describe an environment that could support dispersed, asynchronous communication. Mashayekhi (1993) explains that the benefits of such a dispersed system grow as the physical distance between the various participants increases. He also observes that cost may prove a limiting factor in terms of the network and processing power required. Indeed, a key ingredient of the environment is the network and server required to run the GSS software.

2.2.7 Ergonomics and Interface Design

In Davison (1995a) a number of different decision rooms are described. These range from the frequently encountered U-shaped table (Vogel et al., 1987), where participants can face each other, to a facility with concentric, tiered rows of workstations. The University of Arizona, where GSWin has been developed, has built a number of decision rooms including the U-table and two concentric, tiered facilities (Dennis et al., 1988). The second, and most recently built, of these can accommodate 56 users (2 per terminal). Alternative designs are suggested by Mantei (1989), Lyytinen and colleagues (Lyytinen et al., 1993; Maaranen et al. 1993) and Davison and Briggs (1997). Mittleman (1996) describes in consummate detail a plethora of issues that are pertinent to the design of GSS facilities.

User interface design is not an issue that has received significant attention in the literature. However, we discuss it briefly here for one key reason, namely: "it is arrogant for the [GSS] designer to assume that all users ... have the same [style] and that they come from the same cultural and language background" (Gray and Olfman, 1989, p.124). As we have observed, the GSS research literature is primarily North American based, with a resultant focus on both North American norms and the English language. It is recognised that different users will have different cognitive styles and so "a thoughtful designer will create interfaces that allow the user to select the form of presentation" (ibid., p.125). This equally applies to the language used: recent work has focused on GSS that either incorporate a translation facility (Aiken et al., 1994, 1995) or permit idea generation in non-Roman alphabetical systems (Park et al., 1990; Wei and Tan, 1993).

2.2.8 Facilitator and Chauffeur Support

Groups using a GSS seldom do so unaided, though SAMM (DeSanctis et al., 1987) was an exception. More usually, a group will have either a facilitator whose job it is to direct the "the group members on what GDSS features to use, when to use them, and how to use them" (Dickson et al., 1993, p.175) or a chauffeur, who implements features of the system for the group, but only at its request (Jarvenpaa et al., 1988). There is a clear distinction between these two roles. The facilitator may often be the co-ordinator of a meeting, but may not necessarily be a member of the group itself and so does not participate in the actual activities - idea generation, evaluation and so on. The role of the chauffeur, on the other hand, is purely technical and does not involve any management of the meeting. The chauffeur should be instructed what to do by the group. On some occasions, particularly with larger groups, both facilitator and chauffeur may be present and here the chauffeur will take instructions from the facilitator. In smaller groups, the chauffeur will take instructions from the group's leader. Other combinations are also possible, for example a combined chauffeur/facilitator who explains how the software works, makes suggestions for its use, and also implements the software tools for the group.

2.3 Socio-Psychological Aspects of Group Processes

In this section we examine a number of salient issues associated with how groups of individuals interact. These cover the social environment, the membership of the group, the processes that occur within a group in the course of its interactions, and finally the meeting outcome.

2.3.1 Group Environment.

Three key elements of a group, in social environment terms, are: the size of the group, the proximity of the members to each other, and the composition in terms of the group's members. A fourth element is the culture - both of the group itself and of the wider environment (Watson et al., 1994). Culture is treated separately in 2.4 below.

Considerable research has been conducted in the last half century into the impacts which different group sizes have on "various dimensions of group performance, member attitudes and group interaction" (Cummings et al., 1974,

p.461). In the pre-GSS era, it was realised that larger groups may produce fewer ideas (per person) than smaller groups, but they do have the advantage of a larger logical size (Dennis et al., 1989), i.e. more human resources are available for problem solution. This in turn is reflected in better quality decisions (Ziller, 1957; Hare, 1981). Where GSS-supported group interaction is concerned, much empirical work has been carried out in the laboratory with relatively small groups (less than seven people), though field studies have been conducted with significantly larger groups of people (commonly 15-20 people, but up to 90). Work with larger field groups at the University of Arizona has been possible since the late 1980s when new, larger facilities came on stream (Vogel and Nunamaker, 1990). Despite the claims and counter-claims in the research literature, advocating one size of group over another (see e.g. Vogel et al. (1987), Dennis et al. (1990b) and Benbasat and Lim (1993)), in a business world context there is no standard size for a group. If 50 people need to meet, then that is the group size.

