Chapter Four: Framework and Instrument Development

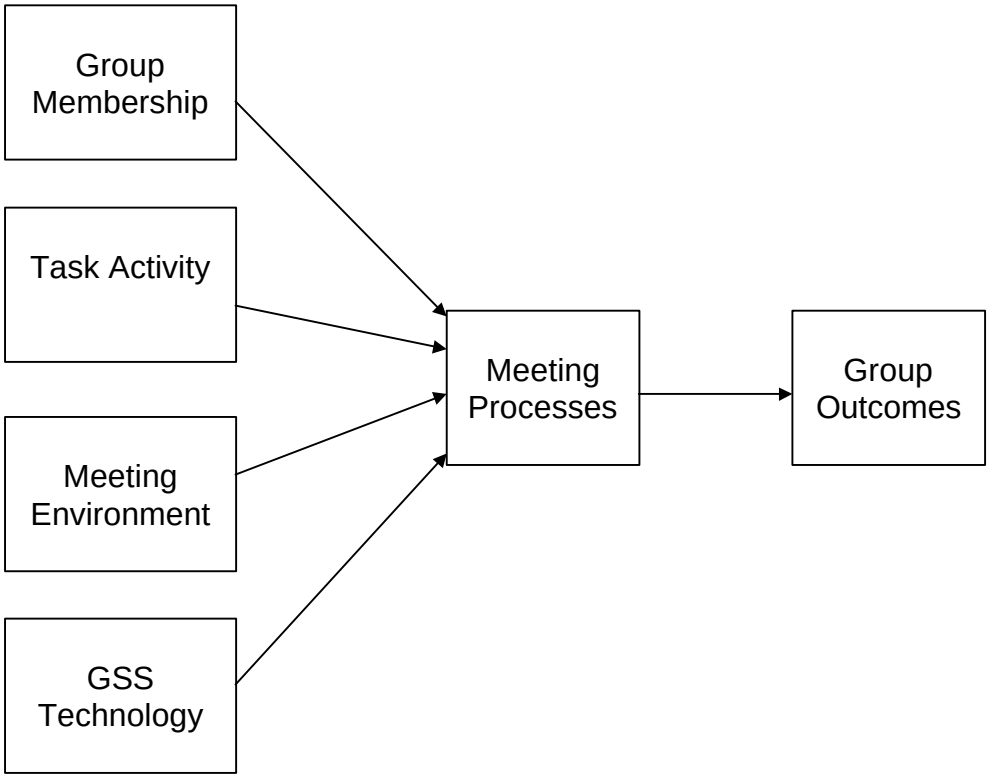
4.1 Introduction

A research framework has several purposes. It is developed by the researcher and guides the research. It also provides the reader with an illustration of how the various phenomena in the research are conceived and how they relate to one another. Moreover, the framework can be used as a basis for other activities, such as the development of an instrument. In this research, we have developed a framework that attempts to explain the key processes that occur in meetings. Through an understanding of these phenomena or processes, and by relating these processes to the outcomes of a meeting, so we have a better understanding of how we can attempt to improve meetings and their outcomes. We also develop an instrument that reflects some of the phenomena in the framework and hence can be used to measure those phenomena. The meeting processes and instrument will all be described in greater detail in the following sections.

In Chapter Two, we have presented a review of the literature that we believe is important to our research. Within this literature, particularly the empirical GSS research, a number of models to describe the inputs (independent variables), processes and interactions (mediating variables) and outputs or outcomes (dependent variables) in meetings have been proposed (see e.g. Dennis et al., 1988; Connolly et al., 1990; Nunamaker et al., 1989, 1991; Ocker et al., 1996). In its simplest form, this generic model resembles Figure 4.1 below.

We could expand and extend this simple model by fleshing out the details of the 'boxes'. However, this is insufficient. Each research project has its own, unique worldview and this is reflected in the models used. As we have already described, in this research, we focus on meeting processes, as well as some of the outputs from those processes. This focus is critical in action research since we need to be able to identify characteristics of meetings that can be studied and, where necessary, improved so as to improve in turn the meeting outcomes.

Figure 4.1 A Simple Framework of a GSS Meeting (after Nunamaker et al., 1989)



Therefore, in the expanded framework (see Figure 4.2 below), we highlight those elements that we measure with the instrument. Other items, for example group size, existing sub-groups, even group history, can be measured independently either by simple observation or through interviewing members of the group. The key independent variable is whether or not the GSS is used. As we have explained above, we wish to document changes in group processes over time comparing an initial situation where GSS is not available with later sessions where it is available. This framework summarises the literature presented in Chapter Two. To this extent, we do not explain further how the literature deals with the various elements of the framework. However, we do explain how we deal with the various inputs, processes and outputs of the framework in the context of the instrument that we develop. This is important since, whereas we measure some of the phenomena we are unable to measure others. It is both useful and necessary to explain which ones are measured, which ones we hold constant and which ones we recognise as being variable but unmeasurable.