As with group size, there is a considerable literature on group member proximity (see e.g. Korzenny (1978) and Latané (1981)). Three theories of proximity have emerged, namely linear proximity (the pure physical distance) (Monge et al., 1985), functional proximity (presence over long distances aided by such devices as email, telephones and so forth) (Korzenny, 1978) and psychological proximity (Bennett, 1974) which relates to a sense of nearness that is perceived. In addition, Quinn (1977) observes that time may play a role in proximity, with people who spend more time with or close to one another also feeling more proximate than people who see each other less often - clearly this is a function of linear or geographical proximity. Proximity is related to GSS by way of media richness theory (Daft and Lengel, 1986; Daft et al., 1987; Trevino et al., 1990) in that when people can see each other, then they can use visual, audio and textual communication, but when they are physically dispersed, they may have to reply on a reduced subset of these media. Media richness theory has been challenged in recent years, with work by Lee (1994) suggesting that in some situations it may not apply. It was originally believed that rich communications would typically exist in face-to-face situations, where all features (text, sound, sight, even smell) of communication are available including paralinguistic information (tone and volume of voice, gestures, signals, etc.) (Cook and Lalljee, 1972; Rutter et al., 1977, 1978), as well as almost instantaneous feedback (Daft et al., 1987). Lee's work (1994), however, shows that richness is

possible simply through email communications. Very little work has been conducted into environments where participants are not in same time same place mode. However, as we have described in 2.2.6 above, Mashayekhi (1993) suggests how it might work in a practical setting.

In 2.2.5.4, we considered anonymity. It is worth noting here that anonymity in face-to-face field groups is difficult to implement since, unless the group has a zero history, it is likely that the different members of the group will be able to identify each other's writing styles. However, in dispersed settings where the identity of the other group members is not known, anonymity may be more effective.

Group composition has seldom been an area of concern in the literature except insofar as it is recognised that student groups do not generate very consistent results, as we have already discussed above. Mennecke et al. (1992, p.552), however, maintain that "academics and practitioners who seek to understand and work with GSSs should understand the influence that group development and group history have on group behaviour and performance". This influence can be considerable, since behaviour and performance can vary as a result of many factors, e.g.: task, environment, ergonomics, facilitator style, etc. The way in which a group develops and matures over time is particularly important, since a group's internal structure can change as group members interact, share and learn together (Mennecke et al., 1992).

A considerable literature on phases of group development has been established over the last fifty years with a variety of competing theories. These theories are considered briefly here.

Bales (Bales, 1970; Bales and Strodbeck, 1951) developed an equilibrium model which posits that a group is in a continuous state of dividing its time and work between task related needs and socioemotional needs, attempting to maintain an equilibrium between the two states. A number of researchers (e.g. Bennis and Shephard (1956), Jacobson (1956), Tuckman (1965)) have developed what Mennecke et al. (1992) term "linear-progressive models". These models share the assumption that there is a "definite order of progression" in the group from stage to stage. Bennis and Shephard's (1956) model makes the case that groups move through two phases (dependence (on authority) and interdependence (with peers)) via six sub-phases: dependence-submission; counterdependence-fight; resolution-catharsis; enchantment-flight; disenchantment-flight; and consensual-validation. As a

group matures and as communication increases within a group, so it moves through the phases.

A number of cyclical models have also been developed, for example Mills' (1967) life cycle model, which considers group development on a parallel with the human life cycle from birth through growth to death. Mills' model also asserts that the group is able to extend existing group patterns to new group members. Some researchers such as Thelen (Thelen, 1954; Stock and Thelen, 1958) developed recurring cycle models from their experience with training groups. Here the group develops as a function of the changing nature of its work and corresponding socio-emotional maturity. There is thus a progression, with each "work emotionality culture" giving way to the next as problems are solved in turn.

Poole (1983) has developed a contingency (nonsequential) model of development where the group changes due to a "series of intertwining threads of activity that evolve simultaneously and interlock in different patterns over time" (Poole, 1983, p.326). He suggests that if the threads develop in co-ordination with one another, then the group development will appear to be linear, as described above, but if there is a lack of co-ordination, no sequence will be apparent. The model also includes three different forms of discontinuity that may occur in group development. These are normal discontinuities, such as changes of subject or deliberate adjournment, reflective discontinuities, that cause the group to return to previously completed tasks, and disruptive discontinuities, which occur if there is a major conflict or failure that stops forward movement.

McGrath (1990, 1991) has proposed a complex model of group development that assumes groups to be multifunctional. Three levels of function are identified, viz.: production, member well being and member support. For each of these three functions. Four modes of activity are specified, viz.: I: inception (goal choices), II: problem solving (means choices), III: conflict resolution (political choices) and IV: execution (goal attainment). The modes are not strictly sequential in nature as a group with a straightforward problem solving approach and no political problems may proceed directly from mode I to IV. Furthermore, political issues may not directly contribute to task completion, yet are clearly important, even if they hamper the group in its goal attainment. This model therefore is critical of processes that are solely task-oriented.

Finally, Gersick (1991) has proposed a punctuated equilibrium model of group development that makes the case that groups develop in a discontinuous manner characterised by plateaux of stability interspersed by radical changes of transition. In such transition phases, a group would drop old ways of accomplishing tasks, adopt new perspectives on its work and make dramatic progress (Gersick, 1988). Gersick's (1989) own explanation for the model refers to the Einstellung effect, namely the tendency of people to use the same problem solving techniques irrespective of their appropriateness or any success achieved. Changes occur when crises emerge, typically half way through a pre-specified time allocation, the crisis being that time is running out. Other crises include encountering some form of failure, achieving a milestone, and changes in task, group membership, group structure or authority (Gersick and Hackman, 1990).