4.2 Inputs to the Framework

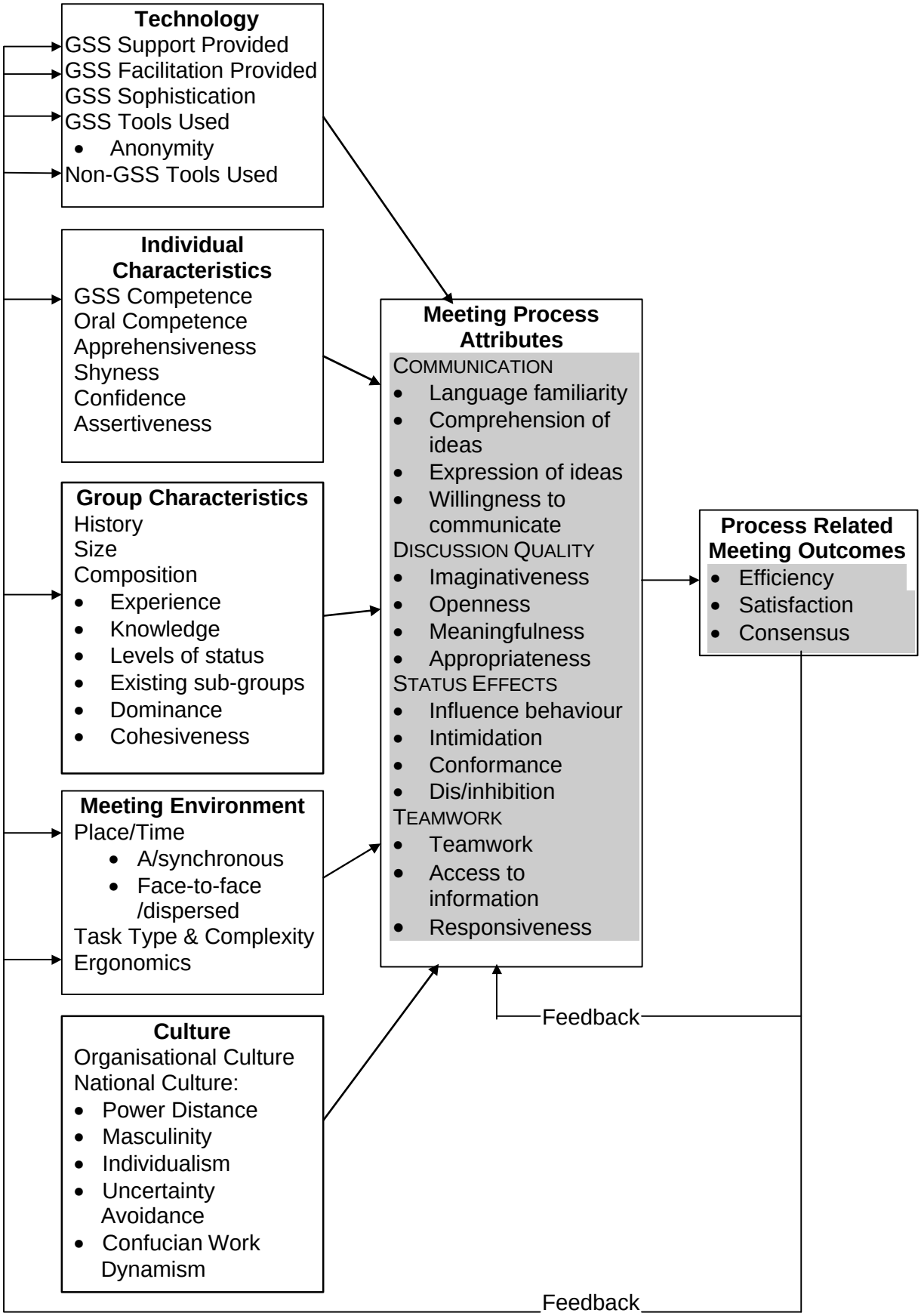
4.2.1 Features of GSS Technology

As we have already made clear in Chapter One, our research question involves investigating how we should apply GSS so as to improve meeting processes in business and professional environments. Nevertheless, although we do not at this point in the thesis attempt to prescribe precisely how GSS should be used in a given context (the nature of action research is that the action depends on the characteristics of the context), it is instructive to review very quickly the key features of a GSS. We see these as being tools that facilitate idea generation, discussion and evaluation, with varying degrees of structure provided according to the needs of the group. Communications may be either identified or anonymous. Meetings that do not utilise a GSS may still use other forms of technology such as whiteboards and flip charts. The instrument we are developing does not attempt to measure the use of these items, since they can be better recorded independently of the participants, i.e. by the researcher or other impartial observers.