A commonality of all the above models except the last is the concept of phases of development. This is not to suggest that all groups go through phases of development in a deterministic fashion, however, since the evident complexity of real world groups will include too many factors to be readily represented in a phasic manner. However, it is also clear that understanding group development is critical if generalisations are to be made in empirical research.

What is equally true is that much prior research into groups, both in the GSS literature and more generally, has used *ad hoc* groups, with attempts to generalise results to the organisational context, where most groups are not *ad hoc* but established. A small number of studies investigated this inappropriate generalisation. Hall and Williams (1966) found in a study with management subjects that in high conflict situations, established groups perform significantly better on decision quality and idea generation tasks, but in low conflict situations the difference is insignificant. However, the opposite results were found by Ford et al. (1977) in a study with student subjects.

An equally small number of studies have been conducted in the GSS domain (Chidambaram et al., 1991; Dennis et al., 1990d; Walther, 1992). Results are unfortunately conclusive due to various problems with experimental design, including very short time durations, the use of different GSS tools and the continued use of student subjects, making generalisations beyond the student population problematic.

Considering prior group development studies, Mennecke et al. (1992) advance eighteen propositions that are intended to "provide a theoretical justification

and explanation for relationships observed in prior laboratory and field research" (ibid., pp.552-3). Key among these propositions are (original item numbers used)(ibid. pp.557-562):

> 5: Abrupt transitions similar to the midpoint transition reported by Gersick (1988, 1989) will be less likely to be observed when groups are not constrained by a time limit.
>
> 7: Overall satisfaction with the group's product and process will be greater for established group members when compared to ad hoc members.
>
> 8: Established groups will produce better quality decisions using a more efficient process when compared to ad hoc groups.
>
> 10: For groups that interact using a GSS over a significant period of time, scores for dependent variables such as task performance or user perceptions will demonstrate an improvement after a group's initial exposure to GSS technology.
>
> 11: For tasks that do not require expert knowledge for successful completion, domination within the meeting by leaders or expert members in established groups that use GSS technology will be less when compared with established groups that do not use GSS technology.
>
> 13: Groups that use a GSS will be less likely to exhibit negative social behaviour related to status and power issues when compared to groups that do not use the GSS.
>
> 17: Leaders will be less likely to emerge in groups that use a GSS through the development process when compared with groups that do not use the GSS.
>
> 18: Groups that use a GSS through the development process will develop into more cohesive teams in a shorter period of time when compared with groups that do not use the GSS.

As Mennecke et al. (1992, p.566) point out, team composition is likely, "in the leaner, more flexible organisations emerging in today's competitive business

market", to be in a constant state of flux, related to Sabel's (1991) concept of "Möbius strip"[3] organisations: "team members within these organisations will frequently be reassigned to new teams as the organisation adapts" (Mennecke et al., 1992, p.566). This concept introduces a new hazard, i.e. that the GSS must be robust enough to support a group even though that group is experiencing constantly changing membership. However, it also provides the GSS tools with a great potential for facilitating group development and cohesion, and thereby supporting teams and teamwork (see also Wynne and Noel (1992)).

2.3.2 Group Characteristics

In this section we explore two key characteristics of groups that are important in group interaction: status and influence. Following these, in 2.3.3 we look at group processes themselves and examine how they affect communication more generally. It is important to understand where the origins of status lie, since it is through these origins that we can examine how status manifests itself and so how status may be moderated. Dubrovsky et al. (1991) note that most status comes from social order rather than from biological or instinctual patterning. The social order comprises a hierarchy of relative values which group members have of one another. The hierarchy may not be strictly vertical, as will be seen, since there are numerous sources for value formation which may give individual group members higher statuses at different times, situations and places depending on circumstances.

Status can be acquired from a number of sources, including: race, gender, age, physical attractiveness, organisational position, experience, expert knowledge and task competency, and expected performance level (Sigall and Michaela, 1976; Kirchler and Davis, 1986; Dubrovsky et al., 1991). In organisations, status can also be derived from the environment, such as the location of an office in a building and its proximity to other offices, from the clothes people wear and from their titles, etc. (O'Reilly and Roberts, 1974; Monge and Kirste, 1980; Jablin, 1987).

During meetings, seating arrangements become important, since they affect both verbal and non-verbal behaviour, such as eye contact and group member visibility (Krauss et al., 1977; Patterson, 1983; Mantei, 1989). Thus a person can create and maintain a high status profile by monopolising a group's attention, by

[3] A Möbius strip is a "geometrical form that has no identifiable top or bottom, beginning or end"

positioning him/her-self in such a way that other group members are forced to realign their own seating position to look at him/her, and by using authoritative gestures and other verbal and non-verbal behaviour (Mantei, 1989). All these social boundaries regulate group and inter-group communication. Status, once acquired or created, has to be maintained. This is often accomplished through the establishment of and expected adherence to norms, such as required patterns of behaviour, respect, deference to one's superiors, etc.