4.2.2 Individual Characteristics

The level of sophistication inherent in a GSS is important because it guides the activities that can be performed. However, within our research, the sophistication level is fixed because we use only one GSS product - GroupSystems for Windows. Here we are referring to DeSanctis and Gallupe's (1987) taxonomy of GSS types - some provide communication support while others offer higher level activities, such as the capability to facilitate information modelling (see e.g. Dean et al., 1995). The fundamental variable in this section is GSS technology - is it used or not?

Figure 4.2 Research Framework for Meeting Processes and Outcomes



Individual characteristics covers some key features of individual participants, particularly characteristics that are likely to determine both the ability and the willingness to communicate and to use the GSS software. Where communication is concerned, we have identified shyness, apprehensiveness, assertiveness and confidence as being important. The willingness and ability to use the GSS software is also important - not all people like to use computers during meetings and even if they are willing, their ability to do so will probably vary within a group.

4.2.3 Group Characteristics

Group characteristics includes several different elements. Firstly, the group can be identified in terms of how large it is, for how long it has been formed, and for how long it is expected to exist. In these respects, each group will be different. At the same time, we can look at the experience of the different members of the group and their knowledge about the topic under consideration in a given meeting. On the other hand, we can also examine the interpersonal characteristics of the group's members: are some members naturally dominant? Is the group cohesive or is it fragmented, either into sub-groups or into factions? Do the members of the group cover a wide range of status levels, or are they relatively homogeneous in this respect? We have discussed many of these items in greater detail in 2.3.2 and 2.3.3 above. All of these characteristics are inherently flexible and will vary from group to group.

4.2.4 Meeting Environment

Meeting environment refers to the actual location of a meeting (i.e. what kind of physical facility) and may depend on GSS technology factors, since, for example, decision rooms are equipped with technology. The cases we have investigated have all used the same technology, but in two different physical locations. Ergonomics refers to the layout of the physical location, as well as the design of the tables, chairs, equipment, etc.. Meeting environment in addition considers whether meetings are face-to-face or dispersed and whether they occur synchronously or asynchronously. The meetings investigated in this research include both face-to-face and dispersed, synchronous and asynchronous settings. Eight different task types (not meeting types) have been identified (McGrath, 1984), six of which (planning, creativity, intellective, decision-making, cognitive-conflict and mixed-motive) Pervan (1994b) considers to be amenable to GSS support.

4.2.5 Culture

Well established literatures exist for both organisational and national culture. These have been explored in 2.4 above. Culture is important, because the ways in which individuals from different cultures interact may vary. Some organisations may place a higher value on information dispersion, while others may favour a more secretive, information-retaining line. Equally, the nationals of some countries may find it hard to interact with their superiors in a free and easy manner, whereas others may not experience this difficulty. Various dimensions of culture have been identified by researchers (e.g. Hofstede, 1980; Chinese Culture Connection, 1987), but these dimensions are not absolute. They simply try to explain how people behave. The groups we have studied in this research have been monocultural in an organisational sense (each group has come from a single organisation), though the national cultures of different members of the groups may vary. The instrument does not attempt to measure cultural variations - this information can be gathered independently of the instrument through interviews and organisational literature.

4.3 Meeting Process Attributes

Four meeting process constructs have been identified from the literature as important, viz.: communication, discussion quality, status effects and teamwork. We refer to the interactions that take place in meetings (i.e. the meeting's processes) in terms of these underlying constructs, rather than the more functional modes where those processes are seen, e.g. the elicitation of assumptions, identification of stakeholders, focused idea generation, and idea evaluation.

Where 'communication' is concerned, the notion of willingness is important to our discussion, since although meeting members may be thoroughly competent and able to participate, they may not do so for a number of reasons. This reduced participation is referred to as a process loss, defined by Miner (1984, p.113) after Steiner (1972), as the "difference between potential and actual group performance". Process losses have been described in 2.3.3.1. We measure the characteristics of a meeting that may contribute to process losses under 'status effects'.

Assuming that communication does take place, we are still concerned with the quality of that communication. A number of scales are used to measure this quality: creativity, openness, meaningfulness and appropriateness. The generation of novel,

creative solutions or ideas is vital, because it promotes the reappraisal of a situation (Nemeth and Wachtler, 1983). Such a reappraisal is vital if we are to have as complete as possible an assessment of a problem and its solution. Creative ideas need not only come from individuals. Small sub-groups or teams (Argyris, 1970; Dyer, 1987) of individuals may form to suggest, or at least support, such creative ideas. These teams need to have good access to information and must be responsive to one another if they are to function well as teams.

4.4 Meeting Outcomes

We can identify a number of meeting outcomes in the literature, viz.: efficiency, satisfaction and consensus. These outcomes can be classified according to whether they are related to the meeting's processes or products, though there is considerable overlap.