Perception of status is critical if that status is to be effective. In situations where group members receive weak status signals from other group members, their behaviour is less likely to be formal and restrained, more likely to be impulsive and unregulatable (Dubrovsky et al., 1991). Thus, the reduced (perceived) status may be evidenced through interaction process outcomes. Research conducted by Short et al. (1976) Hiltz and Turoff (1978), and Kiesler et al. (1984) has shown that the use of electronic mail greatly reduces the number of status-indicating cues, such as attire, affiliation, race, age, organisational position and room location, that are conveyed. That this information may be obtained from other sources is nonetheless true, but its immediacy is diminished. In line with these reduced cues, and augmented by the increased speed of computer-mediated communication, field research (Sproull and Kiesler, 1986) indicates that group members are less aware of socially imposed boundaries.

In laboratory research (Siegel et al., 1986; McGuire et al., 1987), electronically communicating groups tend to display less inhibited behaviour and so make a greater number of unconventional decisions compared to traditional groups (which do not have electronic support), where evidently the status cues would be stronger. Reductions in evaluation apprehension (Lamm and Trommsdorf, 1973; Diehl and Stroebe, 1987), coupled with less direct feedback, can help to explain this reduced perception of status. These findings have significant implications for the use of a GSS, since they may cause unexpected side-effects, such as disinhibited behaviour, to appear. This in turn may prove unacceptable to meeting organisers. As a consequence, as Dubrovsky et al. (1991) imply, the meeting process may veer off its intended course and prove to be hard to realign.

(Mennecke et al., 1992b, p.566).

There is a relatively long standing sociological basis for the study of influence in group behaviour (see Asch, 1951, 1956; Moscovici, 1976). As we have already considered, status is a major factor involved in the formation of influence, and as such this kind of influence is often referred to as status influence. However, there are other aspects of influence that have to be investigated. These are normative and informational influence (Deutsch and Gerard, 1955), and majority and minority influence (Mugny and Pérez, 1991), which we discuss next.

Normative influence derives from norms and entails conformance with the expectations of others (Kaplan and Miller, 1987). It is also often associated with status influence, in that status itself is often associated with norms and the adherence to them, as discussed above (Clapper et al., 1991; Tan et al., 1993c). Normative influence may further be seen as emanating not so much from individuals, as from an organisation. Research undertaken by Jacobs and Campbell (1961) provided evidence for the existence and perpetuation of organisational norms. Once norms are established, it takes some time for them to be removed by successive generations of group members (Nemeth and Staw, 1989). In a summary of this organisational level research, Wanous (1980) notes that individuals must confront the demands and norms of the organisation and be able to fit in with them. Furthermore, Hollander (1960) contends that conformance and competence are prerequisites to the attainment of status, and Schein (1968) views conformity with "pivotal norms" as critical to acceptance by the organisation and later acquisition of influence in the organisation.

Informational influence derives from information, and involves "the acceptance of information from others as evidence about reality" (Kaplan and Miller, 1987, p.306). A person who has information or knowledge may be able to use that to wield influence. When information or knowledge possession contributes to status, status may also be said to be associated with informational influence.

It is not likely that normative and informational influence will be entirely separate in real group settings, but rather that they will operate more or less simultaneously, if to different and varying degrees (Huang et al., 1993). Given the recognised importance of normative and informational influence in group decision making, there is a well established literature in this field (Brown, 1965; Burnstein and Vinokur, 1974; Burnstein and Sanctis, 1981; Kaplan and Miller, 1987; Clapper et al., 1991).

Influence, whether normative or informational, is commonly experienced either as majority influence or as minority influence. Mugny and Pérez (1991, p.4) note that "majority influence ... takes on the form of compliance: individuals *tend* (we stress tend, since this is a general tendency, and other cases do exist) to outwardly accept what the majority advocates, whenever the majority is present or psychologically salient. Yet as soon as the majority leaves, or is no longer psychologically salient, its influence disappears". In this way, the influence exerted by the majority can be considered to be a purely transitory one. It also reflects elements of perceived status, in that the influence can only be maintained when the object of the perception (the majority) is in some way salient, whether physically or psychologically.

Minority influence, on the other hand, works in quite a different way: it performs what is conventionally known as a *conversion* (Moscovici, 1980). A minority initially maintains its stance in the face of opposition, exhibiting, critically, commitment and consistency in this position. Although the impact of the minority may not be immediately evident, the effects are likely to be long lasting (Nemeth, 1986; Tan et al., 1993b). While consistency is a key characteristic of effective minority influence (Moscovici and Faucheux, 1972; Nemeth et al., 1974; Nemeth and Wachtler, 1974), there are other attributes of significance, which may themselves relate to status, such as: rigidity, fairness, expertise, perceived competence, and so knowledge and power (Mausner, 1954; Hollander, 1964; Moscovici, 1976).