Efficiency is primarily a process related outcome as it refers to the use of resources (usually time) during the course of a meeting. It has traditionally been measured in GSS research by counting the number of unique (different) ideas or by assessing the relative quality of ideas (Nunamaker et al., 1991; Diehl and Stroebe, 1987). While this is feasible in a laboratory environment, it is less easy to operationalise in a field setting, since quality (which is in any case difficult to measure) or uniqueness are in themselves insufficient indicators of efficiency. Attention should also be paid to the practicality of ideas, as well as any longer term impacts, which may not be immediately obvious, that their implementation would bring about. In this study, we take a broader view of efficiency. The number of ideas generated within a time period is not hard to calculate. However, we also ask participants to give their impressions of meeting efficiency. This is described in detail in 4.7.2.5 below.

Satisfaction is a highly complex construct, and we do not attempt to study it in depth in this research. We rely on two measures of satisfaction - an overall measure and a perception of the extent to which a participant feels that he/she played a useful role in the meeting. Although it is realised that there are many other aspects to a satisfaction construct (see Zigurs and Dickson, 1990, for some examples), it is not the key objective of this research to investigate those various aspects. To do so, while an eminently worthwhile activity in itself, would require a separate research

agenda. It is not unlikely that an instrument to measure satisfaction alone could include 30 or 40 items.

Consensus is difficult to measure because of the distinction between private and public consensus (cf. our discussion in 2.3.4). Indeed, it may not be possible for an outside observer to gain accurate insights into consensus achieved. Consensus also depends on the successful resolution of conflicts (where conflicts exist). This is primarily a meeting facilitation issue, in that a meeting manager or facilitator would *normally* wish to minimise conflict and encourage discussion that leads to consensus. We stress 'normally', since in some cases conflict might be encouraged. In this research we rely on participant perceptions of consensus. We can also collect data in idea evaluation activities, where participants are required to rate, for example, how strongly they agree/disagree with statements. If the standard deviation for a statement is low, this indicates that the participants have similar views on the statement - whether they agree, disagree or have no strong feelings - and so we could conclude that there is a high level of consensus for that statement.

4.5 Feedback

The research framework (see Figure 4.2), in addition to inputs, processes and outputs, also documents the existence of feedback mechanisms. We should remember that meetings are seldom short, one-off affairs (and all of the meetings described in this thesis are longitudinal). It is evident that with meetings occurring on a regular basis, these mechanisms may operate over a considerable period of time. Furthermore, feedback from meeting participants to meeting facilitator may cause changes in the way that subsequent meetings are organised, specifically in terms of the facilitation and support that is provided, the tools used, the place and time of meetings, even the layout of a GSS room. Equally, meeting participants learn more about how to use the software, and so there is feedback to their GSS competency and overall experience. The instrument does not attempt to measure this feedback directly, but it will be reflected in the facilitator's notes and observations about meeting processes and in the learning stage of the action research cycle, and the planning stage of a new cycle.

4.6 Instrument Design

4.6.1 Previous Instruments

In the GSS literature, a small number of variables have been measured fairly frequently. These include meeting success (Hitchcock et al., 1994), meeting process satisfaction and meeting outcome satisfaction (George et al., 1990) and meeting efficiency (Nunamaker et al., 1991). However, we detect inconsistencies in the measurements used, almost to the extent that each research project has an instrument devised especially for it. This view is supported by Pervan (1994b, p.569) who observes that "in the majority of studies, researchers have done their own thing" in terms of the measures used for each type of 'success' indicator. This inconsistency, as well as the fact that most of the measures used cannot be considered comprehensive, presents a worrying trend.

Notwithstanding the above, a minority of researchers have attempted to adopt a more rigorous approach to the measurement of meeting processes. In this respect, McCartt and Rohrbaugh (1989) developed a 23-item instrument to measure the effectiveness of group decision processes in decision conferencing using the Competing Values Approach (Quinn and Rohrbaugh, 1983; Lewis and Minton, 1986). This research has been influential in the design of our own instrument, with similarities between some of the issues that the questions addressed. We decided, however, that it would not be appropriate to adopt this instrument unmodified and unextended as it does not explicitly address some pivotal issues including, critically, the role that status plays in interpersonal communication.

Robey et al. (1989), in a study which assesses group processes during the development of an information system, developed a 13-item instrument to measure levels of participation, influence, conflict and conflict management. This study is important as it recognises the importance of status and its impact on conflict and subsequent conflict resolution. The instrument does not explicitly attempt to measure team work and communication, and its focus on influence is not as deep as we believe is required. Therefore, while it is also an important reference instrument for us, which we have drawn upon, it also seems to fall a little short in terms of measuring meeting processes.

Hecht (1978b), in a major review of the group communication satisfaction literature, identifies a number of problems that have arisen in the measurement of satisfaction. He divides the literature into three classes: interpersonal (dyad), group and organisational. He observes that poor operationalisation in general is a problem, and so advises that items in a construct should be developed from a wide range of sources and should relate to the communication process rather than to the attitudes and traits "existing prior to the interaction" (Hecht, 1978b, p.365). Hecht identifies a number of group satisfaction measures, e.g. Hackman and Vidmar (1970), Crowell and Scheidel (1963), as well as some studies which used factor analysis to reveal dimensions of satisfaction (e.g. Yerby, 1975). While these are interesting, none incorporate all of the issues that we have identified as being important.