Two key concepts already alluded to above are conformity (compliance) and innovation. Studies into majority influence have tended to focus on the way that influence encourages, or forces, conformity (Allen, 1965; Kiesler and Kiesler, 1969; Darley and Darley, 1976; Tan et al., 1993b). Where minority influence is concerned, on the other hand, research has examined innovation and the introduction of divergent and individual viewpoints (Moscovici and Nemeth, 1974; Moscovici, 1976; Levine, 1980; Tan et al., 1993b). These two concepts will reappear below in the context of influence effects and reactions to influence behaviour.

2.3.3 Group Interaction Processes

2.3.3.1 Influence

Research has shown that "majorities exercise their influence at the manifest or public level, whereas minorities exercise their influence at the latent or private levels" (Nemeth and Kwan, 1987, p.789). This variation can be explained in terms of people's unwillingness to express *public* support for a minority's position. This should also be seen in the light of research revealing that minorities that maintain their position can actually be "disliked, ridiculed, and held with disdain" (Nemeth and Staw, 1989, p.188). Anecdotal reports indicate that threats are made to these persistent minorities, even for hypothetical issues (Nemeth and Kwan, 1987) and even when the minority is influential, (Nemeth et al., 1974; Moscovici and Lage, 1976), while the dislike is enhanced when the minority position is seen as obstructing the attainment of a goal. This goal may be either process related, i.e. the perceived *correct* solution is the one which the numerical majority agrees upon, notwithstanding information to the contrary (cf. Janis, 1972), or may reflect normative influence, i.e. it is the position held by people in a position of authority, high status or power, or all three.

Nemeth (1986) found that opposing minority views stimulate the reappraisal of a situation by all group members, leading to the generation of a number of possible innovative solutions. Nemeth and Wachtler (1983) explain that where majority influence is concerned, one is often forced to choose between two alternatives, hence the pressure to conform is relatively high. Where minority influence is concerned, there is less pressure, but there are more opportunities to reassess, re-evaluate and reconsider both the minority's proposed solution(s) and one's own existing ideas. Therefore, the chance that other solutions will be found is increased.

Whilst these formulations may be seen as speculative, they are nonetheless consistent with theoretical and empirical evidence. Nemeth and Wachtler's (1983) empirical evidence supported their ideas, as group members subjected to minority influence displayed creative thinking, selecting novel, correct solutions to problems that tended to be undetected in groups not exposed to this minority influence.

The impact which high status individuals have on lower status group members can be predicted with the social impact theory, the first principle of which implies that "the amount of social impact experienced by the target should be a multiplicative function of the strength, S, the immediacy, I, and the number, N, of sources present" (Latané, 1981, p.344). Latané (ibid.) indicates that strength may be taken as referring to a number of factors, most of which can be included under the generic label of status: the social position, age, economic power, proximity and/or importance of the individuals concerned. Immediacy refers to the proximity, physical or temporal, between those subjected to and emanating influence.

Influence can exert both positive and negative effects on group decision making, and this is particularly true in mixed-status groups, where there are likely to be more opportunities for 'successful' influence behaviour. There are a number of process losses that can occur as a result of influence:

- the unwillingness of lower status members to criticise the opinions of a high status member, out of a fear of negative evaluation and reprisals, resulting in *evaluation apprehension* (Taylor et al., 1958; Lamm and Trommsdorf, 1973; Diehl and Stroebe, 1987);
- the tendency of lower status members to submit to *conformance pressure* and so to comply with an expected standard (a norm) (Hackman and Kaplan, 1974; Shaw, 1981) or with the standard of higher status members (Hollander, 1964);
- the non- or low-participation of low status group members in the discussion process, resulting in *cognitive inertia* where the line of argument taken by the group will very likely adhere to that which the high status member(s) wish(es) it to (Lamm and Trommsdorf, 1973; Jablin and Seibold, 1978);
- the general *domination* of lower status group members by higher status group members (Cyert and March, 1963; Hoffman, 1978; Jablin and Seibold, 1978; Kirchler and Davis, 1986; Jablin, 1987).

As considered above, if the status effects that produce normative influence are strong, they may outweigh any informational influence, i.e. logical reasoning and relevant information, to induce these process losses. On the other hand, there are also possible process gains. Status influence may have a positive impact on the intelligence, design, choice, and implementation phases of group decision making

(Simon, 1977). Thus, more experienced, and so higher status, individuals should be able to exert influence over the allocation of critical resources, and thereby ensure management support for implementation of the decision result, while reducing risks of resistance (Pfeffer and Salancik, 1978).