Hecht's (1978a) own 19-item Interpersonal Communication Satisfaction Inventory devised for measuring communication satisfaction between dyads is another useful reference point for instrument development, yet its focus on dyads makes direct appropriation to our own study inadvisable.

4.6.2 A New Instrument

Having found existing instruments inadequate for our purpose, we have undertaken the task of developing a new instrument. It is useful to reiterate the purpose of developing the instrument:

1) To collect qualitative information about meeting processes and outcomes. This, together with other information collected through interviews and observation, will help us to improve meetings with GSS incorporating an action research methodology;

2) To collect quantitative data about meetings according to the constructs we have identified so as to determine both to what extent the meeting process constructs affect the meeting outcomes and how, if at all, the meeting processes change over time.

To improve the objectivity of any conclusions we draw, it is necessary to collect data with the instrument, as well as other information, from a series of meetings and various different groups. Each of these different groups, and their meetings, is described in a separate case study (see Chapters Five to Eight).

The literary foundations of this instrument are similar to those used for the development of other instruments in the GSS domain. A generalised instrument that

addresses the entire research framework (see Figure 4.2) would need to have not only an unfeasibly large number of questions, but also an impracticably large population size to permit reliable validation of data. Thus we have restricted our instrument development to the shaded components of the framework because we wish to focus on participant perceptions of meeting processes and selected outcomes which are both measurable and likely to be relevant to the meetings we are studying.

Many of the items on the left-hand side of the framework - Technology, Group Characteristics, Meeting Environment and Culture - are not addressed in the instrument as these can either be verified independently of the participants or are directly controlled by the facilitator. Of the items in the Individual Characteristics box, the first (GSS competence) is important, yet hard to measure since most participants are unlikely to be sufficiently familiar or experienced with the GSS software to be able to determine their level of competence. The researcher must observe this competence on a continuous basis as the meetings progress. Interviews with participants may also be used to collect competence-related information in a richer way than is possible with a questionnaire. The other four items in Individual Characteristics are general personality traits and are measured with the instrument. It is intended that they be interpreted in a general sense ("Are you *in general* apprehensive") rather than in any specific, and perhaps extreme, situation.

The remaining items in the questionnaire contribute to five constructs (meeting processes and outcomes), as well as demographic, criterion (single item overall measures) and technology perception variables.

When the instrument was first drafted, some 50 questions were involved. Demographic questions came first, followed by meeting process questions and finally meeting outcomes. Over a 2-year period, the instrument has been revised considerably with many questions being thrown out and a small number added. For those questions that remain, the order has changed little from the earliest versions. This means that while demographic questions still come first, the order of the meeting process questions is not strictly according to construct, since the constructs were only suggested after the first draft instrument. In practice, we believe that the consistent instrument design is more important than the specific question order.

A combination of agree-disagree and semantic differential scales are used. However, unidirectional scales are used, i.e. **agree** is always on the left side and

disagree on the right side. The reason for choosing this unidirectional approach is purely practical - we felt that due to the primarily second-language nature of our participants it was necessary to avoid linguistic confusion as far as possible. This has meant that the questions have had to be simplified (this occurred in the pilot studies) and the scales have not alternated. We realise the dangers of respondents tending to tick "down a column", but have attempted to obviate this problem by providing careful instructions to respondents before they complete the questionnaires.

As already indicated, the instrument has gone through a number of phases of development. A series of pilot tests have been conducted on early versions of the instrument. In these pilot tests, respondents were requested to comment on the format and appropriateness of questions, and to suggest additional material that they believed should be included in such an instrument. In the final pilot test (see Appendix 4.1 for this version of the instrument), 120 meeting participants were sampled and 50 replied (41.6%). Exploratory factor analysis conducted on this sample indicated the presence of five factors (constructs), as well as indicating items which loaded poorly on all factors - these were eliminated from the instrument. It is important to note that these pilot studies were conducted with meeting participants who did not receive GSS support.

Following the pilot tests, we distributed the instrument (see Appendix 4.2 for this version of the instrument) to a large population - the entire academic and administrative staff of the City University of Hong Kong, a total of some 1307 people (we refer to this as the 'University' study). 431 of the questionnaires were returned, and 357 of these were correctly completed making a valid response rate of 27.3%[1].

Once again, the meetings used in this study were not supported with GSS technology. Tables 4.1 and 4.2 show the number and gender of academics and administrative staff in the City University of Hong Kong (CityU) and the study we report here respectively. Table 4.3 offers a summative comparison (gender is not indicated) between Tables 4.1 and 4.2. These tables illustrate that the respondent

[1] 22 of the respondents were invalid because they turned out to be students rather than staff. This fact had not been picked up earlier since the University phone book was used to identify potential respondents. However, since there is a rather fuzzy difference between research student and research assistant, with a certain amount of title changing, it is likely that some people thought to be research assistants were in fact research students. All the other 52 invalid responses were due to partial completion of the questionnaire.

population in this study closely approximates the whole population both in terms of male-female ratios and academic-administrative ratios.