2.3.3.2 Deindividuation and Group Processes

Deindividuation is a term used to describe the interactive style of individuals who appear to be "submerged in the group" (Festinger et al., 1952, p.382). Hiltz et al. (1989, p.221) define deindividuation as "a decreased reliance by individual group members on their own opinions and values, and increased conformity to group opinions and norms". Clearly this would not promote any reversal of cognitive inertia, as described above, while anonymity has been suggested as a contributor towards deindividuation (Zimbardo, 1969). In GSS settings, however, deindividuation seems to produce different effects. Jessup and Tansik (1991), for instance, note that as group members feel themselves to be more submerged in the group, so they may express thoughts that were previously repressed. In this way, "a member of a problem solving group may, for example, contribute a good idea or key comment that he would not otherwise contribute" (ibid., p.267). Indeed, Jessup et al. (1990b) found that anonymity promoted the generation of more critical and more probing comments from group members. These can be explained in terms of deindividuation, itself promoted by the anonymity, in that it supports a "reduction of normal inner restraints", thereby leading to less inhibited behaviour. This less inhibited behaviour should also be seen in the light of process losses attributable to high status influence, as considered above. Such process losses as evaluation apprehension and cognitive inertia may well be diminished when group members experience deindividuation and so feel less constrained, i.e. when they are able to communicate anonymously.

2.3.3.3 Conflict and Conflict Management

Conflict and its management are two more critical elements of the decision process. As with the other areas of group dynamics, there is a healthy literature on the subject (Deutsch, 1969, 1973). Deutsch (1969, p.7) states that conflict exists "whenever incompatible activities occur". Such activities may be inter- or intra-personal, group or national. The conflict may "arise from differences in information or belief ... reflect

differences in resources such as money, time, space, position ... or it may reflect a rivalry in which one person tries to outdo or undo the other" (ibid.). Conflict can be further classified into destructive and productive aspects. Destructive conflict is particularly common where participants see the situation as win-lose, i.e. where one side is sure to lose so it is worth fighting to win. Reconciliation is unlikely in this context, with threats, coercion and deception being employed so as to try to attain a win. This is also known as distributive conflict behaviour, with parties pursuing their own goals to the exclusion of other parties, exhibiting competitive behaviour and ignoring possible alternatives (Ruble and Thomas, 1976).

Productive conflict, on the other hand, can promote stabilisation of a group, especially in relatively loosely-structured organisations or where the group is less well established (i.e. *ad hoc*) (Coser, 1956). Productive conflict is typified by mutual problem solving, sharing and co-operative behaviour - this is also known as integrative conflict behaviour. Integrative behaviour is generally accepted (Fisher and Ury, 1981; Folger and Poole, 1984) as promoting constructive solutions to problems.

Conflict management with technology support has been little studied, yet Poole et al. (1991) found that the use of GSS in conflict management allowed people to be distanced from ideas, which made activities less personalised and more task-oriented. Anonymous evaluation of ideas also permits people to reveal their opinions without the fear of being identified. As we describe above in 2.2.3.4, Chidambaram et al. (1991), in a longitudinal study, found that GSS-supported groups improved their ability to handle conflict over time, whereas unsupported groups became relatively less adept at handling conflict.

Benbasat and Lim (1993) have noted that the presence of a facilitator in an electronically supported environment contributes positively towards the attainment of a consensus. Indeed, managing conflict successfully suggests that a higher level of consensus can be attained. Research data on consensus, however, is very inconsistent and it is likely that this is directly dependent on the inadequate time given to groups to learn to manage conflict and so develop consensus.

2.3.4 Meeting Outcomes

Meeting outcomes are highly complex and in many cases very difficult to measure. In our review of the GSS literature, satisfaction has proved to be one of the most frequently measured variables (see 2.2.3.6 and 2.2.4.4 above). However, it is often

unclear what meeting participants have been satisfied with. Indeed, satisfaction not only depends on a large number of variables, but also it can relate to many different aspects of a meeting. When we look at different studies, experimental results of satisfaction levels exhibit inconsistencies. This may be due either to a poor understanding by participants of what satisfaction refers to, or to the fact that satisfaction levels (with different aspects of a meeting, and depending on different factors) were mixed.

A second outcome is the perception meeting members have of the meeting's efficiency. This is normally measured more objectively by analysing data that describes such elements of a meeting as: the specific number of comments (or creative comments as judged by experts) generated in a meeting; the length of a meeting; and the number of people who participate and for how long (see Nunamaker et al., 1991). This kind of data is most readily captured when GSS technology is used to support a meeting.

Ownership is an outcome variable that indicates to what extent participants feel that they have a responsibility for the outcome of a meeting (cf. Zigurs and Dickson, 1990, pp. 8,13). This outcome might be a decision, a solution, or a set of recommendations or specifications for a particular problem or project. Ownership incorporates elements of involvement (the participant was involved in the process that led to the decision), and usefulness (the participant's ideas were considered useful by other members of the group formed to look at the problem). This is a necessarily subjective, user-centred outcome variable, but it depends on the participant having been involved in the group process.

The fourth outcome variable, consensus, needs some clarification. We are aware that consensus is culturally dependent. In Singapore, for example, consensus does not necessarily correspond to a "genuine reconciliation of differences" (Tripp, 1976), but more to the notion that members of society have a social obligation to conform to rules that place national interests higher than those of individuals (cf. Watson et al., 1994). GSS research has generally avoided such distinctions, favouring a more universal definition, i.e. Tripp's (1976) "genuine reconciliation of differences". To this extent, we agree that consensus depends to some extent on the management and resolution of conflicts, as well as on the technology used to facilitate that conflict management. Poole et al. (1991) note, for example, that the distancing of ideas from their authors, facilitated with anonymous communications, is

critical as it promotes task-oriented discussion rather than people-oriented discussion. However, we also recognise that consensus may be private, public or both. In the former case, an individual privately agrees with a statement. In the case of public consensus, an individual expresses such agreement. However, in both cases, the consensus may go no further. Only when an individual truly agrees with something and expresses his views openly and honestly can we say that true consensus has been reached.

Nonetheless, due to the cultural differences inherent in the interpretation of consensus, it is important that we are able to analyse levels of consensus achieved as reported by meeting members in a culturally dependent manner. We explore this further below in 2.4. The anonymous communications associated with GSS technology are likely to affect consensus, but whether this is positive or negative will depend on the culture concerned. Watson et al. (1994) found that anonymous communications disrupted the generation of consensus in Singapore, while Poole et al. (1991) suggest that it is likely to improve attainment of consensus in North America.

2.4 National Cultures, Organisations and GSS

In decision making, information is indispensable, yet decision making does not take place in a cultural vacuum. Thus information may be interpreted differently according to the culture where decision making is taking place, and so different decision outcomes may ensue. This has implications for the way in which information systems such as GSS are used, if they are used at all. However, it is important to remember that scientific standards for determining the relative superiority of one culture over another do not exist (cf. Hofstede, 1991).

Before 1980, research on national culture was somewhat fragmented, but the publication in that year of Hofstede's seminal study of 88,000 employees of a single multinational corporation (IBM) in 66 countries did much to change this, synthesising previous results. The study supported the existence of four dimensions of national culture and corresponding index scores were produced for forty of the countries (Hofstede, 1980, p.85).

These four dimensions are:

- Power Distance (PDI) - the degree of inequality of power between a person at a higher level and a person at a lower level, (being subservient to the boss);
- Uncertainty Avoidance (UAV) - the extent to which future possibilities are defended against or accepted, (not facing the future or trying to organise it);
- Individualism (IND) - the relative importance of individual goals compared with group or collective goals, (looking after oneself);
- Masculinity (MAS) - the extent to which goals of men dominate those of women, (assertion - nurturance).

(Davison and Jordan, 1996, p.102; after Hofstede, 1980).

Three of these dimensions are of particular relevance to decision making and of interest to us, namely power distance, individualism, and uncertainty avoidance.

Power distance is a dimension that allows for varying relationships between superiors and subordinates in organisations. The 'spirit' of GSS is that it promotes the democratic diffusion of information and decentralisation of decision making (DeSanctis and Poole, 1994). If the boss is powerful and cannot be contradicted, then a GSS may be seen as unacceptable, 'insubordinate' and possibly threatening. This issue is best illustrated with reference to a short, and perhaps apocryphal, story:

> In a GSS session organised for the army, a group of soldiers of varying ranks, including at least one General who is the convenor of the meeting, are discussing what is good and bad with current operational practices in the army. At some stage in the meeting, a participant (of unknown identity and rank) makes a comment which evidently displeases the convening General. He gets to his feet and demands to know who made this comment, saying that it is absolutely not true. The answer not forthcoming, the General cancels the meeting and all subsequent meetings.

In this case, the General is unable to accept some (unrevealed) information which he believes is untrue. The system has enabled the dissemination of

information which may constitute a threat or just be insubordinate to the General and/or his position. Unable to tolerate this, the General, as convenor, cancels the meeting and thereby eliminates use of the technology responsible for the threat to his position.

Hong Kong scores quite highly on the PDI scale in Hofstede's study suggesting that people are accustomed to, and indeed expect, that there will be substantial power differences between managers and junior employees.

The second of Hofstede's dimensions that is important to GSS is Individualism (IND), sometimes also referred to as Collectivism. If a culture is group-oriented, then one might suppose that use of GSS (with its focus on group work) would be more suitable than in an individual-oriented culture. However, this is not necessarily the case.