Table 4.1 Demographics of Academic and Administrative Staff at CityU[2]

	Academics[3]	Administrative Staff[4]	Overall
Male	77%	51%	71%
Female	23%	49%	29%

Table 4.2 Demographics of Academic and Administrative Staff in the University Study[5]

Univ Study	Academics	Administrative Staff	Overall
Male	78% (214)	42% (35)	70% (249)
Female	22% (60)	58% (48)	30% (108)

Table 4.3 Comparison of CityU and University Study Demographics

	CityU	Univ Study
Academic	77%	77% (274)
Administrative Staff	23%	23% (83)

In order to incorporate the lessons learned in the University study, as well as needing to insert a few extra questions relating to the use of technology (all the meetings in the action research cases did have GSS support), it has been necessary to make minor additions and revisions to the instrument. These changes, however, had not been validated when we initiated the action research case studies. For the sake of consistency, only the validated parts of the instrument are described below (see Davison, 1997, for a published version). The modifications are described in 4.9 below.

[2] These are the institutional statistics. Only percentage figures are available.
[3] Academics includes teaching and research staff - Lecturers, Professors, Research Assistants, Research Associates, Research Fellows and so forth.
[4] Administrative Staff includes Administrative Officers, Executive Officers, Technical Staff, Managers, and so forth.
[5] Univ Study: These are the statistics for the study described in this section and represent those 357 who correctly completed the questionnaire.

4.7 Validation and Reliability of the Instrument

4.7.1 Content Validity

An instrument that is valid in content must draw representative questions from a universal pool (Cronbach, 1971; Kerlinger, 1978). We have used several sources of data for our instrument, including critically: previous instruments developed by other researchers; a research framework developed from the relevant literature but independently of earlier instruments; feedback from pilot test respondents on the representativeness of questions. Thus we believe that the content validity is established.

4.7.2 Construct Validity and Reliability

To test the construct validity of items in the instrument, we perform confirmatory factor analysis in order to ascertain whether the items chosen for each construct are truly related to that construct. Here we are testing previously developed theory regarding constructs (factors in factor analysis) that we expect to exist (Nunnally, 1978, p.389). For factor analysis to be undertaken, it is generally considered desirable if there is a larger number of respondents than items. Opinion is divided on the extent of the ratio, Guilford (1954) suggesting 1:2 and Nunnally (1978) suggesting 1:10, while Gorsuch (1983, p.332) argues that "nobody has yet worked out what a safe ratio of the number of subjects to variables is". With our valid respondent population of 357 and 19 construct items in the instrument, we have a very safe ratio of close to 1:19. Of the 19 construct items, 18 load well on 5 different factors. A single item in the discussion quality construct does not load well, so it has been thrown out of the validated instrument. We suspect this poor loading is due to poor wording and in 4.9 below we explain how we have reworded it. In the instrument used in the action research studies, the reworded question is included in the instrument. Its final inclusion in the instrument will depend on subsequent testing during and after the action research case studies (this is discussed in 9.4.2).

The reliability of constructs can be assessed using Cronbach's (1951) alpha. The reliability levels of the five constructs vary between 0.71 and 0.83. While these are high, they fall below the 0.90 Nunnally (1978, p.245) considers necessary for applied research.

The following paragraphs and tables describe the constructs and criterion variables, and present the factor loadings for each item and alpha scores for each construct. Items are referred to by an abbreviated form of the question and possess a reference number, e.g. C1 for Communication Item number 1. This reference number is also used in the instrument (see Appendix 4.3 for the validated items).

4.7.2.1 Communication

The communication construct comprises four items (see Table 4.4 below). Each of these is measured on a five-point Likert scale with anchors at 'strongly agree' and 'strongly disagree'. Although the language of all meetings studied has been English, a majority of participants do not have English as a first language (Cantonese is the predominant first language) and hence we wish to measure their ability to communicate in English. Similarly, we included questions relating to willingness to communicate, the ease with which participants could understand others and the ease of self-expression. All of these four items are critical to meeting success, since if there is no communication or understanding of others contributions, it is impossible to reach a consensus. As Table 4.4 illustrates, the four items have strong factor loadings.