In an individual-oriented culture, GSS will certainly act as a force towards group work, insofar as the members of the group are required to work together so as to achieve a result that is likely to be acceptable to all group members. The provision of anonymity in the intergroup communications allows members to submit ideas without revealing their identity, and, as the literature has shown, this increases not only the task focus of the meeting (Poole et al., 1991), but also the equality of participation (Sproull and Kiesler, 1986). When, on the other hand, the culture is group-oriented, the use of a GSS that incorporates anonymous communications can have dysfunctional effects, as illustrated by a cross-cultural study undertaken in Singapore (which also has a high PDI score) and the USA (Watson et al., 1994). In this study, it was found that some features of GSS were not compatible with Singaporean notions of correct group behaviour. These notions include the fact that public dissent is to be avoided, whereas consensus is to be encouraged. As we have explained above, the meaning of consensus in a Singaporean context differs from that found in North American contexts. Therefore, when a GSS (designed in accordance with North American social and cultural norms) was used in a Singaporean setting, certain individuals were able to use anonymous communications - a feature of GSS that is not compatible with Singaporean social norms - to level criticism at other members of the group (a culturally discouraged behaviour).

The third dimension that concerns us - the avoidance of uncertainty - is arguably that which is closest to the domain of Information Systems, including GSS.

It is ironic, nonetheless, and perhaps paradoxical, that the greatest advances in Information Systems have been made in countries which Hofstede (ibid.) identifies as having relatively low levels of uncertainty avoidance behaviour, e.g. the USA and the UK. In these countries, the future is accepted as having much uncertainty with which one must live.

2.4.1 National Cultural Implications for Implementation of GSS in Hong Kong

As we have already observed, most previous theoretical and empirical work in GSS has been undertaken in North America. Furthermore, most GSS software has been developed in North America. These two facts raise two different sets of culturally-related problems for us in our study of GSS in Hong Kong. Firstly, the cultural environments in Hong Kong and the USA are different. This can be most easily seen through the very different scores obtained on the IND, PDI and UAV indices for the two countries (see Table 2.1 below for the scores for Hong Kong and the USA for these three dimensions). Consequently, the way in which GSS may be used in the two countries will likely differ.

Table 2.1 Dimensions of Culture for Hong Kong and the USA (after Hofstede, 1991)

	PDI	**UAV**	**IND**
Hong Kong	68	29	25
USA	40	46	91

A second, rather more fundamental problem, relates to the cultural environment where the GSS software has been developed. Hofstede, discussing management scientists, observes that "their theories cannot but reflect the collective programming of the mind dominant in [their] country, that is its national culture" (Hofstede, 1994, p.4). This is not to say that their theories are right or wrong, but just that they were developed in (if not for) a specific cultural environment. To expect them to transfer seamlessly to another cultural environment would be naïve.

We can easily sum up these two problems with a short example.

> Country A has a problem and its experts devise a solution for that problem. Country B does not have that problem (or has a different problem), and hence Country

> A's solution is irrelevant. Country C, on the other hand, does have that problem, but Country A's solution is culturally inappropriate or unacceptable. Consequently Country A's solution cannot be used.

Let us now put a little flesh on that example with some details:

> In Hong Kong, many different forms of public transport such as buses, trains, trams, ferries, light-rail vehicles, etc. are operated and are used extensively by the population. In order to simplify the cash transactions involved when travelling by public transport, a special, universally compatible smart card will be introduced. In the USA, public transport is less varied and is seldom used by most people, hence this solution is probably inappropriate. In Bhutan, public transport is widely used by many people, yet the cost of installing smart card technology, and educating people to use it, would be prohibitive - both for users and transportation organisations.

Watson et al. (1994, p.45), in a comparison of US and Singaporean groups, reiterate our concern, noting that "the designs of current GSSs are based on North American concepts of desirable group behaviour. Oriental cultures have a different model of desirable group behaviour". We would go further and say that all cultures have different models of desirable group behaviour: Oriental and North American cultures are not unique in this regard. Watson et al. (1994, p.48) summarise: "US groups are more likely to embrace the social structures of a GSS because they are in accord with their culture. In contrast, Singaporean groups are less likely to adopt a GSS because some of the social structures are in conflict with their notions of acceptable group behaviour". They conclude their paper with some useful discussion, particularly the notion that "culture will shape the adoption of technology" and "GSS features that are culturally compatible will be appropriated (by the group), and the remaining features may be reshaped to satisfy cultural norms or ignored" (ibid., p.53). They also recommend that GSSs be as flexible as possible in supporting the key element of a meeting - information exchange. They guard against the "imposition of a culturally determined model of a meeting - a model that might be

appropriate for only a few cultures" (ibid.). The implication is that different cultures will naturally have different meeting models. These models need to be addressable by GSSs on an individual basis, even to the extent that each meeting group has its own cultural idiosyncrasies, and hence its own models. They suggest that while face-to-face, anonymous meetings may be suitable for the US context, asynchronous, distributed meetings may be more suitable for the Singaporean context. Clearly local environmental factors such as status variations, task type and group size will also mediate the exact nature of the interaction.

2.5 Summary

In this chapter we have reviewed and summarised a huge tract of GSS research work covering both GSS technology and research outcomes, as well as aspects relating to the interaction of individuals in terms of culture and social psychology. This literature is of great importance to the thesis as a whole in that it sets the scene for the research methodology, models and instrument that follow, as well as an interpretation of the cases where we explore how we can improve meetings.