Table 4.4: Communication

Abbrev.	Item Name	Factor Loading
C1	The language of the meeting prevented participation	.74
C2	It was hard to understand other participants when they talked	.66
C3	You experienced difficulty expressing yourself	.82
C4	You felt reluctant to put forward your own ideas	.70
	Eigenvalue / % of variance explained	2.14 / 53.7%
	Cronbach's Alpha	.71

4.7.2.2 Teamwork

Teams (people working co-operatively together) are an essential part of participation and communication in meetings. We believe that strongly bound teams are more likely than poorly-bound teams to experience a heightened sense of satisfaction with a meeting and are more likely to contribute to a successful meeting. In order for a team to function well, it needs to have access to all materials that are relevant to the task it is undertaking (McCartt and Rohrbaugh, 1989). In addition, it is preferable if

team members act co-operatively (i.e. answer questions) in their communication. The three items here were measured on a five-point Likert scale with anchors at 'strongly agree' and 'strongly disagree'.

Table 4.5: Teamwork

Abbrev.	Item Name	Factor Loading
T1	Participants appeared willing to answer questions	.79
T2	Participants worked together as a team	.84
T3	Participants had sufficient access to information to be involved in the meeting	.80
	Eigenvalue / % of variance explained	1.97 / 65.7%
	Cronbach's Alpha	.74

4.7.2.3 Discussion Quality

As the literature shows, high quality of discussion together with such measures as creativeness and openness, is essential to inspired problem solving. The three (originally four) items in this construct all employed the same question, but each then employed a different scale. The questions are:

> "With regard to all meeting members as a whole, how would you rate the discussions in the meeting in terms of the following scales".

The four scales are:

D1 Very meaningful	☐	☐	☐	☐	☐	Totally meaningless
D2 Very appropriate	☐	☐	☐	☐	☐	Totally Inappropriate
D3 Very free and open	☐	☐	☐	☐	☐	Totally closed/restricted
D4 Creative/imaginative approaches used	☐	☐	☐	☐	☐	Familiar/unimaginative approaches used

Factor analysis indicates that item D3 does not load well with the other three items. Although there is no accepted cut-off value for factor loadings, we have consistently used 0.5 in this research. Item D3 fell below this cut-off with a loading of 0.44. It is difficult to explain this, except that free/open and closed/restricted are probably not interpreted in a similar manner by respondents. It seems advisable, in retrospect, to use single adjective items wherever possible so as to reduce the cognitive load on the respondent and minimise chances of misinterpretation. The three remaining discussion quality measures do bind together tightly (see Table 4.6). Although item D4 does not display the problems exhibited by D3, we remove the

possible ambiguity by simplifying the question in the action research version of the instrument.

Table 4.6: Discussion Quality

Abbrev.	Item Name	Factor Loading
D1	Discussions in the meeting were: meaningful - meaningless	.90
D2	Discussions in the meeting were: appropriate - inappropriate	.91
D4	Discussions in the meeting were: creative/imaginative - familiar/unimaginative	.79
	Eigenvalue / % of variance explained	2.26 / 75.2%
	Cronbach's Alpha	.83

4.7.2.4 Status Effects

This construct is titled "status effects" rather than just "status" for the simple reason that it is the effects of status which are manifested in the process of the meeting rather than the underlying status characteristics (Hecht, 1978b). As with the other constructs we have identified, status effects are notably important to the running of a meeting. Identification of status-related problems, such as those illustrated by the items in Table 4.7 below, should have a powerful impact on how a GSS is used in an operational setting since process losses (Diehl and Stroebe, 1987) often derive from status related problems. The four items in this construct use the 5-point agree-disagree scale.

Table 4.7: Status Effects

Abbrev.	Item Name	Factor Loading
S1	Some participants tried to intimidate others verbally, or with threatening gestures	.79
S2	Some participants tried to use status or power to force issues on others	.85
S3	You felt inhibited from participating because of the behaviour of others	.83
S4	You experienced pressure to conform to a particular viewpoint	.63
	Eigenvalue / % of variance explained	2.42 / 60.5%
	Cronbach's Alpha	.78

4.7.2.5 Efficiency

As illustrated in Figure 4.2, efficiency is a meeting outcome, depending on meeting processes. Efficiency is usually taken as referring to such quantifiable items as the number of comments generated in a meeting and the length of a meeting. Notwithstanding this definition, participants themselves may have their own views of meeting efficiency. Thus, four items in the instrument attempt to measure efficiency, as seen by the participants. The extent to which a meeting is result oriented was identified as a key component of effectiveness by a respondent to an earlier pilot study version of the instrument. Another such respondent queried how much time had been spent on serious discussion during a pilot phase meeting that we surveyed. The thorough discussion of issues clearly relates to the seriousness of discussion and to the use of time, particularly if the time available is circumscribed.

While items E2 and E3 used 5-point agree-disagree scales, item E1 used a 'Strongly Result Oriented - Weakly Result Oriented' scale and E4 asked respondents to indicate the percentage of time spent on serious discussion, viz.:

□ 0-20% □ 21-40% □ 41-60% □ 61-80% □ 81-100%.

Table 4.8: Efficiency

Abbrev.	Item Name	Factor Loading
E1	To what extent was this meeting result oriented?	.72
E2	The time in the meeting was efficiently used	.83
E3	Issues raised in the meeting were discussed thoroughly	.80
E4	What % of meeting time was spent on serious discussion?	.65
	Eigenvalue / % of variance explained	2.28 / 57.0%
	Cronbach's Alpha	.74

4.7.3 Predictive Validity

"Predictive validity is estimated by a prediction to an external measure referred to as a *criterion* and by checking a measuring instrument against some outcome. In other words, predictive validity is the correlation coefficient between the results of a given measurement and an external criterion" (Frankfort-Nachmias and Nachmias, 1992, p.159). The criterion variable we used in the University study is the score for the item "You feel you played a useful role in the meeting". If individuals believe they play a

useful role in the meeting, then, we suggest, they are also likely to be satisfied. This satisfaction, furthermore, should translate into a willingness to reparticipate in a similar meeting at a later date (Hitchcock et al., 1994). Bivariate correlations between the criterion variable and all other 18 items in the five constructs correlate well, $p<.01$ in all cases except item C2, which correlates at $p=.018$.

In addition we calculated the meeting process construct scores and then measured the degree of correlation between these scores (communication, discussion quality, status effects and teamwork) and the meeting outcome construct score (efficiency). All four meeting process constructs correlate significantly ($p<.001$) with meeting efficiency.

4.8 Limitations of the Instrument

Although the instrument has been successfully validated, there are a number of concerns. Firstly, a small number of changes have been made since validation. These include the addition of two criterions, two attitudinal questions about technology adoption by participants, and the rewording of items D3 and D4 in the Discussion Quality construct. These changes, described in detail in 4.9 below, need to be revalidated with subsequent data. Furthermore, it must be realised that the instrument is designed both to measure the suitability of a meeting for GSS support and to measure meeting characteristics post GSS implementation. The data we have collected during the instrument development and validation relates to meetings that were not supported with GSS technology. In our action research, we use the instrument to collect data about meetings that do have GSS support. This will extend the applicability of the instrument.

4.9 Post-Validation Instrument Development

As already described, a small number of changes and additions have been made to the instrument since its validation. Item D3 has been modified so that the scale now reads:

Very open □ □ □ □ □ Totally closed

while for D4 the scale has been modified to:

Imaginative □ □ □ □ □ Unimaginative

4.9.1 Consensus and Satisfaction

A new criterion variable, Consensus, has been introduced. Although consensus has always been a part of our research framework, we did not attempt to measure it originally as it was believed to be too complex. However, the comments we received from respondents in the University study reaffirmed the importance of consensus as a measure of a meeting as it may determine the implementability of any result or solution achieved in a meeting. Furthermore, we recognise that it plays an important feedback role in subsequent meetings' processes, particularly communication and teamwork processes. In addition it can guide the facilitator's choice of GSS technology and facilitation style, i.e. so as to attempt to increase consensus if that is necessary. However, rather than attempting to develop a new construct for consensus, which would require further validation, we have decided to include consensus as a criterion variable (which requires only a single item). Thus consensus is measured by the single question:

To what extent was consensus achieved in the meeting?

Strongly Achieved ☐ ☐ ☐ ☐ ☐ Weakly Achieved

In the original instrument, as described above, Satisfaction was measured indirectly through the question "To what extent do you feel that you played a useful role in this meeting?" Although designed as a measure of satisfaction, we now believe that it is useful to measure satisfaction directly as well as indirectly (along the same lines as we measure consensus). This direct method is the approach more usually encountered in the GSS literature. Hence, the following question has been included in the instrument:

How would you rate your overall level of satisfaction with the meeting?

Strongly Satisfied ☐ ☐ ☐ ☐ ☐ Strongly Dissatisfied

4.9.2 Attitudes Towards Technology Use

We collect attitudinal information from participants about the GroupSystems software in a number of ways. The instrument is used to pick up some general and immediate impressions. Thus two additional questions are included in the instrument:

How comfortable do you feel using the technology?

Very Comfortable ☐ ☐ ☐ ☐ ☐ Very Uncomfortable

To what extent did the technology hinder/facilitate your participation in this meeting?

Strongly Hindered □ □ □ □ □ Strongly Facilitated

A final, open-ended question asks participants to give any further comments. Additional information is collected during interviews and by observing the participants during the meeting. Since the researcher is also the chauffeur of the software, he may be called upon to help participants to use the software or to explain certain features. These opportunities may reveal attitudes towards the technology - why it is hard to use, for example - which could not so easily be picked up using a questionnaire.

4.10 Summary

In this chapter we have presented a framework which encapsulates our view of the literature and have described how we have developed an instrument from this framework to measure the key interaction processes and outcomes in meetings. This instrument is used in the following chapters to collect data from various organisational groups. We do not claim that the instrument perfectly measures all key meeting processes, but we do believe that the employment of the instrument will help us to ascertain which meeting processes are a cause for concern for each group and subsequently to ascertain whether or not those processes improve over time when a GSS is used.